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Development of R&D capacities of the Silesian University in Opava

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ECONOMIC AND SOCIETAL CHALLENGES OF THE EUROPEAN ECONOMY

International Scientific Conference

# ECONOMIC AND SOCIETAL CHALLENGES OF THE EUROPEAN ECONOMY

## Conference Proceedings

Organized by Silesian University in Opava,
School of Business Administration in Karviná

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SILESIAN UNIVERSITY
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September 13–15, 2022
Petrovice u Karviné, Czech Republic

EUROPEAN UNION
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***Dears Participants of the Conference***

The international scientific conference "Economic and Societal Challenges of the European Economy" is a platform for international scientific discussion on economic policy in its broadest sense. This conference was held on September 13 - 15, 2022, Petrovice u Karviné, Czechia and it follows the long tradition of conferences on the topics of economic policy of the European Union Member States, organised by the Silesian University in Opava, School of Business Administration in Karvina, Department of Economics and Public Administration in association with the Technical University of Ostrava, Faculty of Economics, Department of Economic Policy and later, PRIGO University. As previous conferences, this year´s one is a platform for the worldwide dissemination and sharing of ideas for research in the field of Economic Policy, Economy of the European Union, Future of European Integration, External Relations of the European Union, Labour Market, Globalisation Processes, Competitiveness, Regional Disparities. Moreover, this year´s conference reflects the actual situation in the European and global economy in relation to the post-pandemic period.

Our lives have been significantly affected by the COVID-19 pandemic in the last three years and one area that was most affected was the traditional people gathering. Some conferences were not held at all, some only virtually (online). Since 2021, we are very happy that we can organize this conference face-to-face again and we have a chance to discuss professional topics, but also informal issues. We would also like to express our deeply appreciations and thanks to all participants for their high quality contributions. It was our pleasure to welcome at our conference a significant number of participants from abroad.

We are happy that we have been able to get such broad participation from different sectors of the scientists, practitioners, policy makers and private sector actors. Together we try to advance efforts and present new ideas related to different aspects of economic policy.

The proceedings contain only papers that have successfully passed a double-blind referee process and whose authors had agreed with publication in the proceedings. There have always been two referee reports on each paper. The referees selected are distinguished scholars from Czech as well as foreign universities.

We hope that next volume of our conference will be also successful and enjoyable to all participants. We look forward to seeing all of you next year ☺.

**Associate Professor Dr. Michal Tvrdon**
**Department of Economics and Public Administration**

***CONTENTS***

# DIGITAL AGRICULTURE: CHALLENGES AND PROSPECTS IN KAZAKHSTAN

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**Abstract**
Currently the agricultural sector is undergoing a period of significant changes. Agriculture stepping into the digital era being influenced by intelligent technologies. The COVID-19 pandemic has demonstrated the importance of the agricultural sector in the society in achieving self-sufficiency in food production. It is now time to take advantage of smart solutions to boost the agricultural sector and contribute to increased farm productivity, resource efficiency and sustainable development. This paper discusses the current challenges the agriculture sector faces in the course of industry digitalization in Kazakhstan. The methods, as the secondary data like surveys, observations, experiments, expert interviews were used. The results of this study show that the agricultural sector is facing some difficulties in the context of digital transformation. The main challenges are: weak and unstable mobile communication network and Internet in rural areas; lack of knowledge and skills in implementation of digital solutions; lack of local specialists in agriculture and IT solutions; absence of a single digital agriculture ecosystem.

**Keywords**
Agriculture, Digitalization, Kazakhstan, Intelligent technologies.

**JEL classification**
O13, O38, Q10.

## Introduction

Digitalization process in Kazakhstan essentially started with the country's decision to introduce a single electronic document management between government agencies in 2005. In 2006 Kazakhstan launched its e-government portal - eGov.kz. Since then the Kazakh Government done significant efforts to develop the information and communication technology industry. In 2013 the national programme "Informational Kazakhstan – 2020", was adopted. In 2017 a subsequent programme "Digital Kazakhstan" was adopted. The level of Kazakhstan e-government development is rated as "emerging leaders" and is considered as one of the most successful. In 2020 Kazakhstan ranked 29th among 193 countries in the UN rating for the level of EGDI (in 2018 - 39th) and the highest among the Commonwealth of Independent States (CIS) and landlocked developing countries (UN, 2020, 2018).

According to the World Economic Forum Global Competitiveness Index, in 2019 Kazakhstan is ranked 55th among 141 economies in the new GCI 4.0 rating, having improved its position by four points (2018 - 59th place). According to the website of Kazakh government (https://primeminister.kz), the development of digital technologies agrarian sector is one of the priorities indicated in the government program "Digital Kazakhstan" which is aimed at accelerating economic development and improving the quality of life of each citizen through the use of digital technologies and creating conditions to digitize the Kazakh economy in key five areas: digitization of industries (focus in Industry 4.0), transition to a digital government, implementation of the digital Silk Road, development of human capital, creation of an innovative ecosystem. Within these five

areas, there are 17 specific goals and 120 projects. The digital industries category contains e-agriculture-related measures.

This paper aims at identifying the challenges and the prospects of agriculture in the course of industry digitalization in Kazakhstan. In the course of the study, the secondary data like surveys, observations, experiments, expert interviews were used. For this purpose, three research questions were addressed: What are the challenges the agriculture sector faces in the context of Industry 4.0? (Q1) What are the benefits of new digital technologies and for whom (including farmers and other food chain actors) and how are those benefits evidenced? (Q2) What support might be needed to help disadvantaged farms and farmers to take advantage of digitalization? (Q3)

The paper begins with a literature review on the current global challenges in the agriculture sector and a brief characterization of the Kazakhstan's agriculture sector. Recommendations for better implementation of digital technologies in Kazakhstan's agriculture sector and answers of research questions are made in the conclusion.

## 1 Literature review

The digital technologies revolution is impacting every aspect of society and business. Obviously COVID-19 pandemic has accelerated the pace of digitalization and altered our lives. Digital technologies are substantially changing the way people and businesses cooperate. The agricultural sector is not an exception. Great variety of digitalization being introduced in agricultural sector. The integration of emerging disruptive digital technologies such as internet of things (IoT), big data and analytics (BDA), system integration (SI), cloud computing (CC), simulation, autonomous robotic systems (ARS), augmented reality (AR), artificial intelligence (AI), wireless sensor networks (WSN), cyber-physical system (CPS), digital twin (DT), and additive manufacturing (AM) in agriculture is sparking the next generation industrial agriculture, namely, agriculture 4.0 – also termed smart agriculture, smart farming, or digital farming (Aceto et al., 2019). Generally digital agriculture includes both the collection and Data analysis to improve both on-farm and off-farm decision making, leading to better business outcomes (Leonard et al., 2017). It is widely recognized that digital agriculture will deliver a fundamental change in efficiency, productivity and sustainability at the enterprise level and across the agro-value chain (Aubert et al., 2012; Wolfert et al., 2017).

Agriculture is facing multiple challenges: it has to produce more food to feed a growing population with a smaller rural labour force, more feedstocks for a potentially huge bioenergy market, contribute to overall development in the many agriculture-dependent developing countries, adopt more efficient and sustainable production methods and adjust to climate change (FAO, 2009). Various researches have been conducted in the field of agriculture to identify the effects of technology adoption and its potential to deal with the different challenges existing in agriculture. Namely, Wolfert et al. (2017) conducted a survey on implementing Big Data to smart farming. They claim that Big Data is used to provide farmers with predictive insights in farming operations and real-time operational decisions. Ferrandez-Pastor et al. (2016) made use of Internet of Things and developed a low-cost sensor and actuator network platform. The platform aimed at optimizing the production efficiency, increasing quality, minimizing environmental impacts, and reducing the use of resources like energy and water. Lopez-Riquelme et al. (2017) created a precision agriculture application on the basis of FIWARE cloud. This application is able to reduce the amount of water for irrigation tasks. They concluded that using FIWARE cloud services in the agronomic context is highly beneficial. Liakos et al. (2018) explored the contemporary condition of machine learning techniques in agriculture. They came to conclusion that real-time artificial intelligence allows computer programs to generate comprehensive recommendations and insights for supporting farmers to make appropriate decisions.

Whilst some researchers underline the possible advantages of using digital technologies in agriculture, namely, digital technologies help to minimize risks and increase efficiency (Bongiovanni and Lowenberg-Deboer, 2004), others highlight the ways in which they could provoke problems like a reduction in employment (Van Es and Woodard, 2017) or a lack of sustainability (Walter et al.,

2017). Several security issues related to developing digital agricultural technologies: the highly heterogenous character of farming businesses, farming systems, and environments (Robertson et al., 2016); the high level of uncertainty around how new technologies might fit into the future of farm decision-making in experiencing rapid change (Fielke et al., 2019); the implicit values and assumptions that research and development providers hold about the normative desirability and expected benefits of these technologies among farmers. These implicit values can create unexpected negative social and ethical implications when technology is broadly adopted such as excluding some groups, or further benefiting those who are already privileged (van der Burg et al., 2019; Klerkx and Begemann, 2020; Klerkx and Rose, 2020). As a consequence, it is an important practice that the agriculture along with associated research organizations and institutions considers some key issues about the technological innovation process. It is no longer enough to reflect on whether new technology is merely viable, but also whether it is suitable for the diversity of futures into which it may be deployed, and moreover, ask social and ethical questions about whether its impact will be positive or negative, and for whom (Aysha et al., 2021).

## 2 Current state of agriculture in Kazakhstan

Kazakhstan is the ninth largest country in the world with more than 70% of its territory suitable for agriculture. Agriculture is one of the key branches of Kazakhstan's economy, providing food and economic security as well as the labour potential of the country, especially in rural areas. The total area of agricultural land in Kazakhstan is 200 million hectares, including 24 million hectares of arable land, 188 million hectares of pasture, five million hectares of hayfields and approximately 4.5 million hectares of fallow land. Kazakhstan has a strong potential for the development of sustainable agriculture, which can make a significant contribution to the domestic economy and social stability. Nevertheless, only 40% or about 96 million hectares of the territory are used in farming production. Kazakhstan is one of the largest exporters of grain and flour but due to the increasing demand for imported food products, Kazakhstan becomes a net importer of agricultural products. The country covers several different agro-ecological systems. The North, where most grains are produced, is suitable for rain-fed agriculture. The centre-south is desert and semi-desert, with mountains in the South and East of the country. In the South, agriculture is mostly dependent on irrigation (1.2 million hectares). The East is traditionally planted with oil-seed crops (mostly sunflower).

**Table 1**. Basic agriculture indicators in Kazakhstan (in 2021)

| Indicator | Value |
|---|---|
| Agriculture, forestry and fisheries, value added (% of GDP) | 5.1 |
| Employment in agriculture (% of total employment) (modeled ILO estimate) | 15.4 |
| Rural population (% of total population) | 42 |
| Population (total) | 19 002 586 |

Source: World Bank, the Bureau of National Statistics of the Republic of Kazakhstan.

According to the Bureau of National Statistics of the Republic of Kazakhstan, in 2021, the share of agriculture in the country's GDP structure is insignificant, about 5%, while the share of employment in this area exceeds 15% of the working-age population (see Table 1). Despite abundant land resources and increasing agricultural production, the contribution of agriculture to Kazakhstan's gross domestic product (GDP) has been lowering over the last five years according to the Bureau of National Statistics. This is a great degree as a result of faster growth in the oil and resources industries as well as weak productivity in the agricultural sector. The agribusiness sector, and particularly the livestock and dairy farming, are a point of concern of the government's policy, which is aiming to reduce dependence on oil and gas. The government has a declared objective of doubling the size of the non-oil sectors by 2025 and is considering the development of priority export-oriented sectors (agricultural production, metalwork, machine engineering and petrochemical industry).

The Ministry of Agriculture accepted the "Concept for Industrial Agriculture Development of the Republic of Kazakhstan for 2021-2030." This policy document is similar to the Ministry's National Agricultural Sector Development Project for 2021-2025. However, the newly adopted policy document provides more context for the Ministry's agricultural development plans while the previous project plan for 2021-2025 outlined quantitative success indicators, goals, and objectives to develop the sector. According to the Ministry of Agriculture of the Republic of Kazakhstan a considerable exposure of the agricultural sector based on objective factors like a limited market for food consumption, high risks from metrological conditions, lack of direct access to sea transportation, limited water resources, unavailability of credit financing, low involvement of second-tier banks in industry financing, low development of trade and logistics infrastructure, life support systems in rural areas.

According to the data provided by the Ministry of Agriculture of Republic of Kazakhstan in January-December 2021, the volume of gross agricultural output decreased by 2.4% and amounted to 7.4 trillion tenge (approx. more € 15 billion). The reason for the decline is the abnormal drought last year, due to which the volume of crop production decreased by 6.7% (approx. €8,7 billion), although livestock production achieved an increase of 3.6% (approx. €6,4 billion) Food production for the specified period increased by 1.9% and amounted to approx. €4,5 billion. The Board of the Ministry of Agriculture concludes that there is a steady trend of investment in the fixed capital of agriculture. Thus, the volume of investments in fixed capital of agriculture increased by 33.3% and amounted to approx. €1,6 billion in food production increased by 3.1% and amounted to approx. €236 million. According to the Ministry data there is a slight increase in labor productivity. Labor productivity per person employed in agriculture for 9 months of 2021 amounted to approx. €4440 (for 9 months of 2020 - approx. €3759), (https://primeminister.kz). As stated by the Bureau of National Statistics of the Republic of Kazakhstan, the share of agriculture in the country's GDP structure stays insignificant, about 5% in 2021. Despite Kazakhstan's high agricultural potential, resource endowments, enormous land mass, and more than adequate state support to the agricultural sector, the country remains to be a net food importer.

Kazakhstan's advantageous agricultural development potential extends much further simple land inheritance. The country has well-known comparative advantages in agricultural production for the following reasons (OECD 2011, Petrick and Pomfret 2017):

- As a former "breadbasket" of the Soviet Union, the country has a legacy of using extensive arable land resources as well as a huge amount of rangelands for inexpensive, surplus agricultural production;
- Demand possibilities in neighboring countries (PRC, the Russian Federation) are expected to be positive in the medium to long run;
- Kazakhstan has a relatively open trade regime compared to other Central Asian countries, as observed by its membership in the World Trade Organization, and the Eurasian Customs Union;
- As agriculture accounted for 15,4% of the nation's workforce but produced just 5,1% of GDP, we assume that labor availability for agriculture is relatively high;
- Kazakhstan has the fiscal preferences to support fast agricultural development, as well as a commitment to the agro-food sector by the Kazakh government.

The agriculture sector's performance in Kazakhstan has remained low because of a series of specific challenges. These challenges fall into five categories (Asian Development Bank, 2018): farm restructuring, addressing water constraints, enabling crop intensification, improving pasture management, and resolving value-chain fragmentation. Each challenge is substantial but can be addressed through specific policy actions, states the Asian Development Bank experts.

Based on the experts' view we can indicate six key problems in the country's agriculture sector (Strategy 2050, 2018):

- low labour productivity,
- low competitiveness of products (as a result, underload of processing enterprises),

- low technical equipment,
- lack of knowledge, expertise,
- low revenues,
- high overhead expenses.

Our requirements on agriculture are not limited to manufacturing, the sector must also contribute to the economic prosperity and social well-being of rural areas, and help preserve natural resources such as land, water and biodiversity in the context urban growth and industrialization, and climate change pressure. There is also an urgent need to protect and restore the quality of existing agricultural land

## 3 Digital agriculture in Kazakhstan

In Kazakhstan there is a great potential for transformation in agriculture through digital technology to increase farming productivity and ensure the country’s food security. The digitalization of agriculture is carried out within the framework of the state program "Digital Kazakhstan”. One of the goals of this program is creating conditions for the transition of the economy to a fundamentally new trajectory - the digital economy of the future. According to the State program “Digital Kazakhstan” the target indicator for the development of digital technologies in agriculture is an increase in labor productivity in the section “Agriculture, forestry and fisheries” up to 82% by 2022 and an increase in the volume of exports of food products up to 69% by 2022. Three main management areas are highlighted in terms of digital farming: “accurate arable farming” management system gives the possibility to farmers to monitor the rates of seeds, humidity, nutrient elements, pests, precipitation probability, etc.; livestock and crop monitoring, involves a system to record pedigrees, a system of control in forestry management and protection, reproduction and utilization of fauna, and a traceability system “from farm to counter”; e-Agrotrade for e-commerce, which includes a unified electronic trading facility for realization of the agricultural sector output (Digital Kazakhstan State Program, 2017).

Digitalization of the agricultural sector in Kazakhstan currently is mainly the introduction and widespread use of GPS navigation technologies, drones, electronic maps. Depending on the elements of precision agriculture used, the Ministry of agriculture has identified three levels of digitalization of the agricultural complex in Kazakhstan:

- *Basic farms* – they are like usual farms with a traditional approach to farming but they benefit from the electronic field maps and soil analysis.
- *Advanced farms* – these are half-automated farms. They use fuel consumption sensors, GPS trackers, weather stations, an electronic weed map, and business process management software.
- *Digital farms* – they make use of new tools and technologies, almost without human involvement.

The great majority of farms in the country are basic farms. The Ministry of Agriculture plans to create digital farms in every district to create an opportunity for every farmer hands-on experience of digital technologies. Three test locations have been organised: Kaskelen agro park, Shortandy, and Kostanai area. After the pilot stage, and once the demonstration farms have been set up, seminars and training activities will be carried out to promote large-scale adoption of digital methods. After finalizing the digitalization process of the agro-industrial complex in the country by 2023, at least 20 more digital and four thousand advanced farms are expected to appear, according to the plans of the Ministry of agriculture (ITU and FAO, 2020).

The Qoldau.kz portal (Figure 1), was launched in 2018 as part of the digitalization of the agro-industrial complex. The platform was developed by the Information and Accounting Center, a subsidiary of the Ministry of Finance of the Republic of Kazakhstan. Initially, the main function of Qoldau.kz was to receive electronic applications from farmers for various types of state support. Later, many other services were hosted on the platform. For example, monitoring the use of

agricultural land, agricultural insurance, the purchase of fertilizers, pesticides, seeds, etc. Subsidizing was completely digitized by 2021. There are 16 areas of subsidizing including seven in crop production, four in livestock production and five in financial instruments. Along with reducing the administrative burden on agricultural producers, this system meant to contribute to the overall digitalization of agriculture through the integration of this platform with other databases (for example, the formation of electronic maps of fields for receiving a per hectare subsidy).

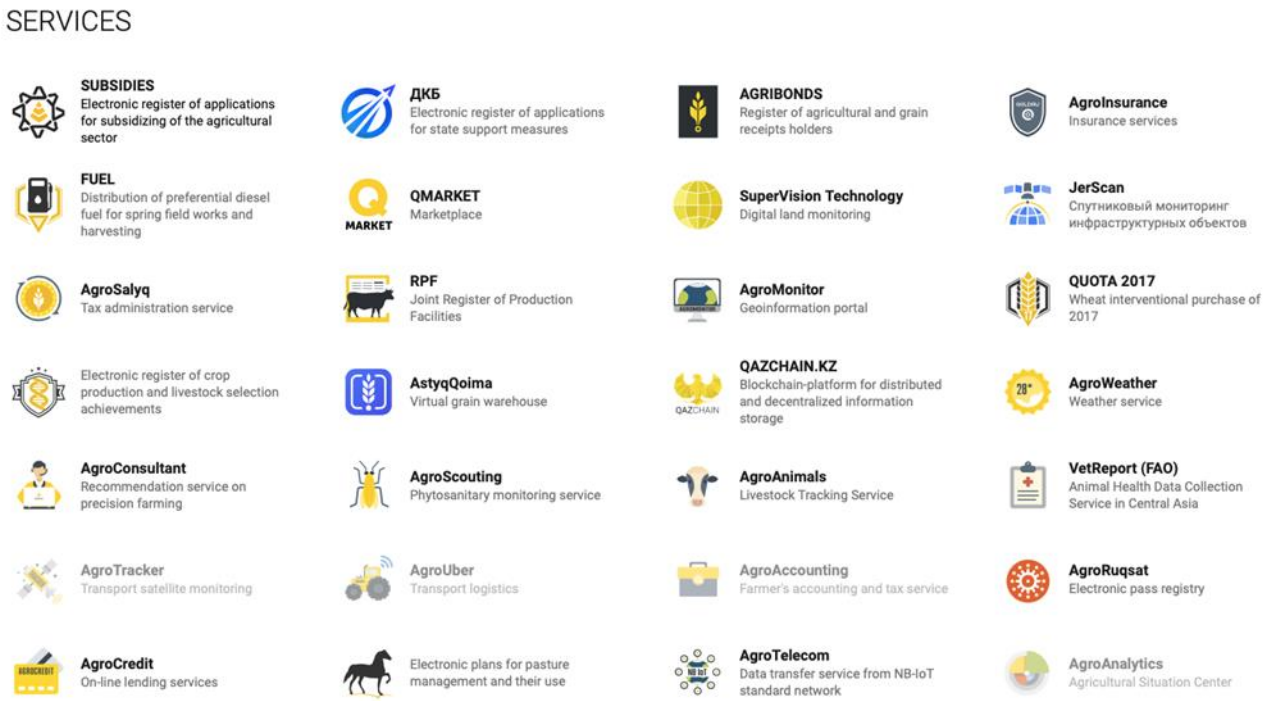


**Fig. 1.** Available services on qoldau.kz platform (Source: https://qoldau.kz 2022)

At the same time, criticism of the farmers was caused by the fact that an annual subscription fee was required to connect to the portal. Whereas public services (including filing applications for state support) in accordance with the law should be free. A compromise was found in that the size of the subscription fee was set small. However, in April 2020, in the midst of the crisis, Transtelecom, which operates the portal, announced plans to increase the subscription fee by 3.7 times at once, from 3 to 11 monthly calculation index (MCI). This decision was motivated by the need to purchase new equipment. According to the news portal QazaqZerno (https://kazakh-zerno.net), the subscription fee was not the only problem with this portal. When the portal was launched, as one of its advantages was the availability of the services anywhere through the internet. Especially, for farmers it would be convenient to apply online instead of traveling to the district center or city to submit their applications for state support (subsidies). In reality it turned out that either due to technical problems on the qoldau.kz server itself, or due to lacking high-speed internet in almost all villages of the country, uploading documents was impossible. Another promise was its simplicity and reducing the corruption risk as farmers would not contact with the officials directly. In practice, it turned out that information regarding the cadastre was not always accurate. As a result, farmers could not register on the system properly and was not able to submit documents for the state support. The next argument in favor of qoldau.kz portal was a transparency in the budget distribution which was not possible without any waiting list for subsidies online.

Taking into account all the above mentioned problems, a new system (Unified State Information System for Subsidizing the Agro-Industrial Complex) for subsidizing agriculture is being developed in Kazakhstan. The state information system for subsidizing agriculture will be free and be integrated with all major government databases. According to the Agriculture Ministry livestock, crop production, financial instruments will be within the framework of a single system absolutely free of

charge. In 2023 seed traceability service will be launched on the portal. Also, a register of recipients and dishonest recipients of subsidies, as well as a waiting list for recipients, will be created to allow fair distribution of subsidies. In addition, a single/common telephone number (call centre) 1475 is registered in Kazakhstan, by which agricultural producers can receive advice on state support.

As reported by the Ministry of Agriculture, a large-scale work is carried out towards a digital transformation of the agriculture sector. For example, within the framework of the National Project for the Development of the Agro-Industrial Complex, state support for agricultural enterprises for the purchase of digital equipment and solutions was introduced. According to the minister, the main instrument for managing land relations is the automatic information system of the State Cadastre, which contains 6.5 million data inputs on land plots, including soil, geobotanical and agricultural lands. This system provides 12 of 15 types of electronic state services in the field of land relations for the population.

Below we will review some of the major milestone achievements in Kazakhstan's digitalizing the agriculture based on the official information (https://primeminister.kz, 2022):

- **The Information System "Identification of Farm Animals" was implemented.** More than 35 million farm animals are registered in the system, which employs about 4.5 thousand veterinary specialists. Kazakhstan became the first EAEU[1] country to use that system. The Information System "Identification of Farm Animals" allows to track the full life cycle of animals, including preventive veterinary measures and simplifies the issuance and speed up the receipt of veterinary passports, significantly save government expenditures.
- As the Minister of Agriculture noted currently **94% of the provided state services have been automated**. Compared to the previous year, the share of services rendered in electronic format to the population increased by 34%.
- **The information analytical system Plem.kz** allows to register the selection and breeding work in livestock breeding. About 35 thousand users have the opportunity to confirm the origin, carry out breeding work and regulate zootechnical events online.
- Business processes were digitized using the functionality of **the Unified Automated Management System "E-Agriculture"**. Domestic agricultural producers and other participants of both domestic and foreign trade have the opportunity to receive electronic accompanying documents without visiting government agencies.
- **All 11 permit documents in crop production have been digitized**. Also, in the field of animal husbandry 10 out of 12 permit documents have been transferred to electronic format.
- **Fully digitized the process of registration** of agricultural machinery, accreditation of procurement organizations, and guaranteeing microcredits commission's work.
- **Subsidizing in all 16 areas,** including seven in crop production, four in livestock production and five in financial instruments **is completely digitized**.
- **The Cropio program was introduced**. This program allows to improve the personnel management process, optimize production processes and the performance of managers, specialists and employees, respectively. This is a satellite monitoring system for agricultural land, specially designed for heads of agricultural companies and agronomists. Cropio monitors the state of crops in real time, monitors the growing season of fields in different regions, identifies problem areas and calculates the recommended fertilization rate. Also, Cropio provides the most accurate meteorological information, serves as a convenient database for storing information and compiling reports, and allows you to track the current state of the agricultural market. At all stages of farming, Cropio will reduce labor costs, save time and resources, and ensure effective land management" (https://primeminister.kzs).

[1] (EAEU) The Eurasian Economic Union is a free trade agreement that came into being in 2015 to increase economic cooperation and raise the standard of living of its members. Member countries include Russia, Armenia, Belarus, Kazakhstan, and Kyrgyzstan.

- **"Digital agronomist" Service**. The app was written on the basis of the 1C platform[2] by local specialists. During its development, a list of agronomic rules and factors that need to be taken into account in the work was approved - for example, the predecessor crop, spatial isolation rules, variety neighborhoods, fallow wedge size, etc. The service helps to evaluate the selected crop structure. Of course, the program cannot completely replace agronomic experience. It takes into account the most basic points of planning, saving the specialist from long routine work (QazaqZerno, 2019).

The Minister of Agriculture of the Republic of Kazakhstan claims that the analysis of the world experience of introducing digital technologies in agriculture demonstrates a significant economic effect from the introduction of the Internet of things in the agro-industrial complex. In the field of agriculture, the average increase in yield is more than 10%, the average savings in the range of 5-10%. Thus, in precision farming with the use of new agronomy technologies at pilot sites, it was possible to get up to 20% more yield, while the farmer's costs were reduced by more than 15%. In animal husbandry, the introduction of digitalization also has a positive effect. Early detection of diseases in animals allows timely treatment, thereby reducing the consumption of veterinary drugs up to 30-40%. Digitalization of feed accounting and feeding processes, with the right approach of specialists, has led to a saving of 25% of the feed stock. Accounting systems also allow timely transfers, culling, insemination, livestock inspection, etc., which together gives up to 10% increase in livestock production. Also, the use of modern equipment was reflected in the increase in milk yield by more than 20%, the yield of calves increased by 25%.

The Minister also shares with success in cosmo-monitoring on the test sites/pilot regions. The first pilot regions were Akmola, East Kazakhstan, Kostanay and Mangystau regions. In accordance with the data of the first stage of space monitoring of pilot regions, 8.3 million hectares of unused land were identified, of which 2.6 million hectares of pastures were voluntarily returned to state ownership, owners of 5.7 million hectares of land were notified to eliminate violations. In 2020, the Ministry of Agriculture completed the creation of soil maps for 26 million hectares, geobotanical maps for 25 million hectares and agricultural maps for 6.5 million hectares (or 3% of agricultural land). In 2021-22, coverage will be increased to 40 million hectares for soil and geobotanical maps and to 33.2 million hectares for agricultural maps (https://primeminister.kz).

## 4 Methodology and data

This research is based on extensive desk literature review. It surveys the available literature resulting from the search string "(digital OR ICT) AND (agriculture OR farmer) AND (Kazakhstan agriculture) AND (challenges OR limit OR barrier)" on Google Scholar, ScienceDirect, and JSTOR (see Table 2). We included additional a document analysis to figure out current state of digital public services in the Republic of Kazakhstan. Research includes a careful review following secondary data source:

- relevant academic literature on digitization of agricultural industries (journal articles, working papers, book chapter, magazine article, and books);
- legislative and policy documents published by the Republic of Kazakhstan;
- reports by international development organizations such as the UN, the World Bank, The Food and Agriculture Organization (FAO), and the OECD;
- official statistical resources (Agency for Strategic planning and reforms of the Republic of Kazakhstan Bureau of National statistics);
- websites of national public agencies through which the majority of online public services are offered;

[2] 1C:Enterprise is a full-stack, low-code platform that provides ready-to-use infrastructure and tools for rapid development of business applications, such as ERP (Enterprise resource planning), POS (Point-of-sale system), WMS (a warehouse management system), or other custom corporate software. 1C:Enterprise uses a domain-driven design approach for developing business software.

- expert interviews and analytical articles on current agriculture development issues in Kazakhstan published in newspapers.

**Table 2**. Data source

| Type of publication | Number |
|---|---|
| Analytical papers published on Kazakhstani case of agriculture digitization | 6 |
| Expert interviews (both international and local) | 4 |
| Book chapters | 3 |
| Legislative and policy documents published by the Republic of Kazakhstan | 6 |
| Official reports released by the Kazakh Government | 5 |
| Reports published by international development organizations | 7 |
| Research papers | 26 |

Source: authors calculation

The purpose of this research was to get an overview image of the agriculture sector faces in the course of industry digitalization in Kazakhstan, by collecting and analyzing data obtained from secondary data analysis.

In this paper following research questions were addressed:

- Question 1 **(Q1)**: What are the challenges the agriculture sector faces in the context of Industry 4.0?
- Question 2 **(Q2)**: What are the benefits of new digital technologies and for whom (including farmers and other food chain actors) and how are those benefits evidenced?
- Question 3 **(Q3)**: What support might be needed to help disadvantaged farms and farmers to take advantage of digitalization?

In the following section we try to identify the main issues of agricultural digitalization and answer the above questions.

## 5 Results and discussion

The "fourth agricultural revolution" comes not only with the promise of multiple gains such as reducing the cost of production, improving its quality and preventing corruption risks, but it also brings the technical, social, economic, ethical and practical questions, with significant implications for how commercial agriculture is structured, practiced and governed (Ingram J. et al., 2020). For example, with the many benefits digital technologies brings to the agriculture sector, new problems arise such as technology gap between urban and rural areas, large landowners and smallholders, or questions about privacy. From personnel management in agriculture point of view, technology cannot fully replace knowledge about agro-ecosystems; it will be difficult for farmers to use technology when they are not proficient and enterprises do not have specific orientations. These are among main challenges organisations and governments face in digitalization of agriculture. In general, it is considered that the difficulty of constructing, maintaining, analyzing and sharing such data limits the possibility of taking effective decision rules with high information value for producers (Weersink et al., 2018). Taking this into consideration, there is a great dependence on the user to interpret the data. Studies have also found a huge learning load for farmers from using digital agriculture tools and the need to invest in human capital (Van Es and Woodard, 2017; Eastwood et al., 2019).

The digital transformation in agriculture is not only transformation of paper data into electronic data, but also it requires the use of digital technologies to create a new way of working. With agriculture this is a huge challenge. If the financial, educational or other sectors of economy are able to instantly respond to changes, the agricultural sector has accumulated unresolved problems, complicated by external changes. The task is to change the farmers' habits or way of working. If the

appropriate steps taken along with adequate state support and the business community, the agriculture sector will achieve its goals in digitalization. Thus, the efficient and affordable ICT infrastructure allow farmers to integrate the digitalization process to increase their competitiveness in a global market.

The results of this study showed the agricultural sector is facing these *challenges* in the context of digital transformation: digital divide between different categories of farmers; limited accessibility and network connection; connectivity costs; absence of technological equipment; lack of ICT skills; low motivation for using new technologies; lack of effective training; lack of hardware; lack of personnel and qualified specialists in agricultural production; insufficient level of social infrastructure in rural areas; lack of proper interrelation of science with production; underdevelopment of trade and logistics infrastructure and wholesale link; insufficient level of applied agricultural technologies; predominance of small-scale production of individual branches of industrial agriculture; the adoption of new technologies is lagging behind for smallholder farmers; the outmigration of young people.

According to the foreign experts´ solutions for the current challenges to a digital agriculture in Kazakhstan can be the following (Fraunhofer-Gesellschaft, 2017):

1. to establish competence centers for Industry 4.0,
2. to establish an appropriate Industry 4.0 platform for Kazakhstan,
3. to establish a specialized institute for industrial automation and digitization,
4. to update curricula and create new specialties at universities to train the necessary specialists,
5. to introduce regulatory measures and low-interest financing opportunities to motivate and encourage companies to introduce Industry 4.0 technologies,
6. to further improve communication infrastructure and regulatory measures to accelerate the development of Internet of Things-technologies in Kazakhstan.

According to the OECD experts the following three key questions are important in taking the actions needed from governments to guarantee the opportunities offered by digital technologies (OECD, 2021):

Firstly, how can government policies and programs adequately assist the adoption of digital technologies in the agriculture and food sectors? Policy makers will need to examine the potential benefits, costs and risks, and understand the factors influencing technology adoption, so that interventions can be targeted to areas where is a market is failure or public interest.

Secondly, how can governments take advantage of digital technologies to design and implement better agricultural policies? This requires understanding how technology can help in different components of the policy cycle, and may require government bodies to expand their skillsets, invest in technology and training, or partner with other actors (both government and non-government).

Thirdly, how can digital technologies modify the roles of government? On the one hand, digital technologies may create new roles or responsibilities for governments, including to enable the digital infrastructure (is there a case for governments to be a provider or a rule maker of new digital infrastructure, and under what circumstances); but on the other hand, if technology can reduce information asymmetries and transactions costs, less government intervention may be needed.

## Conclusion

Kazakhstan is the ninth largest country with more than 70% of its territory suitable for agriculture. Agriculture is one of the key branches of Kazakhstan's economy, providing food and economic security as well as the labour potential of the country, especially in rural areas. Kazakhstan has a strong potential for the development of sustainable agriculture, which can make a significant contribution to the domestic economy and social stability. Despite abundant land resources and increasing agricultural production, the contribution of agriculture to Kazakhstan’s gross domestic product (GDP) has been lowering over the last five years according to the Bureau of National Statistics. This is a great degree as a result of faster growth in the oil and resources industries as well as weak productivity in the agricultural sector. Kazakhstan is one of the world’s largest exporters of

grain, but is import-dependent for several food products. In Kazakhstan the possibilities of creating large ecosystems for the production and processing of meat, fruits, vegetables, sugar, cereals, oilseeds, and dairy products is being considered.

The Ministry of Agriculture of Republic of Kazakhstan carried out a large-scale work towards digitalization of public services and industry-specific business processes. The principal mission of the digitalization of agriculture is to reduce the production cost, improve their quality and create competitive advantages. Digitalization of the agricultural sector in Kazakhstan currently is mainly the introduction and widespread use of GPS navigation technologies, drones, electronic maps. Depending on the elements of precision agriculture used, the Ministry of agriculture has identified three levels of digitalization of the agricultural complex in Kazakhstan: Basic farms - usual farms with a traditional approach to farming but they benefit from the electronic field maps and soil analysis; Advanced farms - half-automated farms using fuel consumption sensors, GPS trackers, weather stations, an electronic weed map, and business process management software; Digital farms - make use of new tools and technologies, almost without human involvement. Of course, the great majority of farms in the country are basic farms and the share of agricultural producers using digital technologies in agriculture is insignificant. This limits productivity growth and cost reduction.

Within the questions, we identified the main challenges (Q1): weak and unstable mobile communication network and Internet in rural areas; lack of knowledge and skills in implementation of digital solutions; lack of local specialists in agriculture and IT solutions; absence of a single digital agriculture ecosystem.

Although there are problems with the implementation of digitization, we can already identify the benefits of it (Q2): an annual yield increase of 10 percent, coupled with cost savings of 10%; early detection of animal reduced the consumption of veterinary drugs up to 30-40%; digitalization of feed accounting and feeding processes saved one quarter of the feed stock and also allow timely transfers, culling, insemination, livestock inspection, etc., which increase 10% of livestock production.

What concerns the support to disadvantaged farms and farmers to take advantage of digitalization (Q3), we see the main role of government firstly in the introduction of the digital infrastructure, secondly in teaching how to use this established digital technology and last but not least, in financial support of all stakeholders in agriculture.

In our opinion, special attention should be given to smallholders and family farmers in introducing digital technologies. In policy making the interests of all stakeholders should be taken into account. Digitalization process should be consumer oriented but not technology driven. In our future research we will focus on monitoring the further process of digitization of agriculture and its comparison with some selected economies.

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# CIRCULAR ECONOMY IN SMES: LEGISLATIVE CONDITION OR COMPANY PHILOSOPHY?

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**Abstract**
The Circular Economy (CE) is one of the biggest transformational challenges in the field of economics. Changing from a consumptive linear take-make-consume-dispose model to a circular economy and a model of production and consumption that involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products for as long as possible is a challenging and long-term process that requires not only legislative support, but more importantly a change in the mindset and motivation of business actors. The aim of the presented paper is to identify motives for implementing CE principles in own business in the Czech Republic. A sample of 73 small and medium-sized enterprises that subscribe to the principles of sustainability and circular economy was examined. Before 2015, when the European Union (EU) discussion started at the European Parliament level, 57% of these enterprises were established. Of the total, 85% of enterprises subscribed to the principles of the circular economy when they set up their business, without any legislative incentive to do it.

**Keywords**
Circular Economy, Sustainability, small and medium Enterprises, Czech Republic.

**JEL classification**
F 18, F 64, G 30.

## Introduction

The circular economy (CE) is a model of consumption and production, which involves recycling, sharing, reusing, repairing, leasing, and refurbishing existing materials and products as long as possible. In this way, the life cycle of products is extended. Consumption of non-renewable resources is growing at an exponential rate even as most governments in emerging and developed economies are moving towards legislative changes. The aim of these measures is to preserve the environment and usable resources for future generations. This means reducing the amount of waste from production to a minimum. Products are manufactured with a limited lifetime, when the product reaches the end of its life it is used up completely. Product materials are kept within the economy wherever possible. These materials are productively reused and reused again and again, thus creating additional value. The circular economy thus marks a departure from the linear economic model, which is based on a take-make-consume-dispose pattern. This model relied on large quantities of readily available cheap materials, energy and energy resources. It also included planned obsolescence. That is, a process whereby a product is designed to have a limited lifetime in order to encourage consumers to buy it again.

The sharp increase in world population over the past century, the rise in living standards has meant an increase in demand for raw materials. However, supplies of critical raw materials found on Earth are limited. This has also meant that some EU countries are dependent on other countries for their raw materials. This was particularly evident after the outbreak of the Russian-Ukrainian military conflict. The extraction, distribution and use of raw materials has a major impact on the environment. The whole process increases energy consumption and $CO_2$ emissions. However, a more rational use of raw materials can reduce $CO_2$ emissions. The transition to a circular economy brings undeniable benefits - reducing pressure on the environment, increasing competitiveness, stimulating innovation, improving security of supply of raw materials, boosting economic growth (an additional 0.5% of gross domestic product), creating new jobs (European Parliament, 2015). This document foresaw the creation of up to 70,000 new jobs, satisfying consumers with more innovative and durable products. The premise is that innovative products will improve the quality of life of consumers and save the

population money in the long run. For the European Union, the circular economy is one of the strategic sustainability projects.

In 2020, the European Commission presented an action plan for the circular economy. The aim of the plan was to promote more sustainable product design, improve the position of the consumer, for example by creating a right to repair, and reduce waste. The plan targets resource-intensive sectors with non-renewable raw materials. Such sectors are considered to be construction, textiles, plastics, electronics and ICT. This plan has become one of the main building blocks of the European Green Deal. This is the new European agenda for sustainable growth. The action plan aims to prepare Member States' economies for a green future, protect the environment, create new consumer rights through measures throughout the life cycle of products and strengthen competitiveness. Since 2015, a team of experts has been working on a plan focused on design and manufacturing for a circular economy. The aim of the activity was to keep used resources in the EU economy for as long as possible. The plan envisaged close involvement of the business and stakeholder community to develop initiatives implemented in the Circular Economy Action Plan (European Commission, 2020).

Stricter recycling rules and binding targets for material use and consumption by 2030 - *New Circular Economy Action Plan* were adopted in 2021. It calls for additional measures to help achieve a carbon neutral, environmentally sustainable, non-toxic and fully circular economy by 2050 (Huitema, 2021).

The first package of measures (European Commission, 2022) to accelerate the transition to a circular economy was adopted by the European Commission in spring 2022. The proposals include the promotion of sustainable products, empowering consumers for a green transition, revising the regulation of construction products and creating a strategy for sustainable textiles.

The paper aims to identify the motivation to use the principles of circular economy in business in a selected sample of small and medium-sized enterprises. The remainder of the paper is structured in the following way: Section 1 deals with the literature review on circular economy in the world, European Union, and the Czech Republic, sustainability, Green Deal and historical approaches of companies to these activities. Section 2 presents data and methods. Section 3 introduces the empirical results, case study and a discussion, and finally, Section 4 concludes with the outlines and implications.

## 1 Literature review

The concept and idea of the Circular Economy (CE) has been extensively studied since the late 20th century in governments, business and necessarily academia. The popularity of CE is growing, especially because it helps to consume raw materials and minimize emissions, increases the sustainability of consumption, improves resource efficiency, and above all opens new market prospects (Tunn et al., 2019; Shpak et al., 2020). At the government level, CE is seen as a facilitator of long-term growth and as a means to combat global warming (Calisto Friant et al., 2020). The basic principle of CE is defined by the European Parliament as „*a production and consumption model that includes sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products for as long as possible”*. This is the way to extend product life cycles. (European Parliament, 2015).

The idea of circular flow for materials and energy is not new, appearing as early as 1966 in the book by Kenneth E. Boulding, who explains that we should be in a "cyclical" system of production (Boulding, 1966). The author discusses the classes of inputs and outputs of open and closed systems, specifically in the context of material, energy and information systems of the past and in the time frame of the 1960s. He provides a philosophical view of conceptualisation of the spaceman economy. For its part, the term "circular economy" appeared for the first time in "The Economics of Natural Resources" (Kneese, 1988) and soon after that was used by Pearce and Turner (Pearce and Turner, 1990) to describe an economic system where waste at extraction, production, and consumption stages

is turned into inputs. Over the last several decades, a growing body of literature from various disciplines has emerged that has influenced our present understanding and interpretation of the CE (Lieder and Rashid, 2016). While the concept of a circular economy has been discussed since the 1970s, switching from the current linear model of economy to a circular one has recently attracted increased attention from major global companies and policymakers. In time for the World Economic Forum 2012 in Davos, the Ellen MacArthur Foundation (EMF) and McKinsey Company published a report which evaluates the potential benefits of the transition to a circular economy (Ellen MacArthur Foundation, 2021). From the early 2000s, China integrated the notion into its industrial and environmental policies to make them resource-oriented, production-oriented, waste, use-oriented and life cycle oriented (Junming et al., 2019). The European Union introduced its vision of the circular economy in 2014, a New Circular Economy Action Plan having been launched in 2020 that "show the way to a climate-neutral, competitive economy of empowered consumers" (Huitema, 2021).

The shift to CE marks a change in the linear economic model that has dominated economic trends since the beginning of the Industrial Revolution. Changing the linear economic model is no easy task and means transforming generations of production and consumption patterns. Innovative transformative technologies such as digital and engineering technologies, combined with creative thinking about CE, will lead to fundamental changes across the entire value chain that are not limited to specific industries or materials (Lacy et al., 2014; Vanner et al., 2014).

CE is closely linked to the notion of competitiveness, innovation and sustainability (MacGregor Pelikanova, 2019). New business models focus on the delivered outcome rather than the sold product. This can bring environmental benefits and improve competitiveness. This led to the emergence of a new research area in the mid-1990s - Product and Service Systems (PSS) (Tukker, 2015). According to Tukker and Tischner (2006), PSS "consist of a mixture of tangible products and intangible services designed and combined so that together they are able to satisfy the needs of the end customer".

Access to renewables also brings high energy intensity and society is sensitive to sustainable energy sources. The Czech Republic is one of the largest exporters of electricity generated from nuclear power. It is also important to monitor the social perception of society. Čábelková et al. (2021) showed that more information on a Nuclear Fusion (NF) positively influenced the support. Internet news were (negatively) and printed newspapers and magazines were (positively) related to support. The Nuclear Fusion being and unlimited source of energy (positively) and using radioactive material and competing for renewables money (negatively) were related to support. NF offers significant benefits, namely being effectively inexhaustible fuel, independent of daylight, season, and weather, atomic safety, with no need to extract and maintain fossil or nuclear resources, and having a negligible environmental impact. These benefits may make NF plants eventually the cheapest, leanest, and most unlimited source of energy (SME EnterPRIZE, 2022).

Support from government and government-funded non-profit organizations is at the beginning of. Ministry of Industry and Trade of the Czech Republic (MIT) in cooperation with the Ministry of the Environment and the Association of Small and Medium Enterprises and Tradesmen of the Czech Republic (AMSP), declared the Year of Circular Economy. The year 2022 is marked by seminars and educational events with concrete examples of implementation in the field of circular economy, circular economy and others. In order to ensure maximum awareness, especially among start-ups, small and medium-sized enterprises, quality materials on the circular economy, information channels or examples of good practice in the implementation of circular economy principles will be presented (MIT, 2021).

## 2 Methodology and data

The aim of the paper is to identify the motivation to use the principles of circular economy in business in a selected sample of Czech SMEs. A quantitative analysis of the number of enterprises according to size, number of employees and industry sector will be carried out. The motivation of enterprises to implement circular economy principles in their business strategy will be evaluated by combining

theoretical research and interview findings. The data for the analysis was obtained from a sample of 73 Czech SMEs that subscribe to the principles of sustainability and circular economy and participated in the national round of the SME EnterPRIZE 2022 competition (SME EnterPRIZE, 2022). The financial data on the performance of the sample was obtained from the Orbis Europe database produced by Bureau van Dijk, which maps in detail 110 million business entities in Europe.

## 3 Empirical results

The sample of selected companies was first examined from a historical perspective. The European Parliament started to seriously address the issue of the change from a linear model to a circular economy in 2015. We investigated how many businesses were founded before 2015. Descriptive statistics by size of enterprises are given in Tab. 1.

**Table 1**. Descriptive Statistics

| | Number of employees | | Operating revenue (K EUR) | | ROE before Tax | |
|---|---|---|---|---|---|---|
| | Small | Medium | Small | Medium | Small | Medium |
| AC value | 7.840 | 48.604 | 264.304 | 4342.515 | 5.861 | 18.059 |
| Error wed. Values | 0.991 | 4.451 | 71.861 | 765.267 | 8.596 | 5.862 |
| Median | 6 | 18 | 87.483 | 2399.928 | 1 | 5.172 |
| Modus | 6 | 15 | n.a. | 886.150 | 1 | 1 |
| Direction deviation | 4.955 | 30.840 | 359.305 | 5301.924 | 42.982 | 40.616 |
| Max-min difference | 15 | 148.000 | 1016.015 | 25147.800 | 271.474 | 254.254 |
| Minimum | 1 | 2 | 0.284 | 0.053 | -148.431 | - 35.202 |
| Maximum | 16 | 150.000 | 1016.299 | 25147.853 | 123.043 | 219.052 |
| Number | 25 | 48 | 25 | 48 | 25 | 48 |

Source: Orbis Europe 2022. Author.

There are 48 medium-sized enterprises and 25 small enterprises in the statistical sample, based on the EUR Lex L 124, 2003 classification. The average turnover of small enterprises is 264.3 K EUR and for medium-sized enterprises 4342.5 K EUR. Of the total number of sustainable enterprises, 78 were founded by 2015, i.e. a full 57%. In the following years, 1-4 enterprises were added per year. Overall, see Fig. 1.

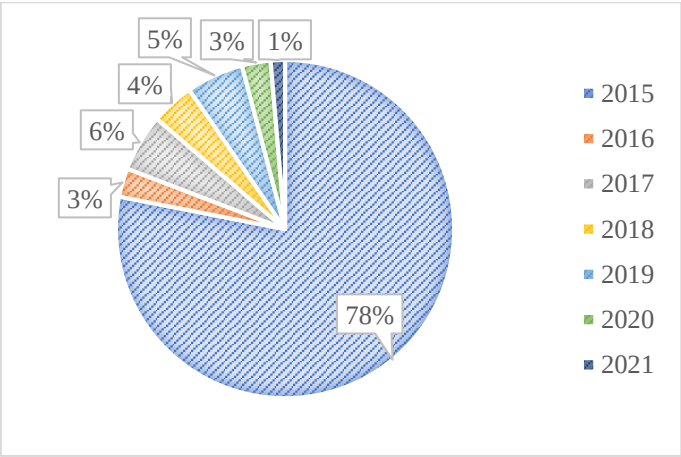


**Fig. 1.** Number of enterprises by year of foundation (Source: own calculation)

Historically, only one enterprise was founded outside the market economy period. Only 22% of businesses were founded before 2015, when the European Parliament defined the basic principles of

CE. Yet these businesses have incorporated sustainable business and CE principles into their strategies since the early days of business, without being motivated by legislation.

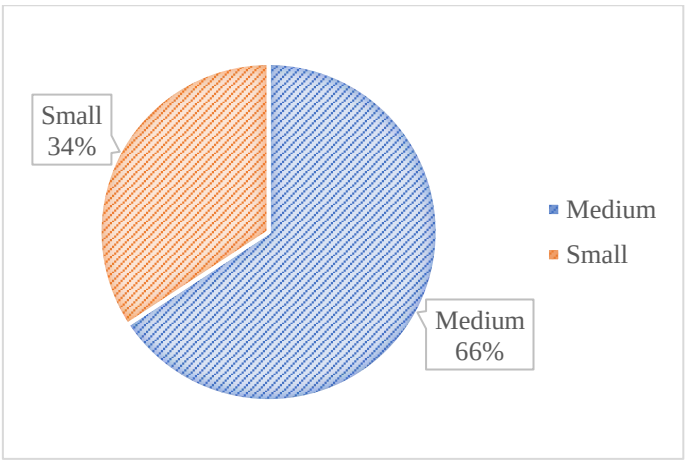


**Fig. 2.** Share of enterprises by size (Source: own calculation)

The sample includes two-thirds of medium-sized enterprises (48 enterprises) and one-third of small enterprises (25 enterprises), see fig. 2. There were no changes in company size during the years under review. The values are from the last financial year. The average number of employees in small enterprises is 7.84, in medium-sized enterprises it is 48.6, (see Tab. 1) which does not meet the lower limit for the number of employees according to the definition of EUR Lex L 124 (EUR-Lex - L, 2003), but if enterprises achieve a higher turnover they are already in the medium-sized enterprise category. The nature of sustainable business also implies that enterprises have fewer employees, as work is more of a mission than an occupation. The economic indicator chosen is Return on Equity (ROE), which provides the business owner with information on the profit per unit of capital invested.

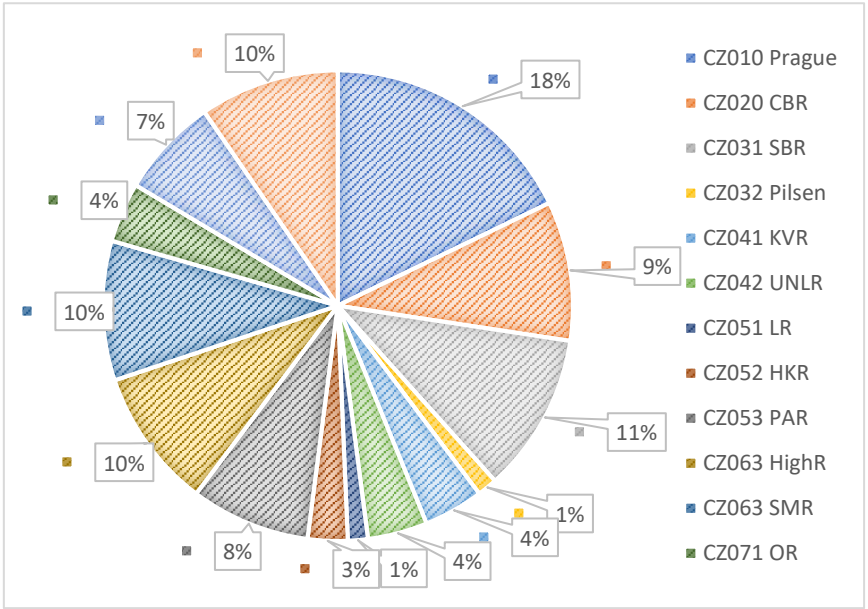


**Fig. 3.** Distribution of enterprises by region (Source: own calculation)

The monitored enterprises were disaggregated according to their location. The highest concentration of enterprises is in the capital city of Prague, where almost 20% of enterprises operate. This was followed by the South Bohemia region with 11% and the Highland, South Moravia and

Moravia-Silesia regions with 10%. Surprisingly, the lowest concentration of SMEs claiming CE principles is in the highly industrial Pilsen Region, see fig. 3.

The interviews with CEOs of the companies revealed that their motivation when starting the company was already "to do business in harmony with nature". 62 enterprises, or 85%, were inclined to this statement. Eleven enterprises, or 15%, had taken measures in the course of doing business that were in line with the principles of a sustainable economy. Thus, in particular, the adjustment of energy intensity of production, waste water management, its reuse. Fifteen enterprises, i.e. 20.5%, are engaged in the processing of industrial waste as part of their main business activity and thus generate other products for consumption. 5.5% of enterprises are engaged in the provision of cleaning services and their main raw materials are water and electricity to power machinery. As they were not indifferent to the waste of water, they have innovated their technological processes so that water can be reused a maximum of four times after treatment.

One of the companies with the longest business history in accordance with the principles of the circular economy is a medium-sized enterprise founded by a woman and operating on the market in the Czech Republic for 27 years. The company manufactures stainless steel water management equipment for wastewater treatment and filtration. The company's success has long since extended beyond the borders of the Czech Republic and its production is supplied to countries in Europe, Asia and South America. The company upgraded its own operations 10 years ago by building a solar power plant that provides 50% of its own energy independence. The water that is used for production is returned to circulation as utility water. The principles of the circular economy are literally the DNA of the company.

An agricultural enterprise that adopted the principles of circular economy in 2017 by converting a brownfield used for cattle breeding to aquaculture freshwater fish farming. Production became independent of a year-round water source, and wastewater with fish excrement is used as organic fertilizer for other crops. Other waste is used as natural fertiliser. The company sells its fish production exclusively within the region, minimising the carbon footprint of the distribution of the finished product.

All the enterprises in the sample confirmed in their presentations that doing business in accordance with the CE principles is possible, profitable and all enterprises have chosen to do business in this way without being forced by legislation to do so.

## Conclusion

The aim of the paper was to identify the motivation to use the principles of circular economy in business in a selected sample of small and medium-sized enterprises. The world economy for many centuries has been focused on a linear economic model. Its principle was - "Make, sell, consume and throw away". Switching to CE means changing the linear economic model, and this is not an easy task. It means transforming generations of production and consumption patterns. Within the historical context, the first references to the need for a change in resource management appear in the 1960s, when the economy in Eastern Europe operated on the principles of central planning and resources seemed unlimited. The rapid growth of the world population in the 20th century, and in particular the rise in living standards, meant an increase in the consumption of energy and water resources, much of which is non-renewable. Concern about the extreme consumption of non-renewable resources has led the economies of developed countries to adopt measures that will lead to conservation in this area.

CE has become one of the strategic sustainability projects for the European Union. In 2015, the European Parliament issued the first document that assumes that CE is a way to extend the life cycle of products. Other binding documents have followed.

A sample of 73 SMEs, established in the Czech Republic, owned by Czech capital and operating across sectors, was subjected to the processing of basic economic indicators such as operating revenue and ROE. All enterprises subscribe to CE principles and more than half (57%) of them were founded before 2015. Every year, 1-4 enterprises were added with the vision of managing and doing business

in accordance with CE principles. All companies adapt their resource consumption, production process or service provision to a closed cycle, where raw materials are put back into circulation. Only a small part of the residual waste does not find further use. The research was conducted through interviews with business owners and CEOs and economic indicators were supplemented from the ORBIS database. Their processing was done by descriptive statistics. 85% of the enterprises were inclined to claim that the motivation of their business activity was to do business in harmony with nature. 20.5% have as their main business activity the processing of waste and its recovery as input raw material in the production process for other businesses.

Agricultural enterprises try to use waste and wastewater as organic fertilizer in their business activities, thus not only saving considerable financial resources on artificial fertilizers, but especially saving the environment for the next generation.

CE research has many areas where research can be further developed. This article has limitations that need to be mentioned. The topic is interesting and offers room for further research, especially the analysis of enterprises doing business with the CE principle with regard to value creation for the economy and profit generation for the owners.

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# COMPARISON OF THE DEVELOPMENT OF R&D TAX SUPER DEDUCTION IN CZECHIA AND SLOVAKIA

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**Abstract**
Research and development can be considered an important factor of competitiveness especially because of their potential for solving problems and ensuring sustainable development. In both Slovakia and the Czech Republic, science and research are among the declared priorities of the governments, but in the GERD indicator, the Czechia reaches twice the value of Slovakia. The aim of this paper is to evaluate the development of the application of R&D Tax super deduction by comparing two neighbouring countries - Czechia and Slovakia. The comparison will compare the conditions of application at different points in time and will also provide a quantitative analysis of the number and volume of R&D Tax super deduction applied in each year in both countries. Slovakia introduced R&D Tax super deductions in 2015, in Czechia it has been available since 2005. Changes in the conditions of application of superannuation are more frequent in Slovakia compared to Czechia, while the basic rate also has a larger variance in Slovakia compared to Czechia. Considering the size of the economy, the development of the application of R&D Tax super deductions in both countries can be evaluated as comparable and dependent on the rates of R&D Tax super deductions.

**Keywords**
R&D Tax Super deduction, Qualifying Research expenses, Czechia, Slovak, Enterprises.

**JEL classification**
H20; E62; O32; O38

## Introduction

The dynamics of EU member states' development is closely linked to geopolitical developments and the course of economic crises. Individual countries and economic groupings base their ability to survive on global competitiveness and constant competition for leading positions, see Competitiveness Index, 2020. Some European Union (EU) countries are in the top 10 of the Competitiveness Index, but the leading positions belong to Singapore and the USA. There are several comparative measures of innovation performance, but here too the leading positions belong to the US, Singapore, and Korea. Although according to the Global Innovation Index (GII) (WIPO, 2021), Switzerland and Sweden lead the way. Several types of R&D projects have been developed within the EU. The current programme is Horizon Europe (2021), which builds on Horizon 2020, the Lisbon Strategy, and the Europe 2020 Strategy. The target remains to achieve R&D spending of 3% of GDP. The flagship measure is the Gross Domestic Expenditure on Research and Experimental Development (GERD), which captures all spending on R&D carried out within each economy each year. Fiscal policy instruments applied in individual countries also act to support the conduct of in-house R&D by business. In the EU countries in particular, indirect support for R&D, called the R&D tax super deduction for qualifying research expenses (QRE), has proved its worth over the last twenty years.

At the present time, with the onset of the energy crisis, inflation rising sharply and the COVID-19 pandemic not yet over, it is essential to set strategic objectives in enterprises to promote R&D and initiate innovations that will successfully improve business performance, reduce energy intensity of production, consumption of non-renewable resources and increase the involvement of enterprises in the circular economy. How to successfully use innovation in enterprises is very important at a time when innovation strategy is almost a matter of survival.

Any external support for research, development and innovation is also desirable in the business sector, as it is the negative effects of crises that most affect entrepreneurs, who are the sole creators of a country's added value (GDP). Therefore, it is important to monitor the application of R&D tax super deduction as one of the supporting instruments of the fiscal policy of the state. Given the inconsistencies in legislative arrangements across EU countries, it is interesting to identify the impact of such instruments on the business sector and public finances.

The aim of the paper is to compare the development in the application of R&D tax super deduction in two countries of the CEE region, which have common economic and historical backgrounds. The results of the selected countries are compared with the EU average and the EU leader in the application of indirect public support for R&D in enterprises as a share of GDP.

## 1 Literature review

The Frascati Manual covers the concept of R&D in three areas - basic research, applied research and experimental development. It defines R&D as "creative work carried out on a systematic basis to increase knowledge, including knowledge about people, culture and society, and to use this body of knowledge to design new applications" (OECD, 2015). Investment in this area can be made by the state but also by the private sector. Evidence suggests that private enterprises spend less on R&D than is socially optimal because the presence of externalities creates a gap between private and large sector profitability (Arrow 1962; Nelson 1959).

The effectiveness of fiscal policy to stimulate Business Enterprise Expenditure on R&D (BERD) supported the testing of the hypothesis for the United States, Canada, and Sweden that tax credits, as well as other tax incentives, encourage industry R&D. The reported rate of increase in investment is about 1-2 percent, accounting for one-third of foregone government revenue Mansfield (1986). Hall and Van Reenen (2000) surveyed the econometric evidence on the effectiveness of fiscal incentives for R&D in several OECD countries, in particular Australia, Canada, France, Japan, Sweden, and the United States, concluding that a $1 in tax credit for R&D stimulates a $1 of additional R&D. Furthermore, there are several empirical studies that identify the effects of R&D Tax Incentives on R&D intensity. Bloom et al. (2002) examined 9 OECD countries over the period 1979-1997. In this period, the effect was found: a 10% fall in the cost of R&D stimulates a 1% rise in the level of R&D in the short run and a 10% rise in R&D in the long run. Using panel data from 21 OECD countries, Falk (2006) verified that R&D Tax incentives and other R&D subsidies have a significant positive impact on BERD. There are concerns about reduced revenues to the government budget if income tax fraud occurs (Majerova, 2016). Nevertheless, one of the priority objectives of the business community and states is to increase competitiveness. Antimiani and Costantini, 2013) have empirically confirmed the relationship between technological innovation and the growth of international competitiveness of new and existing EU member states. This is also reflected in the growth of the share of the quaternary sector of the economies in question (Turečková, 2014). Innovation can be described as differentiation from others that will lead to an increase in the level of performance and to gaining a competitive advantage. Evaluating the types of innovation in enterprises should help managers in developing production processes and productivity (Gelard and Emamisaleh, 2014).

One of the ways of development and application in the global market, is systematic research, development, and innovation in the business environment, this in line with environmental protection

and sustainability in a broader context (Borghesi, 2015) Innovation is not just a modern trend, but it is the basis for sustainable growth of companies regardless of their size and attitude towards ethics (MacGregor Pelikanova et al, 2021). Organisational, product, marketing and process innovations should respond to demographic trends (Bierwisch, Goluchowicz and Som, 2014), SMART technologies (Turečková and Nevima, 2020) as well as the development opportunities of the locations (Borseková et al., 2021).

R&D Tax super deduction in Czechia has been tracked since 2007. The number of enterprises has gradually increased. Enterprises accessed R&D Tax super deduction, among other reasons, because this R&D support was known by their foreign parent companies (Bockova, 2014). The use of R&D Tax super deduction appeared to be administratively less demanding than applying for public subsidies (Bockova, 2015).

OECD governments are seeking, through direct and indirect support, to develop and support the implementation of R&D to the greatest extent possible, especially with an awareness of the need to meet global sustainability goals. Within the European Union, Slovakia and Czechia are among the countries that also contribute to R&D from the state budget, both through direct and indirect support. Currently, this share of R&D expenditure in GDP is well below the EU average in both countries compared to other EU countries. The EU Lisbon Strategy set a target for EU countries to spend 3% of GDP on R&D by 2010. However, this has not been met, so the target has been postponed to 2020, but most EU countries are still not meeting the target, and this is still a challenge for Czechia and Slovakia. Only 5 countries are currently meeting the target and the most successful are Belgium, Sweden, Austria, and Denmark. Figure 1 shows the evolution of R&D expenditure as a share of GDP (%) in selected EU countries, in addition to the EU average and the data for Czechia and Slovakia, the graph also shows the EU leaders in this indicator.

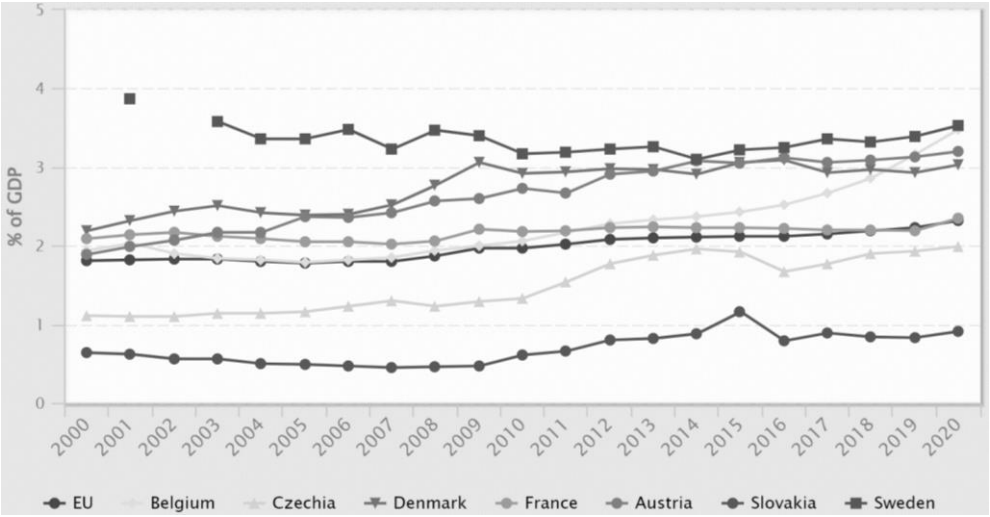


**Fig. 1**. GERD in selected EU members (Source: https://ec.europa.eu/eurostat/web/science-technology-innovation/visualisations)

Table 1 compares the share of R&D expenditures in GDP (%) in Czechia and Slovakia with the average in EU member - countries for the period when indirect R&D support in the form of R&D Tax super deduction is available in both countries.

**Table 1**. Development of GERD in Czechia and Slovakia (%)

| Countries EU | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Czechia | 1.92 | 1.67 | 1.77 | 1.90 | 1.93 | 1.99 |
| Slovakia | 1.16 | 0.79 | 0.89 | 0.84 | 0.83 | 0.91 |
| Average EU | 2.12 | 2.12 | 2.15 | 2.19 | 2.23 | 2.32 |

Source: Eurostat (2022).

Indirect support for business R&D allows to increase the R&D expenditure ratio given the higher amount of capital available to entrepreneurs and also given the availability of technology and the proximity of the challenges to be addressed by innovation. Governments are therefore seeking to use mainly indirect forms of support in the business sector.

## 2 Methodology and data

The aim of this article is to evaluate the development of R&D Tax super deduction in two neighbouring countries - Czechia and Slovakia. The comparison will compare the conditions and requirements of the application at different points in time since its introduction in both countries. As part of the comparison of the development of the R&D Tax Super Deduction, we will perform a quantitative analysis of the number of entrepreneurs applying the R&D Tax Super Deduction and the total amount of R&D Tax Super Deduction applied in each year in both countries.

Linking the theoretical analysis of the evolution of super deduction claims and the evolution of the volume of super deductions applied, we will examine the most important factors influencing the growth or decline of the quantitative indicators of R&D Tax super deduction applied in both countries based on quantitative indicators, the number of entrepreneurs and the volume of super deductions applied.

The data for the analysis of the adjustment of super deductions are theoretically based on the legislation concerning both countries. For the quantitative analysis, information on entrepreneurs who claim R&D Tax super deduction in both countries with the amount of their claimed R&D Tax super deduction is used. In Slovakia, the information on entrepreneurs claiming R&D Tax super deduction is transparently published on the website of the Financial Administration (https://www.financnasprava.sk) at four-yearly updated intervals, based on the data of taxpayers claiming R&D Tax super deduction of R&D costs and required to provide selected data on the amount of R&D Tax super deduction and related R&D projects carried out in their income tax return for a specific tax year. Based on Act No. 669/2004 Coll. (Act No. 669/2004, 2004), the provisions of Section 34(4) and (5) of Act No. 586/1992 Coll., on Income Taxes, as amended, were added to Act No. 586/1992 Coll., on Income Taxes, effective as of 1 January 2005, according to which a taxpayer may claim a deduction from the income tax base in the amount of 100% of the expenses incurred in the implementation of research and development projects. Czechia has been using the deductible item to support research and development since 2007, but the use of this support is not transparent, as in Slovakia. The data on the number of subjects, the amount of the total deduction and therefore the reduction of revenue to the state budget is published only anonymised on the website of the Czech Statistical Office (CZSO, 2022a).

## 3 Empirical results

### 3.1 Comparative analysis of supercomputing requirements in Slovakia and Czechia

As part of the theoretical analysis of the development of requirements and conditions for the application of R&D Tax super deduction of R&D costs, Table 2 compares the chronological development of conditions and requirements imposed on entrepreneurs in Czechia and Slovakia who want to reduce their tax burden by applying R&D Tax super deduction of R&D costs. Since 2018,

legal entities in Slovakia have been able to benefit from a special tax regime, the so-called "patent box", which exempts income earned because of research and development from part of the income tax. The exemption from income tax can be applied by a legal entity in the case of income derived from remuneration for the use of patents, utility models and software (intangible assets) resulting from the taxpayer's own development activities in Slovakia, up to 50% of such income, or from the sale of products whose production used a patent or utility model created by the taxpayer in Slovakia, up to 50% of such income.

**Table 2**. Requirements for claiming the R&D Tax super deduction in Czechia and Slovakia

| **Tax period** | **Conditions for claiming R&D Tax super deduction in Slovakia** | | **Conditions for claiming the R&D Tax super deduction in Czechia** | |
|---|---|---|---|---|
| | Basic rate R&D Tax super deduction | Rate of increased R&D expenditure | Basic rate R&D Tax super deduction | Rate of increased R&D expenditure |
| | R&D Tax super deduction reduces the income tax base by | | | |
| 2015 – 2017 | 25% of total R&D expenditure + 25% personal costs youth of researchers | 25 % annual positive difference in R&D expenditure | 100% total R&D expenditure; The additional deduction is 10% of the difference between the QRE of the current year and the QRE of the prior year. | 110% expenditure more than the total R&D expenditure in the reference period |
| 2018 | 100 % of total R&D expenditure | 100 % the positive difference between the averages of two two-year average R&D expenditures | 100% of total R&D expenditure | 110% expenditure more than the total R&D expenditure in the reference period |
| 2019 | 150 % of total R&D expenditure | 100 % the positive difference between the averages of two two-year average R&D expenditures | 100% of total R&D expenditure | 110% expenditure more than the total R&D expenditure in the reference period |
| 2020 - 2021 | 200 % of total R&D expenditure | 100 % the positive difference between the averages of two two-year average R&D expenditures | 100% of total R&D expenditure | 110% expenditure more than the total R&D expenditure in the reference period |
| 2022 | 100 % of total R&D expenditure | 100 % the positive difference between the averages of two two-year average R&D expenditures | 100% of total R&D expenditure | 110% expenditure more than the total R&D expenditure in the reference period |

Source: author's calculation according to the laws on income taxes in Czechia and Slovakia

The period of application of the exemption of such income is linked to the period of application of tax depreciation on the capitalised costs of the development of the patent, utility model or software in the fixed assets of the entrepreneur. In this case, it is important to keep a consistent record of their income.

An important requirement for claiming the R&D Tax Super Deduction is the development of a research and development project. An R&D project in Slovakia for which the additional deduction can be claimed is a written document in which the taxpayer defines its subject matter and must be signed by a person authorised to act on behalf of the taxpayer (e.g., manager, board member, sole trader, authorised representative, etc.) no later than the deadline for filing the tax return. This change, effective as of 1 January 2020, will apply to a research and development project started for a taxable year beginning no earlier than 1 January 2020 (Financial Directorate of the Slovak Republic, 2022). Until 2020, the R&D project had to be prepared and submitted in advance, before the start of the tax year for which the entity intended to claim the R&D Tax Super Deduction, including its signature by a person authorised to act on behalf of the tax entity.

From 2022, the basic rate of super-taxes in Slovakia has fallen back to 100%, but a deduction for investment expenditure (costs) is being introduced to encourage higher value-added investments, i.e., productive investments linked to Industry 4.0. The impact of these changes will be the subject of subsequent research.

In Czechia, since the introduction of the R&D Tax Super Deduction in 2005, it has been possible to claim 100% of R&D costs in the tax year as an expense and, in the case of a positive profit, to use the deductible item under Section 34(4). Under section 34(5), the costs can be deducted no later than in the third period following the period in which they were incurred. Methodological Instruction D-288 (Financial Administration, 2005) was issued to ensure a uniform procedure for the application of § 34(4) and (5). Since 2014, this deductible item has been redefined more extensively in § 34a (1) (Senate Act No. 344/2013 Coll., 2014); the amount of the deduction changes depending on the increase in costs between two subsequent periods. Act No. 80/2019 Coll., with effect from 1 April 2019, amended the provisions of §34a, §34b, §34c and §34e of Act No. 586/1992 Coll., on Income Taxes, and added a new provision to §34ba of Act No. 586/1992 Coll., on Income Taxes - Notification of the intention to deduct from the income tax base a deduction for research and development support (Financial Administration CZ, 2019). Additional changes were made to prevent the abuse of deductions to optimise the tax base of companies (Deloitte Report, 2020).

### 3.2 Comparative quantitative analysis of applied R&D Tax super deduction R&D in Slovakia and Czechia

The total income tax saving for a particular enterprise corresponds to the amount determined by the corresponding tax rate applied for a particular business, which in the case of Slovakia is an income tax rate of 15% and the basic tax rate in 2020 is 21%. As part of the follow-up research, it is important to investigate how entrepreneurs continue to work with the tax savings, whether they use them for further R&D or business development. In Czechia, the current corporate income tax rate (CIT) of 19% has been in force since the 2010 tax year.

In 2007, the Corporate Income Tax Return would have been 24%, in 2008 21% and in 2009 20%. In terms of reducing the Corporate Income Tax Return in Czechia, there has been an increase in revenue to the state budget and a slight decrease in the profitability of the R&D Tax super deduction. In Czechia, the number of companies that used the R&D Tax super deduction for financing increased from the beginning of the legal period until 2015. Since 2015, the number of companies that have used this type of R&D subsidy has been decreasing. The average amount per business grew until 2019. In 2020, the number of enterprises fell by 14% year-on-year and the average amount of the deduction claimed fell to the 2018 level, a year-on-year decline of 18%. The comparison shows that while the number of businesses claiming R&D Tax super deduction in Czechia has been declining since 2015 compared to the growth in Slovakia, the absolute amount of R&D Tax super deduction

claimed has not declined in the years up to 2020, see Table 3. In 2020, the decrease in the absolute absorption rate in Czechia is associated with a decrease in the number of enterprises, while in Slovakia the trend from 2020 onwards is increasing in both parameters examined. Even though in Slovakia the parameters of providing support are changed every year, the number of entities using indirect R&D support is growing. In the Czech Republic, on the other hand, the number of enterprises is decreasing. The amount of the super deduction that Czech enterprises are generally able to use for investments in R&D is also decreasing.

**Table 3**. Comparative quantitative analysis of the applied tax super deduction for research and development in Slovakia and Czechia

| | Number of entities that claimed the R&D Tax super deduction | | Absolute amount of R&D Tax super deduction applied in the tax year (mil euro) * | |
|---|---|---|---|---|
| | **Slovakia** | **Czechia** | **Slovakia** | **Czechia** |
| 2007 | | 574 | | 189.42 |
| 2008 | - | 598 | - | 180.73 |
| 2009 | - | 634 | - | 198.80 |
| 2010 | - | 718 | - | 276.82 |
| 2011 | - | 863 | - | 376.24 |
| 2012 | - | 1 025 | - | 415.75 |
| 2013 | - | 1 124 | - | 441.60 |
| 2014 | - | 1 268 | - | 430.45 |
| 2015 | 83 | 1 311 | 9.22 | 492.75 |
| 2016 | 112 | 1 254 | 16.54 | 465.53 |
| 2017 | 163 | 1 141 | 39.99 | 519.18 |
| 2018 | 270 | 1 043 | 120.96 | 529.84 |
| 2019 | 369 | 950 | 117.14 | 566.83 |
| 2020 | 405 | 837 | 156.19 | 423.14 |

- For Czechia the CZK/EUR conversion as of 31.12 of the respective year was used

Source: author's calculation according to Financial Administration SR, 2022; Czech Statistical Office (CZSO). 2022a

It can be assumed that, in addition to the pandemic, the year-on-year decline in both parameters in Czechia may also be influenced by a shift of some research to Slovakia in enterprises that are also active in Czechia and Slovakia, mainly due to higher R&D tax deduction rates.

## 4 Discussion

The generosity of R&D tax incentives is intrinsically linked to the design of the tax relief measure and to the characteristics of the enterprise. Nationally, the level of tax support for additional R&D departments was highest in 2021 for both profitable and loss-making SMEs in Slovakia and Iceland, outside the EU in Colombia. Profitable and loss-making large enterprises receive the highest level of R&D tax subsidy in Slovakia, Portugal, and France. R&D tax subsidy rates for SMEs can fall below those of large enterprises when countries offer SME R&D tax hikes and preferential tax rates on legal income Croatia, outside the EU, China, with the value of tax deductions tied to the level of taxation on legal income. To encourage R&D in enterprises that cannot otherwise use their credits or allowances, 19 OECD countries offer refundable (payable) or equivalent incentives. Such provisions tend to be more generous to SMEs and young enterprises compared to large enterprises, as is the case in France, non-EU Australia, and Canada (OECD, 2022). A comparison of actual R&D tax support as % of GDP for Slovakia, Czechia and other selected EU economies is published in Figure 2.

While Sweden has the highest R&D expenditure to GDP ratio in Fig. 1, it is among the worst in terms of indirect R&D support. Similarly, Austria and Denmark. GERD in Czechia has increased

from 1% in 2005 to 2% in 2019. Tax support for R&D in Czechia has increased from 0.03% in 2005 to 0.06% in 2013. After that, it fell to 0.05% of GDP. Slovakia supported R&D costs in relation to GDP with an additional 0.03% by introducing R&D Tax super deduction.

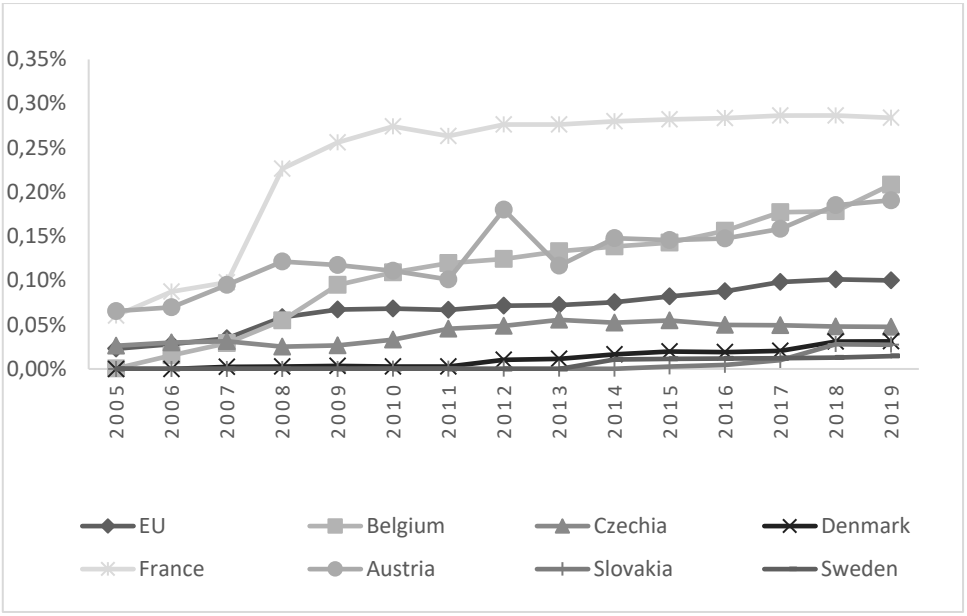


**Fig. 2.** Indirect government support through R&D Tax incentives, % of GDP (Source: CZSO, 2022b)

In Czechia, the R&D Tax super deduction has a significantly longer duration than in Slovakia. After a sharp increase in the number of companies using this type to finance their own R&D, the number of companies declined. This happened after the modification of the obligations of the enterprise in relation to reporting and proving eligible R&D costs to the tax authorities. The decrease in tax support also occurred in 2020. Due to the unfavourable economic situation, companies took the opportunity to carry forward part of the R&D expenditure to other years. Between 2019 and 2020, the volume of unclaimed R&D expenditure increased by CZK 2.5 billion. These were mainly enterprises in the manufacturing industry. The total amount of unclaimed R&D expenditure in 2020 reached CZK 8.7 billion, which would correspond to an amount of R&D tax support of CZK 1.6 billion if the full amount of R&D expenditure was claimed by enterprises (CZSO, 2022a).

Governments in advanced economies are constantly looking for ways to increase R&D spending, particularly in the corporate sector. While in Slovakia the number of companies that have used R&D Tax super deduction has been increasing despite the COVID-19 pandemic, in Czechia the number of companies has declined. The amount of expenses claimed decreased, but the level of R&D tax support as a percentage of GDP was maintained due to the decline in GDP. Increasing the costs spent on research activities and the implementation of research results will not guarantee that the R&D investment will have a real return for the enterprise and the owner in the future (Dvouletý et al., 2021).

## 5 Conclusion

In recent years, research and development has become one of the priorities of most countries or communities in the world, because in social, economic, and especially environmental crises, it is through innovation and the results of research and development that it is possible to solve some problems and move society forward with a sign of sustainable development. It is therefore important to see how the various measures taken by governments to promote research and development translate into their practical applications. In the individual indicators monitored, which include R&D expenditure (as % of GDP), both Slovakia and Czechia reach levels of up to 2%, with Czechia reaching twice the Slovak value but falling short of the 3% level set by the EU as a target milestone

for the indicator. Czechia has maintained a significant level of tax support in recent years (0.05%), while Slovakia has increased to 0.03% of GDP in the summer thanks to an increase in R&D Tax Super Deduction.

In both Slovakia and Czechia, science and research are among the declared priorities of governments, so monitoring the implementation of R&D by entrepreneurs and their use of support mechanisms such as the R&D Tax super deduction for R&D expenditure is important for optimising and evaluating the effectiveness of these support instruments. Slovakia and Czechia, due to their common historical roots and similar economic backgrounds, have indirect support for research in the form of R&D super deduction, with Slovakia introducing this support only in 2015 and Czechia in 2005. Changes in the conditions of application of the super deduction are more frequent in Slovakia compared to Czechia, while the basic rate also has a larger variance in Slovakia compared to Czechia. Considering the size of the economy, the development of the application of the super deduction in both countries can be assessed as comparable and dependent on economic conditions, R&D Tax super deduction rates or the relaxation or tightening of the conditions for its application, in particular in relation to the obligations of entrepreneurs to develop an R&D project, which is a mandatory requirement for the application of the R&D Tax super deduction.

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# COMPARISON OF PATERNITY POSTNATAL CARE BENEFITS IN THE CZECH REPUBLIC AND POLAND

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**Abstract**

The topic of this article is paternity leave in the Czech Republic and Poland. The aim of the article is to compare the paternity postnatal care benefits in the Czech Republic and Poland. The article is structured into several parts. In the introductory part, it introduces the reader to the authors' literature searches related to the topic of paternity leave, especially the socio-economic context, which relates to gender issues and the position of the contemporary family in society, in an international context. The following section presents the methodology of the article, followed by a description of the legislative anchoring of paternity leave in the Czech Republic and Poland. The description mainly uses the legislative documents of the two selected countries. In the next section, a comparison of paternity postnatal care benefits in the Czech Republic and Poland is presented. The subject of the comparative examination is basic information on the amount of the benefits, the length of paternity leave, fathers' active approaches to paternity leave and the financial costs of the two selected countries in the social security system. Finally, the results of the comparative analysis are summarized and the possibilities of the development of paternity leave are predicted.

**Keywords**
Comparison, Czech Republic, legislation, paternity benefits, Poland, social security

**JEL classification**
H55, K31

## Introduction

Paternity leave is one of the modern social policy instruments of developed welfare states. The introduction of the institution of paternity leave is intended to contribute to greater participation of fathers in the upbringing of the child at an early age, while at the same time allowing mothers to recover after childbirth and to provide partial relief from the care of the newborn child. Paternity leave thus changes the conservative myths about the social role of the father as the breadwinner and the social role of the mother as the caregiver and nurturer of the children in the family. The aim of the article is to compare the benefits of paternity leave in the Czech Republic and Poland. Poland was chosen because it is more conservative in its views on the traditional family. Therefore, the authors were interested in whether this would be reflected in paternity leave and its financing.

The article is structured into several parts. The first one introduces the reader to the authors' literature searches related to the topic of the article. It introduces the concept of paternity leave from the perspective of the development of family policy in the international environment. The following part is devoted to the methodology of the article and a description of paternity leave in the Czech Republic and Poland. The authors draw here mainly on the legislative sources of both selected countries and available statistical data. The results of the description and statistical analysis are

presented in Table 1 and Table 2. This is followed by a comparison of paternity benefits in the Czech Republic and Poland, which builds on the description and statistical analysis of paternity leave in the previous text. The results are again presented graphically in Figures 1-3. Table 3 summarizes the data considered for both countries. The paper concludes with a summary of the results of the investigation and predictions for the future, especially from a socio-economic perspective.

## 1 Literature review

Based on ILO data (2022, p. 96), in 2021, fathers were entitled to some form of paternity leave in 115 countries, of which 102 countries provided paid paternity leave and 81 countries provided 100% of earnings. The average duration of paternity leave in 2021 was 3.3 days, with significant regional variations. Across the Europe and Central Asia region, 68.8 per cent of men were entitled to at least one day of paternity leave, the highest proportion of any world region (ILO, 2022, p. 99). At the same time, in the countries surveyed, the Czech Republic and Poland, paternity leave was higher than the reported average of 3.3 days. The Czech Republic was among the 27 countries that allowed paternity leave for 5-9 days. Poland, along with 35 other countries, had a paternity leave period of 10-15 days (ILO, 2022, p. 100).

The topic of paternity leave and the position of fathers in childcare in general has been a debated topic in recent years not only in the public sphere but also in terms of scientific literature. With the birth of a child, the emergence of parenthood, and the building of new family ties, the time parents devote to the family after the birth of a child is a major factor that determines the quality and quantity of their involvement in the child's upbringing (Petts and Knoester, 2018), and patterns of behaviour set at this critical time of family relationship building can persist for years, e.g. according to Nepomnyascha and Waldfogel (2007), fathers who took 2 or more weeks off work after childbirth were more involved in direct childcare (e.g. changing diapers) even after 9 months. Longer paternity leave was also associated with greater father involvement in caregiving and engagement in developmental tasks with the child not only during infancy but also during the first few years of the child's life (Petts and Knoester 2018).

Another strand of research in this area concerned fathers' motivations for taking this paid leave. For example, Eerola et al. (2019) found that key determinants of this choice included the nature of the man's work itself, his partner's education, family income, the man's desire to have some time off from work, and the man's desire to allow his partner to return to work or school. Berrigan, Schoppe-Sullivan, and Kamp Dush (2021) identified the main determinants as fatherhood at older ages, planned parenthood, and disregard for the principle of maternal essentialism, which holds that mothers are the primary and most important caregivers.

The family policy itself, its development and the intensity of its implication in the social policy of a given country have a significant influence on the active approach to fatherhood. From this perspective, the post-communist countries of Central and Eastern Europe are an interesting area for its development (Szelewa and Polakowski, 2008). Robila (2012) generally describes the direction of development of parental leave in Eastern Europe after the fall of communism as a shift away from the attempt to combine motherhood and a woman's career, which was typical of the communist era. Authors such as Robila (2012) and Saxonberg and Szelewa (2007) refer to this direction of development as the so-called refamiliarization. As part of this refamiliarization, the trend of increasing financial support for parenthood and extending it so that women can stay at home and care for their children was promoted. This approach placed men in the role of breadwinner, emphasising motherhood, childcare and child-rearing as the role of women, and promoted a rather stereotypical division of labour between men and women and did not include incentives such as paternity leave at the time. Meanwhile, Saxonberg and Sirovátka (2006) found that Czechs and Poles strongly support gender equality in the home and are positive about the view that men should be more involved in housework and childcare, even more so than, for example, Western Europeans. Nevická, Hamuľák and Krippel (2021) compared the positions of fathers in the Czech Republic and Slovakia in relation

to parental leave and found that the system in the Czech Republic is more similar to the model recommended by the EU, which balances childcare between both parents.

In the absence of an analysis focusing on the "paternity benefits" itself in the Central European countries, the current paper focuses exclusively on the level of the paternity postnatal care benefits as an exclusive right of fathers in the Czech Republic and Poland, and compares them not only in terms of legislative anchoring but also in terms of relative, developmental indicators, such as the share of expenditure on the paternity benefits in total social security expenditure or the share of paternity benefits recipients.

## 2 Methodology and data

The methodology of the presented article fully reflects the nature of the paper itself, i.e. the theoretical and descriptive part is based on a search of relevant literature and legal norms concerning paternity benefits and paternity leave in general or specifically in reference to the specifics of the Czech Republic and Poland. Empirical data analysis and its presentation in the form of graphical visualisation and tables is the content of the practical part. Here we were significantly limited by the availability of comparable data in terms of content and publication, and the length of practical application of the paternity postnatal care benefits in the Czech Republic. Suitably applicable data are available for Poland for the period 2014-2021, and for the Czech Republic for the last four years (2018-2021), with selected information for 2021 not yet published. Despite the difference in time periods, a small inter-regional comparison has been made to accentuate the similarities/differences in the two countries' approach to „fatherhood“, see below.

The initial data sources are presented in the chapters on the description of "paternity leave" in Poland and the Czech Republic. These are based on information available on the website of the Czech Social Security Administration for the Czech Republic and for Poland, it is a synthesis of partial data from the Central Statistical Office of Poland (Głównego Urzędu Statystycznego) and Social Insurance Institution (Zakładu Ubezpieczeń Społecznych). Monetary values of indicators in PLN have been converted into CZK at the Czech National Bank exchange rate. This was the average annual exchange rate, which is also shown in Table 2. These numerical values of the analysed indicators for the given years formed the basis for the subsequent data analysis and comparison developed in Chapter 5.

## 3 Paternity postnatal care benefits in the Czech Republic

The paternity benefits in the Czech Republic belong to the system of sickness insurance benefits and can be found in § 38a - 38d of Act No.187/2006 Coll. on Sickness Insurance, as amended (zákon č. 187/2006 Sb., zákon o nemocenském pojištění). As of 1 January 2022, following the Directive (EU) 2019/1158 of the European Parliament and of the Council of 20 June 2019 on work-life balance for parents and carers and repealing Council Directive 2010/18/EU, the paternity benefits can be drawn for a period of 2 weeks; previously, as of 1 February 2018, the period of drawing the paternity benefits was 7 days. It can be taken up within 6 weeks of the birth of the child or taking custody of the child. The start date can be determined by the individual, but intermittent use is not possible. The following variations of the benefits can be distinguished: (1) Standard paternity leave with commencement within 6 weeks of the date of birth of the child or the date of taking the child into permanent care replacing parental care. Here it is regardless of any hospitalisation of the child. (2) With an extension by the number days of hospitalization (the last day of the six-week hospitalization period does not last) – the period of the choice of the onset of the benefit is extended by as many days as the hospitalization lasted. (3) With an extension by the number of days of hospitalization (the last day of the six-week hospitalization period lasts) - the period of the choice of the onset of the benefit is extended by as many days as the hospitalization lasted during the six-week period. As such hospitalization may last for a longer period of time, a general limiting clause is set that the paternity benefits may be taken up in this way until the child is one year old at the latest (Podnikatel.cz, 2021).

As a rule, the insured person who is listed as the father on the child's birth certificate is entitled to paternity benefits, even if the parents are not married. However, an insured person who is not the child's father may also receive paternity benefits. This is the case if the child is placed in substitute care and if the child is under 7 years of age on the date of taking into care. The amount of the paternity benefits is set by law at 70% of the daily assessment base.

As already mentioned, it is a sickness insurance benefit, which means that only persons who are covered by sickness insurance are entitled to it. In the case of income from employment, participation in sickness insurance must be established before the start of paternity leave. In the case of self-employed workers, on the other hand, the condition of voluntary participation in sickness insurance must be met for at least the three months immediately preceding the start of paternity leave. The postnatal paternity care benefits belong to sickness insurance benefits and are paid by the Czech Social Security Administration.

Table 1 shows the expenditures of the Czech Social Security Administration (CSSA) on the paternity postnatal care benefits, the total expenditures of the CSSA on social security and other social benefits, the number of live births, the number of citizens and the number of recipients of the paternity postnatal care benefits in the Czech Republic in 2018-2021.

**Table 1.** The expenditures of the Czech Social Security Administration (CSSA) on the paternity postnatal care benefits, the total expenditures of the CSSA on social security and other social benefits, the number of live births, the number of citizens and the number of recipients of the paternity postnatal care benefits in the Czech Republic in 2018-2021

| Year | The expenditures of the CSSA on the paternity postnatal care benefits (in thousands of CZK) | The total expenditures of the CSSA on social security, on other social benefits and on other expenditures (in thousands of CZK) | The number of citizens in the Czech Republic as of 31.12. of the given year | The number of live births in the Czech Republic | The number of recipients of the paternity postnatal care benefits in the Czech Republic |
|---|---|---|---|---|---|
| 2018 | 221 446 | 457 500 000 | 10 626 430 | 114 036 | 43 731 |
| 2019 | 273 292 | 499 400 000 | 10 669 324 | 112 231 | 49 285 |
| 2020 | 269 232 | 562 800 000 | 10 700 155 | 110 200 | 46 200 |
| 2021 | 291 481 | 569 900 000 | 10 500 850 | 111 793 | --- |

Source: own processing, drawn from: Česká správa sociálního zabezpečení [online]. [2022-06-28]. Available from: https://www.cssz.cz/documents/20143/1057648/4Q_Prijmy_a_vydaje_na_socialni_zabezpeceni_12_2021.pdf/85213bd3-6001-45d7-4e45-3af64e6c2444, Czech Social Security Administration [online]. [2022-06-28]. Available from: https://www.cssz.cz/documents/20143/688157/4Q_2020_Prijmy_a_vydaje_na_socialni_zabezpeceni_12_2020.pdf/d0b0bd3a-c0e9-3bf3-2e5e-3c76acb7bda3, Český statistický úřad [online]. [2022-06-28]. Available from: https://vdb.czso.cz/vdbvo2/faces/index.jsf?page=vystup-objekt&z=T&f=TABULKA&katalog=30850&pvo= SZB03&u=v380__VUZEMI__97__19, Český statistický úřad [online]. [2022-06-28]. Available from: https://vdb.czso.cz/vdbvo2/faces/index.jsf?page=vystup-objekt&pvo=DEM05&z=T&f=TABULKA&skupId=546&katalog=30845&pvo=DEM05&str=v94, Report on activities of Czech Social Security Administration 2020 [online]. [2022-06-28]. Available from: https://www.cssz.cz/documents/20143/99593/Zpr%C3%A1va%20o%20%C4%8Dinnosti%20%C4%8CSSZ%20za%20rok%202020.pdf/02ef91ee-829f-d547-dd09-395aa76a8cb4

## 4 Paternity benefits in Poland

In the Republic of Poland since 1 January 2010, an employee who is a father raising a child is entitled to paternity leave. In the Republic of Poland, paternity leave is regulated by Article no.$182^3$ of the Labour Code of 26 June 1974 (Ustawa z dnia 26 czerwca 1974 r. - Kodeks pracy (Dz. U. z 2020 r. poz. 1320, ze zm.)). Since 1 January 2010, it has been possible to take paternity leave for 7 days (Infor.Kadry, 2010). As of 1 January 2012, the period of paternity leave was extended to 2 weeks

(Infor. Kadry, 2011). As of 2 January 2016, it is possible to divide the leave into two parts and take it at different times. Each of these parts cannot be shorter than 7 days, so the employee can use two options: the first option is 2 weeks of paternity leave, the second option is two paternity leaves of 1 week each (in fact one leave taken in two parts). Paternity leave can be taken up to 24 months of the child's age or 24 months after the adoption decision. However, the child must not be older than 7 years. Employees on paternity leave are entitled to maternity allowance equal to 100 % of the average remuneration for the 12 months preceding the month in which the paternity leave is taken. If the period of employment is less than one year, the basis for calculating maternity allowance is calculated for the whole calendar months (Infor.Kadry, 2021). For the period of paternity leave, the person is entitled to receive remuneration in the form of maternity allowance from the Social Insurance Institution.

Maternity allowance is a sickness insurance benefit paid by the Social Insurance Institution, the so-called ZUS (Zakład Ubezpieczeń Społecznych).[1] The ZUS is administered by the FUS (The Social Insurance Fund, in Polish Fundusz Ubezpieczeń Społecznych).[2] The ZUS is responsible for the payment of these allowances and also ensures that the allowances paid from the FUS reach the beneficiaries on time and in the correct amount.

Maternity benefits in the Republic of Poland (Poland) are granted for the period of **maternity leave, parental leave and paternity leave** (Article 29a of the Act of 25 June 1990 on cash benefits from social insurance for sickness and maternity– Ustawa z o świadczeniach pieniężnych z ubezpieczenia społecznego w razie choroby i macierzyństwa in connection with Article 184 of the Labour Code of the Republic of Poland).

Table 2 shows the ZUS/FUS expenditures on paternity benefits, total ZUS/FUS expenditures, number of citizens, number of live births and number of paternity benefit recipients in the Republic of Poland in 2014-2021.

[1]The ZUS is one of the largest public institutions in the Republic of Poland in terms of the scope of its tasks, and its tasks include, among others, the power to establish entitlement to and pay: old-age pensions and old-age care allowances, disability pensions and disability care allowances, survivors' pensions and orphans' pensions, maternity and sickness benefits, care allowances, compensatory allowances and allowances for rehabilitation services.

[2] FUS was established on 1 January 1999 as a state special-purpose fund administered by the ZUS.

**Table 2.** The ZUS/FUS expenditures on paternity benefits, total ZUS/FUS expenditures, number of citizens, number of live births and number of paternity benefit recipients in the Republic of Poland in 2014-2021

| Year | The ZUS/FUS expenditures on paternity benefits (in thousands of PLN) | The total ZUS/FUS expenditures on social security, other social benefits and other expenditures (in thousands of PLN) | CZK/PLN exchange rate (average for the year according to the CNB) | The ZUS/FUS expenditures on paternity benefits (in thousands of CZK) | The total ZUS/FUS expenditures on social security, other social benefits and other expenditures (in thousands of CZK) | The number of citizens in the Republic of Poland as of 31.12. of the given year | The number of live births in the Republic of Poland | The number of paternity benefit recipients in the Republic of Poland |
|---|---|---|---|---|---|---|---|---|
| 2014 | 218 706,9 | 191 710 325 | 6,58 | 1439091,40 | 1 261 837 359 | 38 478 602 | 375 160 | 129 400 |
| 2015 | 253 387,8 | 199 498 002 | 6,53 | 1654622,33 | 1 301 724 463 | 38 437 239 | 369 308 | 148 400 |
| 2016 | 238 698,9 | 205 437 828 | 6,20 | 1479933,18 | 1 273 303 658 | 38 432 992 | 382 257 | 146 400 |
| 2017 | 282 238,3 | 212 943 051 | 6,19 | 1747055,08 | 1 317 052 770 | 38 433 558 | 401 982 | 174 200 |
| 2018 | 330 083,1 | 229 890 464 | 6,02 | 1987100,26 | 1 383 940 593 | 38 411 148 | 388 178 | 196 000 |
| 2019 | 357 144,1 | 244 192 228 | 5,97 | 2132150,28 | 1 458 560 178 | 38 382 576 | 374 954 | 199 800 |
| 2020 | 350 230,9 | 264 481 379 | 5,96 | 2085625,01 | 1 574 986 612 | 38 265 000 | 355 300 | 188 400 |
| 2021 | 369 411,4 | 280 258 772 | 5,62 | 2075630,30 | 1 574 703 975 | 38 081 000 | 331 000 | 185 200 |

Source: own processing, drawn from: Główny Urząd Statystyczny [online]. [2022-06-28]. Available from: file:///C:/Users/sno0001/AppData/Local/Temp/rocznik_demograficzny_2020.pdf, Eurostat 2021 [online]. [2022-06-28]. Available from: https://ec.europa.eu/eurostat, Business Insider [online]. [2022-06-28]. Available from: https://businessinsider.com.pl/gospodarka/przygnebiajace-dane-gus-najwiecej-zgonow-od-ii-wojny-swiatowej/0fb87q7, Informacja o świadczeniach pieniężnych z Funduszu Ubezpieczeń Społecznych oraz niektórych świadczeniach z Zabezpieczenia Społecznego [online]. [2022-06-28]. Available from: https://www.zus.pl/baza-wiedzy/statystyka/kwartalne-informacje-o-swiadczeniach-pienieznych-z-fus-oraz-o-innych-swiadczeniach, Zakład Ubezpieczeń Społecznych, [online]. [2022-06-29]. Available from: https://www.zus.pl/documents/10182/167642/Rocznik+statystyczny+2012_2014.pdf/04c53d63-f65d-4ef9-9588-62e0e1c1b1ec?t=1505137240361, Zakład Ubezpieczeń Społecznych, [online]. [2022-06-29]. Available from: https://www.zus.pl/documents/10182/167642/Rocznik+statystyczny+2015_2017.pdf/b1c94916-3012-c38e-fff8-abf0dfec9242?t=1582553575365.

## 5 Comparison of paternity postnatal care benefits in the Czech Republic and Poland

The most relevant indicator for comparing the paternity postnatal care benefits is the conversion of these benefits per day (Fig. 1). Poland had a paternity benefit of 14 days in all years under review, while the Czech Republic had a paternity benefit of only 7 days until last year (2021). After recalculating the relevant benefit, it can be argued that a Czech father receives a higher amount per day from the state than a Polish father, although the latter receives this benefit at 100% of the assessment base (in the Czech Republic it is 70%). For example, in 2020, the recipient in the Czech Republic received this benefit worth 832 CZK, while in Poland it was 790 CZK. As can be seen from the chart below, in Poland the amount of the paternity benefit ranged between 716 and 800 CZK between 2014 and 2021, while for the Czech Republic the amount of the paternity benefit increased by 109 CZK, i.e. by 15%, over the 3 available years.

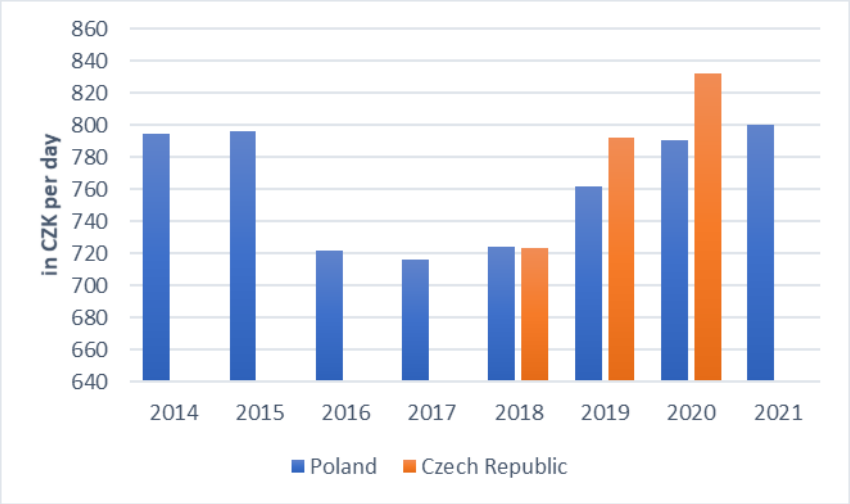


**Fig. 1.** Calculated paternity benefits for one day in the Czech Republic and Poland (in CZK per day) (Source: own calculation)

The second indicator measures the share of expenditure on paternity benefits in total expenditure on social security, other social benefits and other expenditures (Fig. 2). The values of this indicator are very low, which can be logically explained by the fact that this social benefit is small in terms of volume and number of beneficiaries. To put it simply, in Poland paternity benefit expenditures account on average for 0.13% of total social security expenditures, while in the Czech Republic we are in a percentage range at least half as large, i.e. around 0.05%. This noticeable difference in the level of the indicator between the two countries can be partly explained by the recalculation of the total expenditures on social security, on other social benefits and on other per capita expenditures, where in the Czech Republic, for example, these expenditures per capita are 30% higher than in Poland for 2021.

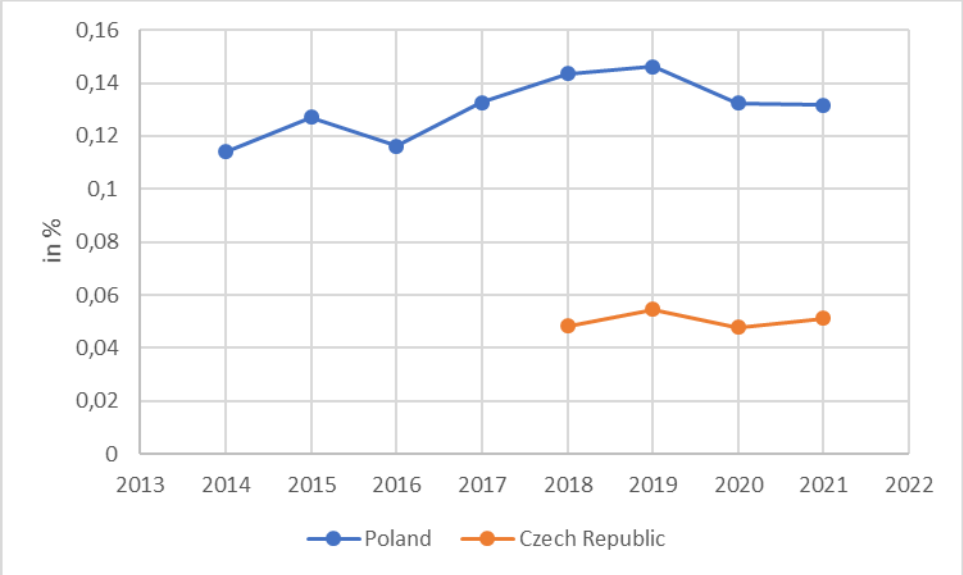


**Fig. 2.** Share of expenditure on paternity in total expenditure on social security, other social benefits and other expenditures (in %) (Source: own calculation)

A final indicator suitable for comparison, given the content of the paper, is the proportion of paternity subscriptions per live birth. In simple terms, this is essentially the percentage of live births whose fathers have officially taken paternity leave. In Poland, this indicator was less than 35% in 2014, while in 2021 it was already 56%. Thus, paternity leave is becoming more and more relevant in Poland and an increasing number of fathers are using it. In contrast, the Czech Republic is not doing so well on this indicator. In 2020, only 42% of potential recipients used paternity leave.

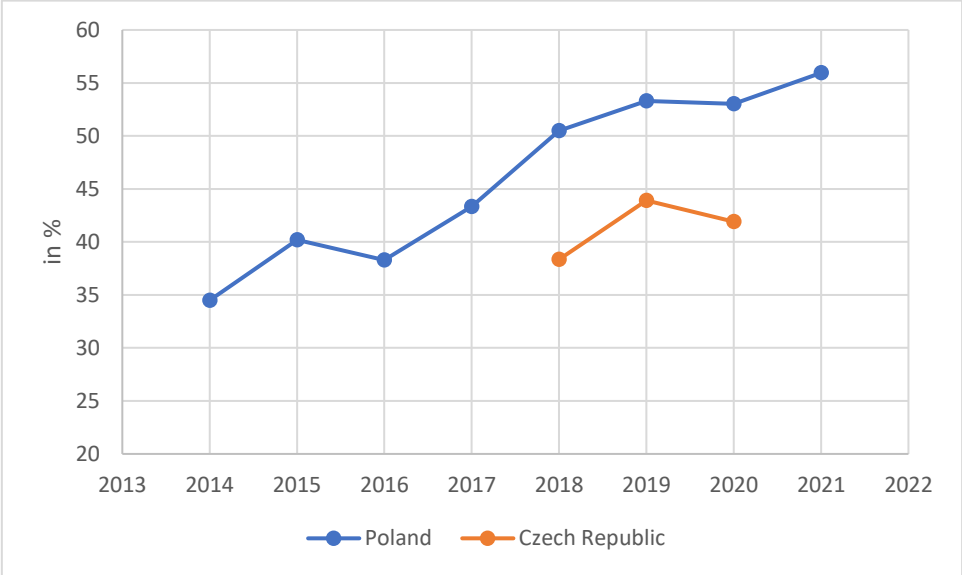


**Fig. 3.** Share of paternal subscribers per live birth (in %) (Source: own calculation)

Finally, a comparison is made of the conditions and possibilities granted to paternity in the two countries analysed. The information is summarized in Table 3 and is up to date as of June 30, 2022. In both countries, the paternity leave period is currently 14 days, the amount of paternity benefit in the Czech Republic is 70% of the assessment base, while in Poland it is 100%, in Poland it is possible to divide the paternity leave period into two parts, which is not possible in the Czech Republic. As for the deadline for taking paternity leave, this is also more variable for Polish beneficiaries, as they can take it up to the age of the child's second birthday. In our country, with a few exceptions, it is only possible up to 6 weeks after the birth of the child. According to the above, the conditions for joining the paternity leave system are more favourable in Poland. This may be the reason why more Polish fathers are also using the associated paternity benefit.

**Table 3**. Comparison of paternity benefits (paternity leave) in the Czech Republic and in Poland (as of 30 June 2022)

| Indicator | Czech Republic | Poland |
|---|---|---|
| Duration of paternity leave | 2 weeks | 2 weeks |
| Amount of paternity leave | 70 % | 100 % |
| Possibility of taking paternity leave in 2 parts (possibility of interruption) | no | yes |
| Time rule for taking paternity leave | start within 6 weeks of the child's birth, exceptionally within 1 year of the child's age | up to 24 months of the child's age |

Source: own

## Conclusion

The results of the comparison of paternity postnatal care benefits in the Czech Republic and Poland showed certain differences in the nature and the duration of the benefit, in the amount of the assessment base and in the number of fathers interested in taking paternity leave. One of the reasons for the higher interest of Polish fathers may be the introduction of paternity leave in 2010, whereas in the Czech Republic paternity leave was not enacted until eight years later. Nowadays, one of the key indicators in child and family care is the fact that the parent who usually has a lower salary takes

care of the offspring at home, so it does not always have to be the woman. Another factor is the unemployment of one of the parents or their health condition.

The results of the investigation raised further research questions related to paternity leave. In particular, the motivation of men - fathers for deciding to take paternity leave, while at the same time it would be interesting to examine more closely the views of women - mothers on paternity leave and joint care of the newborn child. The economic factors that influence state expenditure on social security, etc. are also an interesting subject for investigation.

In conclusion, the institution of paternity leave is one of the important instruments of family policy in both countries. In the future, we can expect more fathers in the Czech Republic to be interested in paternity leave, as shown by the development in Poland. The amount of the allowance is completely inadequate given the current financial needs of families with children, as is the length of paternity leave, which could be at least four weeks. It would certainly be beneficial to take the example of Poland and provide the possibility of varying the use of paternity leave over the two years of the child's age.

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# HUMAN RESOURCES IN RESEARCH AND DEVELOPMENT – ANALYSIS OF THE EU COUNTRIES

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**Abstract**
The paper focuses on human resources in research and development (R&D), which is one of the key indicators of the conduct of research activity. The paper aims to evaluate selected categories of human resources in research and development and their similarities in EU countries in years 2015 and 2020. The method of multidimensional scaling is applied to evaluate the structure of similarity of human resources in R&D in the EU countries. The results have proved the division of the EU countries into seven groups (clusters) according to the evaluated human resources in R&D. At the same time, marked differences have been observed between some EU countries with respect to the selected categories of human resources. The results reflect the potential of the individual EU countries to ensure the quality of the performed research and are a precondition for the development of new findings and technologies.

**Keywords**
Research and Development, Human resources, R&D personnel, Researchers, EU countries, Multidimensional scaling

**JEL classification**
J21, O32, O57

## Introduction

Research and development (R&D) is a creative, systematic work performed in order to expand current knowledge including the acquisition of new knowledge or its practical application. R&D plays an important part in the development of any core technology, internet-based companies, telecommunication, or in core industries (Prokop et al., 2021). One of the key indicators of R&D is human resources, which are also a precondition for sustainable development and competitiveness (Ivancheva and Gourova, 2011; Della Malva and Carree, 2013; Lelek, 2014; Majerova and Nevima, 2016; Suarez et al., 2020; Svermova et al, 2020). A great deal of international and European research addresses the current topics of human resources in R&D, structure of employees research and development or the quality of human resources. The quality of human resources determines the quality of the performed research and is a precondition for the development of new findings and technologies, which leads to the implementation of innovative features, thereby increasing competitiveness (Van Bouwel and Veugelers, 2013; Roy, 2018; Kou et al., 2020; Martínez-Sánchez et al., 2020; Lee, 2022).

Human resources in science and technology (HRST) provide information concerning the demand for and the supply of people with high qualifications. Human resources in science and technology refers to those persons who 1) have successfully completed education at the third level and 2) may not formally qualified but are employed in a science and technology (S&T) occupation where the above qualifications are normally required (Eurostat, 2022a).

Two main groups of R&D personnel can be distinguished (internal and external) who potentially contribute to the R&D activities (OECD, 2015). R&D personnel include all persons engaged directly in R&D, whether they are employed by the statistical unit or are external contributors fully integrated

into the statistical unit's R&D activities, as well as those providing direct services for the R&D activities (R&D managers, administrators, technicians and clerical staff). R&D personnel include also highly trained researchers, specialists with high levels of technical experience and training, and other supporting staff who contribute directly to carrying out R&D projects and activities (OECD, 2015, pp.161). According to UIS (2022) other positions in R&D personnel can be characterised (e.g. R&D engineers or R&D directors). Potential human resources (doctoral and master's students) represent another group of human resources in R&D. Doctoral and master's students may be included in either group of R&D personnel if they meet the specific criteria identified aimed at ensuring that only individuals with an appreciable contribution to the institution's R&D are included (OECD, 2015, pp. 159-160).

The full-time equivalent (FTE) of R&D personnel is used most often for the purposes of national and international comparison, which defines the real time devoted to R&D, when one FTE equals one year of a full-time engagement in R&D. Other indicators of R&D for the evaluation of human resources are person-years and their characteristics, including sex, R&D function, age and formal qualification (OECD, 2015).

The aim paper is to evaluate selected categories of human resources in R&D and their similarities in the EU countries in years 2015 and 2020.

## 1 Literature review

Human resources in research and development are one of the indicators which reflect a country's degree of implication in supporting of the science, research, development and innovation, and it is an important factor of the economic and social progress. A number of studies make it clear that career development and mobility of highly skilled people in research and development are still at the centre in Europe (Beret et al., 2003; Møen, 2005; Gretchen, 2006; Magnani, 2006; Ivancheva and Gourova, 2011; Gica, 2012; Marinoiu, 2014; Roy, 2018; Svermova et al., 2020; Medase, 2021; Lee, 2022).

Beret et al. (2003) discussed the impact of globalisation processes on models of R&D personnel management in multinational companies operating in Europe. The authors focused on two dimensions, recruitment and mobility, and examined whether the hold of national differences in the area of human resources in R&D has been significantly weakened in the face of new models of competitiveness and management. Møen et al. (2005) found that the technical staff in R&D-intensive companies pays for the knowledge they accumulate on the job through lower wages early in their career. They later earn a return on these implicit investments through higher wages. Findings show that the potential externalities associated with labor mobility are, at least partially, internalised in the labour market. Another author (Coccia, 2014) analysed the structure and organisational behaviour of public research institutions under unstable growth of human resources and in the presence of shrinking budgets. Suarez et al. (2020) examined the impact of investments in research and development (R&D) and qualified human resources on economic growth, subjected to the national innovation system.

According to OECD (2015) researchers are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques instrumentation, software or operational methods. They participate in performing the output in R&D in the public sector (research projects and scientific papers) and the private sector (patents, innovations or utility models). As Gica (2012) states, researchers, regardless of hierarchy, are the key resource of RDI entities (universities, institutes, a non-governmental organisation) that ensure their survival, development and competitive success. Lelek (2014**)** discussed the issue of precondition for the number of researchers as an important input factor for research and development. He performed an analysis carried out on higher education graduates, who can be considered a base of a group of researchers.

Human resources in R&D can be divided by various criteria used for statistical purposes, comparative analyses and for the measurement and evaluation of human resources at the regional,

national and European levels (OECD, 2015; Eurostat, 2022a; UIS, 2022). The selected criteria of R&D personnel and researchers in the European dimension are seen in Table1. R&D personnel by sector of employment can be divided into four sectors of performance (Business enterprise, Government, Higher education and Private non-profit organisations), similarly to R&D expenditures. The structure of R&D personnel by function involves mainly researchers, but also technicians and equivalents staff and other supporting staff. Another viewpoint is R&D personnel by formal level of qualification (which distinguishes five groups according to the ISCED level) or the viewpoint of human resources by field of R&D (e.g. natural sciences, social sciences, humanities).

**Table 1**. Selected categories of R&D personnel in EU countries

| **Category of R&D personnel** | **Structure of division of R&D employees** | **Category of R&D personnel** | **Structure of division of R&D employees** |
|---|---|---|---|
| R&D personnel by sector of employment | Business enterprise<br>Government<br>Higher education<br>Private non-profit organizations | R&D personnel and researchers by age | under 25 years<br>25-34 years<br>35-44 years<br>45-54 years<br>55-64 years<br>65 years and more |
| R&D personnel by function | Researcher<br>Technician and equivalent staff<br>Other supporting staff | R&D personnel and researchers by seniority levels | *Category A:* The single highest grade/post at which research is normally conducted.<br>*Category B:* Researchers working in positions not as senior as top position (A) but more senior than newly qualified doctoral graduates (ISCED level 8).<br>*Category C*: The first grade/post into which a newly qualified doctoral graduate would normally be recruited.<br>*Category D:* Either doctoral students at the ISCED level 8 who are engaged as researchers, or researchers working in posts that do not normally require a doctorate degree. |
| R&D personnel by formal level of qualification | ISCED level 8<br>ISCED level 7<br>ISCED level 6<br>ISCED level 5<br>all lower ISCED levels combined. | | |
| R&D personnel and researchers by fields of R&D | Natural sciences<br>Engineering and technology<br>Medical and health sciences<br>Agricultural and veterinary sciences<br>Social sciences<br>Humanities and the arts | | |

Source: OECD (2015); UIS (2022).

According to the OECD (2015), R&D personnel and researchers can be divided into six categories by age (under 25 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65 years and more). The structure of R&D personnel and researchers by seniority levels comprises four groups (A, B, C, D). For example, categogy A is "Director of research" or "Full professor", category B includes "Senior researcher", "Principal investigator" or "Associate professor". Examples of category C are "Researcher", "Investigator" or "Assistant professor" and "Post-doctoral fellow", and category D are "Ph.D. students" or "Junior researchers" (without a Ph.D.). Master's students who count as researchers would also fall under category D (UIS, 2022).

Also other current issues are investigated in relation to human resources and R&D. Popovych and Kostrytsa (2016) analysed the dynamics of age structure of scientific personnel in Ukraine for the period from 1995 to 2014. Their results confirm that the current age structure of scientific personnel is still able to ensure a rapid improvement of capacity if the government provides support in effective manner. Svermova et al. (2020) show human resources are a core determinant of quality in higher education and research. Universities must therefore work to enhance their human potential, both

qualitatively and quantitatively. Some authors (Roy, 2018; Martínez-Sánchez et al., 2020) deal with flexibility of human resources and the relation between effort in R&D and absorption capacity of knowledge or they dealt with factors that affect the performance of R&D personnel and human resources in R&D (Kim et al., 2018; Heo et al., 2021). Other authors accentuate employees' qualifications, training and internal R&D as one of the current areas of human-resource development (Medase, 2021). Some research shows the gender structure in research and development activities has received more and more attention in terms of its increasing importance in R&D management. Kou et al. (2020) examined how the gender structure affects the R&D efficiency, and the findings suggest that the female R&D personnel are more effective in conducting scientific research activities, while their counterparts are more effective in doing technology development activities.

## 2 Methodology and data

The subject of our research is the European dimension of human resources in R&D. The paper makes use of secondary statistical data obtained from Eurostat statistics database (Science and technology-Human resources in science & technology), (Eurostat, 2022b). Four indicators related to human resources in R&D have been used for the purposes of the analysis and evaluation of human resources in R&D in the EU countries in years 2015 and 2020. Table 2 shows used indicators R&D.

**Table 2**. Used indicators R&D

| Indicators | Unit | Source |
|---|---|---|
| Total R&D personnel (FTE) | % of total employment | Eurostat |
| Total researchers (FTE) | % of total employment | Eurostat |
| Professionals employed in science and technology | % of total employment | Eurostat |
| Scientists and engineers 25 to 64 years in science and technology | % of total population | Eurostat |

Source: EUROSTAT.

The original intention was to make use of a wider variety of indicators of human resources, however these were unavailable for all the observed countries and years or they failed to meet the requirements of data correlation and conditions regarding the application of used method. The selected set comprises 27EU countries (Belgium-BE, Bulgaria-BG, Czech Republic-CZ, Denmark-DK, Germany-DE, Estonia-EE, Ireland-IE, Greece-GR, Spain-ES, France-FR, Croatia-HR, Italy-IT, Cyprus-CY, Latvia-LV, Lithuania-LT, Luxembourg-LU, Hungary-HU, Malta-MT, Netherlands-NL, Austria-AT, Poland-PL, Portugal-PT, Romania-RO, Slovenia-SI, Slovakia-SK, Finland-FI, Sweden-SE).

In evaluating the similarities and differences of the EU countries according to R&D human resources methods multidimensional scaling was applied**.** Analysis is performed in years 2015 and 2020. The year 2020 renders the last available data and the last year of the Europe 2020 strategy; and 2015 represents the middle of the period of the Europe 2020.

Multidimensional scaling (MDS) depicts objects, characterised by multidimensional profiles, in an area (or a multidimensional space), which enables their clear comparison (Kruskal, 1964). This method is suitable to compare objects when the basis of the dimensions compared is unknown. The aim of multidimensional scaling is to determine the number of dimensions and the position of an object (object coordinates). The output of multidimensional scaling is a scatter diagram (perception map), where individual axes represent basic dimensions, and individual points the objects compared. The higher the similarity between two objects (in our case EU countries) is, the closer the points representing these are. Numerical outputs form the basis for the construction of the image. The quality of the whole model can be assessed by use of the STRESS value (> 0.20 weak; 0.10 – 0.20 satisfactory; 0.05-0.10 good; 0.025-0.05 excellent; 0 perfect model quality) and RSQ (Squared

correlation index) represents an index that can reach values within the interval (0;1), (Meyers et al., 2013). Multidimensional scaling has a strong interpretative potential. However, it is also used as the basis for clustering and typology. The method of multidimensional scaling was also used in research by Bartłomowicz and Cheba (2017).

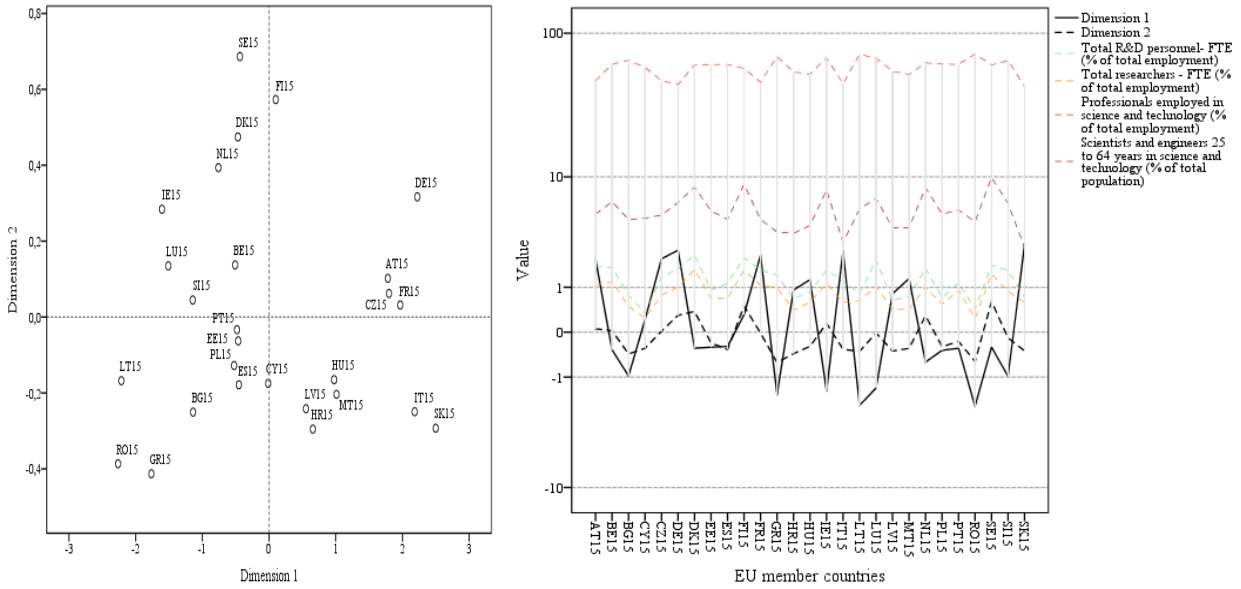
## 3 Empirical results

Empirical results evaluate EU countries according to the selected categories of human resources in R&D and their similarities in years 2015 and 2020 by use of multidimensional scaling.

### 3.1 Similarity of selected human resources in research and development in the EU countries in 2015

The evaluation of similarity of the EU countries according to the structure of human resources in research and development now concerns the year 2015. The results of multidimensional scaling apply Euclidean rate of distances in a two-dimensional form (k=2). The STRESS value of the model concerning the year 2015 equals 0.00412, when the value below 0.025 is considered excellent model quality, and the RQS of 0.99996 is adequate.

The similarity of the EU countries according to human resources in research and development in 2015 is also shown in Fig. 1A. Human resources in research and development in the individual countries of the EU in two dimensions is depicted in Fig. 1B.




A) Similarity of the EU member states by use of multidimensional scaling

B) Depiction of human resources in research and development in the EU member states in two dimensions

**Fig. 1.** EU member states according to the representation of human resources in research and development, year 2015 (Source: Authors according to Eurostat)

Dimension 1 is saturated by the indicator Professionals employed in science and technology (% of total employment), and dimension 2 is saturated by indicators Total R&D personnel (FTE) as % of total employment), Total researchers (FTE) as % of total employment), and Scientists and engineers 25 to 64 years in science and technology (% of total population). Based on the structure of similarity of human resources in research and development in 2015, the EU countries can be divided into seven clusters (Fig. 1A and Table 3).

**Table 3**. Clusters of EU countries according to R&D human resources and dimensions in 2015

| Cluster | Country | Dimension 1 | Dimension 2 | Cluster | Country | Dimension 1 | Dimension 2 |
|---|---|---|---|---|---|---|---|
| 1. | AT | 1.7803 | 0.1021 | 4. | LT | -2.2144 | -0.1677 |
| 1. | CZ | 1.798 | 0.0623 | 4. | RO | -2.2644 | -0.3866 |
| 1. | DE | 2.2228 | 0.3168 | 5. | CY | -0.0124 | -0.1751 |
| 1. | FR | 1.9664 | 0.0318 | 5. | EE | -0.4628 | -0.0629 |
| 2. | DK | -0.4673 | 0.4747 | 5. | ES | -0.4527 | -0.1785 |
| 2. | FI | 0.0998 | 0.573 | 5. | PL | -0.5243 | -0.1277 |
| 2. | NL | -0.760 | 0.3938 | 5. | PT | -0.4805 | -0.0331 |
| 2. | SE | -0.4371 | 0.6865 | 6. | HR | 0.6566 | -0.295 |
| 3. | BE | -0.5084 | 0.1376 | 6. | HU | 0.9759 | -0.165 |
| 3. | IE | -1.6062 | 0.2842 | 6. | LV | 0.5535 | -0.2415 |
| 3. | LU | -1.5106 | 0.1349 | 6. | MT | 1.0112 | -0.2037 |
| 3. | SI | -1.1432 | 0.0449 | 7. | IT | 2.1843 | -0.2494 |
| 4. | BG | -1.1391 | -0.2506 | 7. | SK | 2.4988 | -0.2928 |
| 4. | GR | -1.7642 | -0.413 | | | | |

Source: Authors.

*The first cluster* comprises countries (AT, DE, CZ, FR) with the second lowest representation of human resources in research and development in terms of Professionals employed in science and technology (% of total employment). However, these countries have a high share of Total R&D personnel (FTE) as % of total employment, and in the case of DE, FR, AT also a high share of Total researchers (FTE) as % of total employment and an above-average representation of Scientists and engineers 25 to 64 years in science and technology (% of total population) when compared to the other EU countries. These indicators show predominantly average, in the case of Germany above-average values in dimension 2. *The second cluster* is characterised by four countries (SE, FI, DK, NL) with an above-average share of Professionals employed in science and technology (% of total employment), which is depicted in dimension 1. These countries demonstrate the largest share of a) Total R&D personnel (FTE) as % of total employment, b) Total researchers (FTE) as % of total employment and c) Scientists and engineers 25 to 64 years in science and technology as % of total population. These indicators represent the highest values in dimension 2. *The third cluster* is composed of four countries (IE, LU, SI, BE) with a high representation of Professionals employed in science and technology as % of total employment, which is shown in dimension 1. Simultaneously, countries show the second largest share of Total R&D personnel (FTE) as % of total employment, Total researchers (FTE) as % of total employment and Scientists and engineers 25 to 64 years in science and technology as % of total population (see values in dimension 2). *The fourth cluster* is also composed of four countries (LT, RO, BG, GR) with the highest representation of Professionals employed in science and technology as % of total employment. In comparison to the other countries, this cluster shows a lower representation of Total researchers (FTE) as % of total employment and Scientists and engineers 25 to 64 years in science and technology as % of total population, which is demonstrated by the low values in dimension 2.

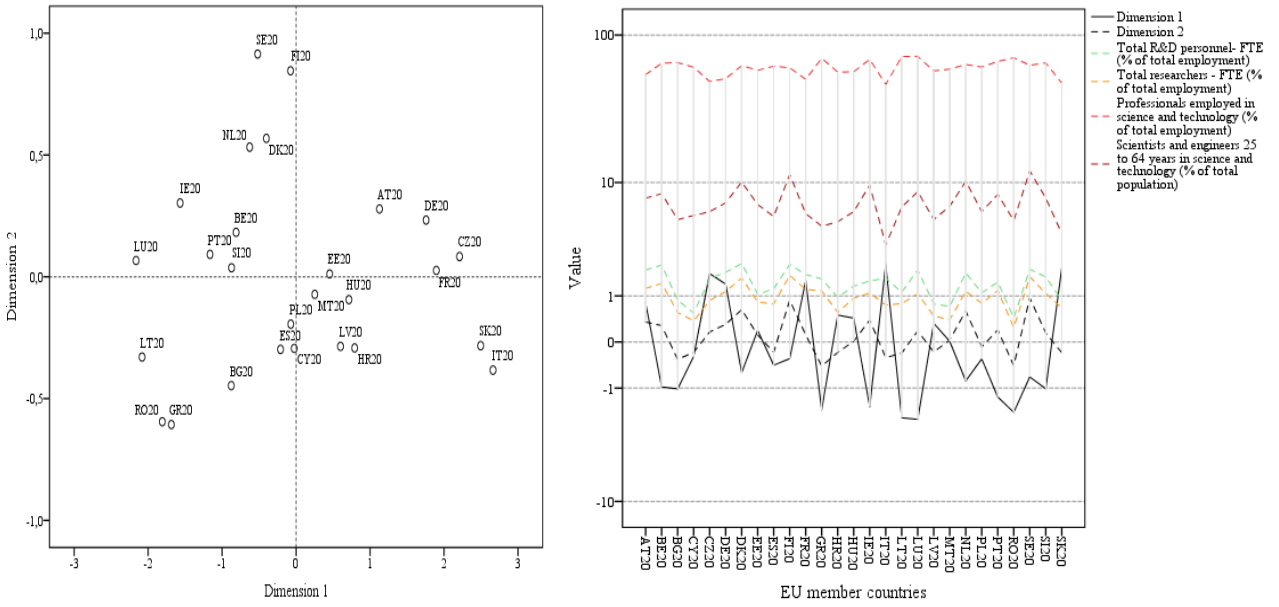
*The fifth cluster* consists of five countries (EE, PL, PT, ES, CY) with an average to moderately above-average representation of Professionals employed in science and technology as % of total employment (see values in dimension 1). In comparison to the other EU countries, this cluster have a small share of Total researchers (FTE) as % of total employment) in the case of CY, PL, EE, ES, and a small share of Scientists and engineers 25 to 64 years in science and technology as % of total population in the case of CY, ES, and a small share of Total R&D personnel (FTE) as % of total employment pro CY, PL, EE. *The sixth cluster* is composed of four countries (LV, HU, HR, MT)

with a low share of Professionals employed in science and technology as % of total employment, which is seen in dimension 1. Typically, these countries also show a low representation of Total researchers (FTE) as % of total employment or Scientists and engineers 25 to 64 years in science and technology as % of total population (see values in dimension 2). *The seventh cluster* comprises two countries (IT, SK) with the lowest share of Professionals employed in science and technology as % of total employment. These countries also show a low share of Total researchers (FTE) % of total employment and the lowest representation of Scientists and engineers 25 to 64 years in science and technology as % of total population in comparison to the other EU countries, as shown in dimension 2.

### 3.2 Similarity of selected human resources in research and development in the EU countries in 2020

As a next step, the similarity of human resources in R&D in the EU countries in 2020 is evaluated. The STRESS value of the model of multidimensional scaling based on the Euclidean rate of distances in a two-dimensional form (k=2) concerning the year 2015 equals 0.00688, when the value below 0.025 is considered excellent model quality, and the RQS (Squared correlation index) of 0.99986 is adequate.

The similarity of the EU countries according to human resources in research and development in 2020 is also shown in Fig.2A. Human resources in research and development in the individual countries of the EU in two dimensions is depicted in Fig.2B.




A) Similarity of the EU member states by use of multidimensional scaling

B) Depiction of human resources in research and development in the EU member states in two dimensions

**Fig. 2.** EU member states according to the representation of human resources in research and development, year 2020 (Source: Authors according to Eurostat)

Dimension 1 in 2020 is also saturated predominantly by the indicator Professionals employed in science and technology (% of total employment), and dimension 2 is saturated by indicators Total R&D personnel (FTE) as % of total employment, Total researchers (FTE) as % of total employment and Scientists and engineers 25 to 64 years in science and technology as % of total population. The values of STRESS and RQS in 2020 clearly denote an excellent quality of the model of multidimensional scaling as opposed to the model in 2015 (Fig.1A and Fig.1B). In comparison to 2015, no significant changes to the structure of human resources in R&D in any of the EU countries took place according to the evaluated indicators. Also in 2020 the EU countries can be divided into

seven clusters (Fig. 2A) according to the similarity of human resources in research and development. Only a minor change in the clustering of the countries in the third, fifth and sixth cluster according to human resources in R&D took place (see Table 4).

**Table 4**. Clusters of EU countries according to R&D human resources and dimensions in 2020

| Cluster | Country | Dimension 1 | Dimension 2 | Cluster | Country | Dimension 1 | Dimension 2 |
|---|---|---|---|---|---|---|---|
| 1. | AT | 1.1273 | 0.2784 | 4. | BG | -0.876 | -0.4468 |
| 1. | CZ | 2.209 | 0.0832 | 4. | GR | -1.6861 | -0.6067 |
| 1. | DE | 1.7572 | 0.2328 | 4. | LT | -2.0819 | -0.3295 |
| 1. | FR | 1.8952 | 0.0261 | 4. | RO | -1.8081 | -0.595 |
| 2. | DK | -0.4015 | 0.5681 | 5. | CY | -0.0247 | -0.2938 |
| 2. | FI | -0.0746 | 0.8457 | 5. | ES | -0.2099 | -0.2981 |
| 2. | NL | -0.6274 | 0.5324 | 5. | PL | -0.0712 | -0.1945 |
| 2. | SE | -0.5195 | 0.9146 | 6. | EE | 0.4535 | 0.0116 |
| 3. | BE | -0.811 | 0.1824 | 6. | HR | 0.7917 | -0.2922 |
| 3. | IE | -1.5676 | 0.3029 | 6. | HU | 0.7137 | -00936 |
| 3. | LU | -2.1628 | 0.0669 | 6. | LV | 0.6006 | -0.2857 |
| 3. | PT | -1.1637 | 0.0921 | 6. | MT | 0.2527 | -0.0722 |
| 3. | SI | -0.8724 | 0.0371 | 7. | IT | 2.6621 | -0.3833 |
| | | | | 7. | SK | 2.4954 | -0.2828 |

Source: Authors.

*The first cluster* consists of four countries (AT, DE, CZ, FR) with the second lowest share of Professionals employed in science and technology as % of total employment (see values in dimension 1). By contrast, these countries show the second highest representation of Total R&D personnel (FTE) as % of total employment, but also a high representation of Total researchers (FTE) as % of total employment) (except CZ), and in the case of AT and DE also a higher share of Scientists and engineers 25 to 64 years in science and technology (% of total population). This is shown as average to above-average values in dimension 2. *The second cluster* comprises four countries (SE, FI, DK, NL) with an above-average share of Professionals employed in science and technology (% of total employment), as demonstrated by the values in dimension 1. The typical features of these countries are: a) Total R&D personnel (FTE) as % of total employment, b) Total researchers (FTE) as % of total employment), c) Scientists and engineers 25 to 64 years in science and technology as % of total population (see the top values in dimension 2). *The third cluster* is characterised by five countries (IE, LU, PT, SI, BE) with the second highest representation of Professionals employed in science and technology as % of total employment (see dimenze 1) in comparison to the other EU countries. These countries also show a high representation of Total R&D personnel (FTE) as % of total employment), Total researchers (FTE) as % of total employment and second highest share of Scientists and engineers 25 to 64 years in science and technology (% of total population), which is in line with moderately above-average values in dimension 2. *The fourth cluster* is composed of four countries (LT, RO, BG, GR) with the highest representation of Professionals employed in science and technology (% of total employment). When set beside the other countries, these show a low representation of Total researchers (FTE) as % of total employment and Scientists and engineers 25 to 64 years in science and technology as % of total population, as low values in dimension 2 show.

*The fifth cluster* is formed by three countries (PL, ES, CY) with average values of Professionals employed in science and technology as % of total employment in dimension 1. Conversely, in comparison to the other EU countries they show a low representation of: a) Total R&D personnel (FTE) as % of total employment), b) Total researchers (FTE) as % of total employment and c) Scientists and engineers 25 to 64 years in science and technology as % of total population, as moderately below-average values in dimension 2 show. *The sixth cluster* consists of five countries

(EE, MT, LV, HU, HR) with a low representation of Professionals employed in science and technology as % of total employment (see values in dimension 1). These countries have the lowest representation of Total researchers (FTE) as % of total employment, and in the case of MT, LV, HR also a low share of Total R&D personnel (FTE) as % of total employment) in comparison to the other EU countries. EE represents the average values of these indicators in dimension 2, whereas the remaining countries reach the moderately below-average values. *The seventh cluster* only consists of two countries (IT, SK) with the lowest share of Professionals employed in science and technology as % of total employment (see values in dimension 1). These countries have a low representation of Total researchers (FTE) as % of total employment and the lowest representation of Scientists and engineers 25 to 64 years in science and technology as % of total population in comparison to the other EU countries (see values in dimension 2).

When comparing the EU countries according to human human resources in R&D based on the performed analysis of clusters of similar countries, a strong similarity was observed mainly between:

- Austria, Czechia and France in dimension 1 in the first cluster in 2015,
- Denmark and the Netherlands in dimension 2 in the second cluster in 2020,
- Belgium, Portugal and Slovenia in dimensions 1 and 2 in the third cluster in 2020,
- Estonia, Poland, Portugal and Spain in dimension 1, and Cyprus, Spain and Poland in dimension 2 in the fifth cluster in 2020,
- Hungary and Malta in dimension 1 in 2015, and Croatia and Latvia in dimension 2 in 2020.

By contrast, considerable differences in the representation of R&D personnel in years 2015 and 2020 (see Fig.1 and Fig.2) have been found in:

- Total R&D personnel (FTE) as % of total employment in Denmark, Finland, Luxembourg in 2015 a 2020, and Belgium in 2020 (with the highest representation of Total R&D personnel) in comparison to Romania and Cyprus (with the lowest representation of Total R&D personnel as % of total employment),
- Total researchers (FTE) as % of total employment between Finland and Sweden (with the highest representation of Total researchers) in comparison to Greece and Romania (with the lowest representation of Total researchers),
- Scientists and engineers 25 to 64 years in science and technology as % of total population between Finland and Sweden (with the highest representation of Scientists and engineers 25 to 64 years) against Italy and Slovakia with the lowest representation of these employees,
- Professionals employed in science and technology as % of total employment between Lithuania, Romania in 2015 and 2020 and also Luxembourg in 2020 (with the highest representation of Professionals employed in science and technology) against Italy and Slovakia (with the lowest representation of these employees).

## Conclusion

Human resources in science and technology are an indicator which reflects a country's degree of implication in supporting the development of science and technology as an important factor of economic and social progress. The aim of the paper was to evaluate selected categories of human resources in R&D and their similarities in the countries of the EU in years 2015 and 2020. It has been found in the revised literature that R&D personnel by function includes a number of specific positions and categories. Their structure and representation varies in the individual EU countries with respect to the given research by sector of employment. On the basis of an empirical analysis using multidimensional scaling, the structure of the similarity of human resources in R&D in the EU countries in years 2015 and 2020 was evaluated in two dimensions. The results have shown a division of the EU countries into seven groups (clusters) according to the similarity of human resources in R&D. At the same time, marked differences were found between some EU countries in the categories of human resources in R&D. In particular, in Denmark, Finland, Sweden, the Netherlands or Luxembourg (with the highest representation of the majority of the evaluated human resources in

R&D) in comparison to Slovakia, Italy and Greece (with the lowest representation of scientists and engineers between 25 to 64 years in science and technology as % of total population), and Romania, Cyprus and Latvia (with the lowest representation of total researchers [FTE] as % of total employment). The reached results reflect the potential of the individual EU countries for the ensurance of quality of the performed research and are a precondition for the development of new findings and technologies. As a topic for further research, the authors will aim for performing an in-depth analysis of human resources in research and development in the EU countries in connection to financial indicators and indicators of results and innovation in research and development.

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# EFFECT OF MICE TOURISM ON ECONOMIC GROWTH IN SELECTED EUROPEAN COUNTRIES

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**Abstract**
The current paper analyses the economic contribution of business tourism market, generally known as a MICE sector in selected European countries. The aim of this paper is to quantify economic impact of MICE activities in the period 2000 - 2019. The introduction part is dedicated to the identification of MICE tourism contribution to economic development and the tourism related terms to better understand the whole study. Next part focuses on methodology, data and reveals the main aim. From methodological point of view, the study assessed 3 different quantitative approaches – OLS, FE and IV. Instrumental variable proved to be of high significance. The regression analysis shows that 1% increase in MICE activities results in 0,06% – 0,15% increase in GDPpc. The conclusion summarizes the main findings and indicates the next research possibilities related to MICE activities as a factor of economic development.

**Keywords**
MICE, GDPpc, OLS, Instrumental Variable, Fixed Effect.

**JEL classification**
A10, C10, Z31.

## Introduction

Except for COVID-19, tourism has over the years turned into one of the most profitable and intensively developed branches of the world economy. According to latest UNWTO Tourism Highlights, 2020 edition, tourism is the third world´s largest export category after fuels and chemicals, while 28% of world services export is generated by tourism (UNWTO, 2020). However, we can differentiate the form of tourism by the purpose of visit, which can be business or leisure. MICE sector as a part of tourism belongs to the business tourism market based on this purpose.

At the beginning of 21st century, MICE tourism as a short-term for Meetings, Incentives, Congresses, and Events, has become in a lot of countries one of the fastest growing economic sectors which contributes to economic diversification, provides foreign exchange and job creation. The reason why many countries pay attention to the development of international business sector is because organisation of MICE tourism events is attractive and economically interesting for hosting countries, cities, agencies, and other business services. It brings more economic benefits in comparison with the consumption of primary services. The consumption of specific services related to MICE sector includes professional program of congress accompanying program and wide range of intermediated personal services (Novacká et al., 2021).

This economically oriented type of tourism is bound to the existence of suitable conditions for its organization, which means, it does not include only existence of congress centres or exhibitions. What is important is also accompanying infrastructure and services such as transportation system and accommodation facilities, which are hotels of higher standards, since the MICE sector is classified by lucrative clientele. Moreover, this type of tourism enables to fill in off seasons parts of the year and enables resorts to redistribute the tourist occupancy and create profit equally throughout the year

(Kasagranda, Gurňák, Danielová, 2017). From the spatial view of the countries, most of the MICE events takes place in their capitals.

Above mentioned facts make the MICE market the highest revenue contributor to the tourism industry. Globally its value shows a continuous growth from $805 billion in 2017 to $916 billion in 2019 which makes Europe the leading destination with 50% market share. Western Europe holds the largest share (40%) of the MICE tourism world market. The experts predict that MICE market will reach $1,439 billion in 2025. According to ICCA (2020), Europe dominates also in terms of the number of international association conference participants (ICCA, 2020). However, the global pandemic COVID-19 slowed down the development of MICE market, while many of the events in this sector has moved into online world or have been postponed.

From the geographical point of view the object of this paper is Europe, which is globally leading tourism destination. There are numerous regional groups within the Europe in which member states cooperate with one another outside the EU institutional framework. All these groups represent forms of bottom-up cooperation that reside at an intermediate level between the individual member state and the EU. However, these groups vary in different ways. Some of them are long standing (f.e. Benelux, est. 1944) whereas others are quite recent creations (f.e. New Hanseatic League, est. 2018). They vary also in size, from two members (f.e. Franco-German Cooperation) to twelve (Three Seas Initiative). Some of them are deeply institutionalized (f.e. Baltic Assembly) whereas others are only minimally so (f.e. Weimar Triangle). Some involve extensive cooperation across a range of policy areas (f.e. Visegrád Group) whereas others are focused on one policy area only (f.e. Salzburg Forum). Some are focused mainly on internal cooperation (f.e. Central European Defence Cooperation) whereas others are also concerned with policy coordination at the EU level (f.e. the Nordic-Baltic Six) (Cooper, Fabrinni, 2021).

For the purposes of this study, we are going to examine economic impact of MICE sector in countries of 3 regional groupings – Benelux (Belgium, Netherlands, Luxemburg), Visegrad group (Czech Republic, Slovakia, Hungary, Poland) and Nordic Co-operation (Sweeden, Norway, Denmark, Finland, Iceland) except for Iceland due to unavaibility of data. Despite the fact, that selected countries do not belong between world´s MICE leading destinations such USA, Germany, or France, by providing this research we would like to highlight the role of MICE sector in these countries so the policymakers will consider this form of tourism as a priority when developing the strategies of high-income types of tourism.

Our paper is structured as follows. Firstly, we present theoretical background of MICE sector based on literature review of international and domestic scientific publications. Secondly, the objective, materials and methodology of research is explained. Next part presents the research results in detail and provides summary of the main outcomes of this study. Apart from this, the limitations of the study are explained with potential areas of futher future research. This article fills the research gap related to economic contribution of MICE sector in academic literature which is still very limited.

## 1 Literature review

Research of MICE tourism has been objective of many studies in the world over the years. However, there can be found a wide range of research related to MICE from different point of view. Many authors study their economic impact, the impact of MICE on accommodation infrastructure, the impact of COVID-19 on MICE, marketing analyses of MICE, regional competitiveness of MICE tourism development and so on. Following this, we are bringing a short overview of scientific literature related to impact of MICE on the economy of the countries. The economic impact of MICE tourism is well systematized in the academic research, trade journals and industry reports. The role of research on economic impact assessment results into better understanding MICE tourism and its impact on host destination.

Dwyer and Forsyth (1997) in their research paper discuss issues related to the economic significance of MICE tourism and provide the basis of theoretical framework of economic impacts

of MICE. According to them, the economic contribution of MICE tourism to the nation can be determined by applying relevant economic multipliers. In this way, the contribution of this sector to gross domestic product and national employment can be estimated. They describe MICE sector as an important generator of tourism expenditure, investment, foreign exchange earnings and employment, however, the economic significance of MICE tourism remains under-researched because of lack of data available for the estimation of magnitude of these effects.

According to Kuman et al. (2014) data on the economic impact of MICE tourism are often incomplete and limited. They claim that because of this shortcoming in extant industry data several recent academic studies have focused on creating theoretical frameworks, input-output (I-O) models for estimating the total contributions of MICE sector. Apart from this, they consider economic impact studies as beneficial, because they illustrate benefits of this type of tourism. However, they are done in different ways and vary in methodology or information level gathered, which makes each study original.

Lim and Zhu (2018) use panel data technique and GMM estimators in which they include MICE-related attendance in tourism demand modelling. Their results show that there is a significant positive relationship between tourism demand and MICE events in Singapur and tourism demand growth is significantly positive with respect to changes in income.

Fan (2017) provides correlation analysis between the MICE industry and regional economic growth in which he uses 2 parametres, GDP and comprehensive economic benefit of MICE industry in Guiyang city, China. His empirical research through relevant data between time 2011-2015 verify that the development of MICE industry promotes the growth of GDP.

Musina et al. (2019) through economic analyses and marketing research survey in Kazachstan quantified that the costs of a business travelers on average triple the costs of the leisure tourists. Through the quantitative analyses they conclude that during the times of any economic downturns or crises, the sphere of MICE suffers the least and sometimes its volumes.

Katsitadze and Natsvlishvi (2017) deal with the development opportunities of MICE tourism in case of Georgia. They study the attractiveness of destination based on its geographical accessibility, since 70% of MICE tourists choose a destination based on a flight time. Therefore, the study provides and overview of distance of the target markets of Georgia with the approximate duration of flight. The results show that the neighbouring countries still account the biggest share in the number of international tourists incoming in Georgia (87.8%). However, it is impossible to quantify the number of MICE tourists coming to Georgia due to absence of relevant data. They highlight the importance of direct flights and comfortable flight time which attracts the higher number of tourists to the destination. Through the analysis of international tourists' inflows and behaviour of MICE tourists they revealed important impact that country's awareness and geographical location have on potential markets.

Vávra (2021) through mathematical – statistical methods quantified the economic benefits of MICE in Visegrad region. The empirical analyse show the share of MICE contributions on national GDP of Slovakia, Hungary, Poland, and Czech Republic. The results show that the highest share of MICE activities on GDP have been in Poland (1,5%), which generated almost 8 billion euros of MICE-related activities in 2019. Through the algebraic formulas he quantifies the decrease of MICE activities on GDP in 2020 when the world was hit by global pandemic called COVID-19. The highest decrease in comparison with other Visegrad countries has been measured in Hungary (around 89%).

From the above-mentioned scientific studies, we can sum up that MICE industry has been objective of many studies throughout the years. However, there is a research gap when it comes to studying economic impact of MICE industry in European countries. Most of the authors deal with this issue in Asia markets, which is consider as a fastest growing region when it comes to growth of MICE activities. To sum up, researchers in their studies indicate different ways how to evaluate the economic benefits of MICE tourism, however, the further steps are often stopped by the absence of the statistical data.

## 2 Methodology and data

The aim of this paper is to quantify economic impact of MICE activities through the selected economic indicators – GDP, inflation rate, investment, and trade. From the geographical point of view, the object of our research consists of the European countries of selected regional groupings– Benelux, Visegrad group and Nordic Co-operation, which makes 12 countries in total, since the data related to Iceland has not been available. In this study we examine the economic impact in period of years 2000-2019. There have been used several scientific methods such as economic analysis, comparative method and correlation analysis in this paper.

When it comes to processing data for the purpose of quantitative analysis it is important to emphasise that we used secondary data to collect information and construct findings. ICCA (International Congress and Convention Association) is the only database of international meetings providing annual reports of international number of MICE events in the countries and their capitals, which can be compared. However, the only limitation is very little empirical data related to MICA activities on the precise magnitude of the benefits and associated costs generated in this sector.

To sum up, the basis for the quantitative analysis has been secondary data from different official databases such as ICCA, UNWTO, Eurostat and World Bank. In this analysis we have processed the most available statistical database that reflects the development of the MICE activities in the examined geographic area. Apart from secondary data, to provide a detailed literature review, there have been used the scientific studies and papers related to MICE activities from the licensed databased such as Web of Science, Scopus, and the other important databases, f.e. ResearchGate.

The analysis process was based on the objective of this study which is to quantify and identify economic impact of MICE activities in the examined European countries.

### 2.1 Ordinary least squares

This study analyses the data for time of years 2000-2019 meaning that time series for each country consists of 20 years. Such a long time series allows us to control the effects, which take place in a longer period. For this purpose, we use multiple approaches of regression analysis. Firstly, we use ordinary least squares method estimation. The linear equation is as follows:

$$\ln\_GDPpc_{it} = \beta_0 + \beta_1 MICE_{it} + \beta_2 X_{it} + u_{it} \quad (1)$$

where:

- $\ln\_GDPpc_{it}$: gross domestic product per capita in the country *i* in the year *t*
- $MICE_{it}$: number of MICE events in the country *i* in the year *t*
- $X_{it}$: vector of control variables in the country *i* in the year *t*
- $u_{it}$: error term

Control variables represent the macroeconomic indicators, which are important, when it comes to the issue of economic growth. The important variables are investments, which are considered as a driving force in achieving economic growth. Furthermore, we have added inflation which considers the price level in a given country. Trade openness, which is measured by the share of the sum of imports and exports in the country's GDP. Last of all, we have used a capital depreciation in conjunction with population growth, which should impact GDP per capita. Table 1 provides a short overview of descriptive statistics of examined variables.

**Table 1**. Descriptive statistics

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| GDPpc (log) | 10.655 | 0.460 | 9.659 | 11.652 |
| MICE | 131.477 | 76.057 | 6.000 | 368.000 |
| Average Distance | 1341.988 | 429.841 | 492.286 | 2422.525 |
| Trade | 130.914 | 66.386 | 58.157 | 380.104 |
| Inflation | 2.273 | 1.905 | -0.874 | 12.036 |
| Investments | 22.276 | 2.810 | 16.267 | 31.193 |
| Depreciation | 0.524 | 0.592 | -0.994 | 2.481 |

Source: World Bank, ICCA, own calculations

## 2.2 Endogeneity issues

The dependent variable in the research is gross domestic product per capita, which represents the level of income in a country. This variable also considers the tourism infrastructure meaning the richer the country, the better its infrastructure. This is reflected in a higher number of congress centres, accommodation establishments, and catering facilities and subsequently in a higher number of MICE tourism events. The main independent variable that we monitor is the number of MICE tourism events that take place in a country. In the case of this variable, we also assume the opposite relationship, and thus that a higher number of MICE tourism events means that foreign tourists bring money into the country and spend it on tourism-related services during congresses, leading to increase in GDP per capita. From a theoretical point of view, there is a problem with endogeneity between the dependent and independent variable. We test this assumption in research using an instrumental variable and subsequent statistical tests.

From an econometric perspective, instrumental variables regression analyses represent a general way to obtain an unbiased estimate of the relationship between GDPs per capita and MICE tourism, when it is suspected that the MICE tourism is correlated with the error term of the model $u_{it}$. For example, when factors in $u_{it}$ represent omitted factors that determine GDP per capita and GDP per capita influences MICE tourism (reverse causation). Instrumental variable can help in this situation by isolating a part of the variation in X that is uncorrelated with $u_{it}$.

We consider the average distance of an incoming tourist to a given country to be a suitable instrumental variable. We assume that the distance that tourists must travel to get to the country and to the MICE event does not affect how rich the host country is. Also, the distance does not change depending on the wealth of the host country. On the other hand, we assume that this quantity has a major impact on how many international MICE events will take place in each country. The variable expresses the weighted average distance of incoming tourists from the top 10 source markets in a country in a year. The distance is weighted by the share of tourists from an origin country in the total number of arriving tourists each year. The instrument was constructed by computing the following equations:

$$W_{kit} = \frac{Arrivals_{kit}}{Total\_Arrivals_{it}} \quad \big(k = (1, 2, \dots, 10);\ i = (1, 2, \dots, 11)\big) \tag{2}$$

where:

- $W_{kit}$: share of incoming tourists from country *k* to country *i* in the year *t*,
- $Arrivals_{kit}$: number of incoming tourists from country *k* to country *i* in the year *t*,
- $Total\_Arrivals_{it}$: total number of incoming tourists to country *i* in the year *t*.

$$AverageDistance_{it} = \frac{\sum_{i=1}^{10} W_{kit} * X_{ki}}{\sum_{i=1}^{10} W_{kit}} * \frac{1}{\sum_{i=1}^{10} W_{kit}} \quad \left(k = (1, 2, \dots, 10);\ i = (1, 2, \dots, 11)\right) \tag{3}$$

where:

- AverageDistance$_{it}$: average distance of incoming tourist to country *i* in the year *t*,
- $W_{kit}$: share of incoming tourists from country *k* to country *i* in the year *t*,
- $X_{kit}$: distance between capital cities of country *k* and *i*.

We argue that this variable meets the three assumptions needed for an instrumental variable, which are:

1. The instrument (Average Distance) and the endogenous variable (MICE) are associated either because Average Distance has a causal effect on MICE, or because MICE and Average Distance have a common cause.
2. Average Distance affects the outcome only through MICE (holding other control variables constant).
3. Average Distance is not associated with uncontrolled factors that cause GDP per capita.

The first-stage IV variable approach functions is as follows:

$$\text{MICE}_i = \pi_0 + \pi_1 AverageDistance_i + \pi_2 X_i + v_i \tag{4}$$

where:

- MICE$_{it}$: number of MICE events in the country *i* in the year *t*,
- AverageDistance$_{it}$: average distance of incoming tourist to country *i* in the year *t*,
- $X_{it}$: vector of control variables in the country *i* in the year *t*,
- $v_i$: error term.

If the assumptions described above are met, then the unbiased instrumental variable analysis can be conducted using two-stage least squares regression. In the first stage, a regression (2) linking MICE and Average Distance is used to decompose MICE into two components: a problematic component $v_i$ that is correlated with the error term $u_{it}$, and a problem-free component $\pi_0+\pi_1$AverageDistance$_i$+ $\pi_2 X_i$ that is uncorrelated with $u_{it}$. The second stage uses only the problem-free variation in MICE to estimate the coefficient $\beta_1$.

We conducted the following tests for the instrumental variable analysis:

- Endogeneity tests to determine if the relationship between GDP per capita and MICE is in fact endogenous. Stata command *estat endogenous* after regression provided Durbin $\chi 2$ score and Wu-Hausman F values. Results of these tests are shown in regression table.
- 'Weak identification' arises when the excluded instruments are only weakly correlated with the endogenous regressors, and this can cause bias, especially in small samples. To test for weak instruments, we apply a Rule of Thumb, which uses F-statistic for the first-stage regression in 2SLS: if it is larger than about 10, then we are unlikely to suffer from problems that arise with weak instruments. This rule is also called Montiel-Pflueger robust weak instrument test.
- Since we have only one instrument, there is no need to test for overidentification.

## 2.3 Fixed effects

The use of balanced panel data, which we collected for the period 2000-2019 and 11 countries, allows us to control the effects of cross-sectional units, which are characteristic only for them and can be correlated with explanatory variables. If correlated with independent variables, omitting them would result in a bias in the estimate. Since the panel data consists of several observations of the same subject over a longer period, it is possible to eliminate the so-called time-fixed effects. It is therefore possible to control any unobserved shocks that affect the whole country. It is also possible to consider

the fixed effects of individual monitored entities. By controlling the fixed effects of time and space, the data used are demeaned, which ensures stationarity. In this way, it is possible to check comparisons using variations within the monitored regions and not across them. Both methods make it possible to control variables that are only very difficult to quantify. We test the validity of fixed effects in models with the *testparm* command, which answers the question whether the common statistical significance of effects is different from zero. The equation of the linear model has the following form:

$$\ln\_GDPpc_{it} = \beta_0 + \beta_1 MICE_{it} + \beta_2 X_{it} + \beta_3 FE_{it} + \beta_4 TE_{it} + u_{it} \quad (5)$$

where:

- $\ln\_GDPpc_{it}$: gross domestic product per capita in the country *i* in the year *t*,
- $MICE_{it}$: number of MICE events in the country *i* in the year *t*,
- $X_{it}$: vector of control variables in the country *i* in the year *t*,
- $FE_{it}$: fixed effects in the country *i* in the year *t*,
- $TE_{it}$: time effects in the country *i* in the year *t*,
- $U_{it}$: error term.

## 3 Empirical results

Continual development of MICE activities throughout the years results in their contribution to national economy of the countries. Table 2 shows correlation coefficients of observed variables. The correlation analysis shows that there is a weak relationship between GDPs per capita and MICE activities (0,084), which is not significant. We test this relationship also in regression analysis. First important finding supporting our instrumental variable assumption is, that GDP per capita and Average Distance of incoming tourists are not correlated (P-value = 0.661). This supports the validity of our instrument. Second finding is that MICE activities are highly positively correlated with Average Distance of incoming tourists (P-value<0.000) meaning, there is a significant relationship between these variables. Other correlation coefficients are also interesting. We expected the relationship between GDPs per capita and Investments to be positive and Depreciation negative respectively. Data showed otherwise.

**Table 2**. Correlation Matrix

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| (1) GDP per capita | 1.000 | | | | | | |
| (2) MICE | 0.084 | 1.000 | | | | | |
| | (0.217) | | | | | | |
| (3) Average Distance | -0.030 | 0.536*** | 1.000 | | | | |
| | (0.661) | (0.000) | | | | | |
| (4) Trade | 0.436*** | -0.398*** | -0.471*** | 1.000 | | | |
| | (0.000) | (0.000) | (0.000) | | | | |
| (5) Inflation | -0.393*** | -0.293*** | -0.086 | 0.001 | 1.000 | | |
| | (0.000) | (0.000) | (0.204) | (0.986) | | | |
| (6) Investments | -0.359*** | -0.027 | 0.108 | -0.290*** | 0.274*** | 1.000 | |
| | (0.000) | (0.693) | (0.111) | (0.000) | (0.000) | | |
| (7) Depreciation | 0.869*** | -0.105 | -0.178*** | 0.536*** | -0.270*** | -0.305*** | 1.000 |
| | (0.000) | (0.119) | (0.008) | (0.000) | (0.000) | (0.000) | |

Source: World Bank, ICCA, own calculations. P-value in parentheses. *** p<0.01, ** p<0.05, * p<0.1

After correlation analysis, we performed regression analysis. Table 3 shows 2 different methodologic approaches - OLS method and Fixed Effects. Model (1) presents only simple regression of MICE on GDP. The coefficient is negative (-0.042) and statistically insignificant. However, we consider this estimate biased since there are more factors affecting GDP. Therefore, we included other variables (trade, inflation, investments, depreciation) in the model (2), which results in statistically

significant relationship (0,082). Even though, the statistical significance is verified, we still assume that the value of 0,082 is biased due to omitted variables not included in the model, that might be correlated with MICE. Following this, we control for time-invariant fixed effects and time effects, which control possible shocks during each year. In both models the F-statistic of fixed and time effects proved their significance in models. Also, Hausman test showed that Fixed effects model is more suitable than Random effects. Model (3) shows the impact of MICE activities on GDP in a simple regression like Model (1) with the difference of methodological approach. The coefficient says that 1 % increase in MICE activities provides economic growth of about 0.09 %. However, more accurate estimates the Model (4) which takes into account another independent variables with the impact on GDP. The impact of MICE activities has fallen to 0.06 % but remains significant.

Country selection includes one country, which is quite different from the others – Luxembourg. Since Luxembourg is not "ordinary" economy, we decided to re-run regression analysis with subsample excluding Luxembourg. Models (5) and (6) provide results of OLS regression and show statistically significant positive effect of MICE tourism. However, these estimates, as previously, are still considered biased due to omitted variable bias. Models (7) and (8) include fixed and time effects, therefore these estimates are considered more accurate. F-statistic also proved, that inclusion is valid. Estimates are similar to models (3) and (4) meaning that omitting Luxembourg does not change the results.

**Table 3**. OLS and FE Regression Models

| | OLS | | FE | | OLS | | FE | |
|---|---|---|---|---|---|---|---|---|
| | Full sample | | | | Subsample (LUX omitted) | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| MICE (ln) | -0.042 | 0.082*** | 0.094*** | 0.061* | 0.338*** | 0.163*** | 0.200*** | 0.096*** |
| | (0.035) | (0.021) | (0.034) | (0.034) | (0.031) | (0.022) | (0.041) | (0.035) |
| Trade | | 0.001 | | 0.000 | | 0.000 | | 0.003*** |
| | | (0.000) | | (0.001) | | (0.000) | | (0.001) |
| Inflation | | -0.027*** | | -0.020*** | | -0.023*** | | -0.014*** |
| | | (0.008) | | (0.004) | | (0.008) | | (0.003) |
| Investments | | -0.011** | | -0.011*** | | -0.007 | | -0.004 |
| | | (0.005) | | (0.004) | | (0.005) | | (0.004) |
| Depreciation | | 0.638*** | | -0.004 | | 0.586*** | | 0.057** |
| | | (0.030) | | (0.024) | | (0.037) | | (0.024) |
| Constant | 10.847*** | 10.188*** | 10.089*** | 10.582*** | 8.944*** | 9.767*** | 9.508*** | 9.801*** |
| | (0.162) | (0.185) | (0.142) | (0.182) | (0.148) | (0.176) | (0.181) | (0.199) |
| Fixed Effects | NO | NO | YES | YES | NO | NO | YES | YES |
| Time Effects | NO | NO | YES | YES | NO | NO | YES | YES |
| F-Statistic (FE) | | | 4.000 | 4.860 | | | 2.550 | 2.250 |
| P-value (FE) | | | 0.000 | 0.000 | | | 0.000 | 0.003 |
| Hausman $\chi 2$ | | | 12.290 | 6.930 | | | 0.010 | 84.610 |
| Observations | 220 | 220 | 220 | 220 | 200 | 200 | 200 | 200 |
| R-squared | 0.007 | 0.801 | 0.663 | 0.746 | 0.380 | 0.761 | 0.702 | 0.818 |

Source: World Bank, ICCA, own calculations. Standard errors in parentheses. Dependent variable is log of GDPpc 2017 (PPP); *** p<0.01, ** p<0.05, * p<0.1

As we indicated earlier, there is strong theoretical assumption that relationship between GDP per capita and MICE tourism is endogenous. Countries with higher income are very likely to have better tourism and accommodation infrastructure including congress centres. Therefore, more MICE activities in the country. On the other hand, more MICE activities in the country lead to more incoming tourists, who bring and spend more money in the destination country which leads into higher GDP. To verify this assumption of endogeneity, we conducted regression analysis using

instrumental variable method. Table 4 show the results of this approach. Model (1) in the Table 4 shows insignificant relationship between GDPs per capita and MICE. Durbin $\chi 2$ (P-value = 0.652) and Wu-Hausman F test (P-value = 0.654) show that relationship is not endogenous. On the contrary, after including control variables, Model (2) confirms our assumptions of endogeneity. Both tests of endogeneity proved that relationship is indeed endogenous with P-value < 0.05. Montiel-Pfleuger test also confirmed that our instrumental variable (Average Distance) is valid on high level. Since all tests proved to be valid, we believe that estimate using instrumental variable is not biased, therefore we can talk about causal relationship. The estimated coefficient says that one percent increase in MICE activities leads to increase of GDP per capita in volume about 0.15 %. Table 5 shows the first stage regressions of instrumental variable approach. Both models estimated a statistically significant relationship between GDPs per capita and MICE tourism, which confirms the validity of used instrument.

**Table 4**. Instrumental Variable Regression Models

| | Full sample | | Subsample (LUX omitted) | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| MICE (ln) | -0.023 | 0.150*** | 0.274*** | 0.203*** |
| | (0.053) | (0.041) | (0.053) | (0.036) |
| Trade | | 0.001** | | 0.000 |
| | | (0.000) | | (0.000) |
| Inflation | | -0.018* | | -0.019** |
| | | (0.010) | | (0.008) |
| Investments | | -0.010* | | -0.006 |
| | | (0.006) | | (0.005) |
| Depreciation | | 0.641*** | | 0.566*** |
| | | (0.030) | | (0.040) |
| Constant | 10.763*** | 9.764*** | 9.247*** | 9.535*** |
| | (0.246) | (0.286) | (0.256) | (0.239) |
| Durbin score $\chi 2$ | 0.204 | 4.047 | 2.161 | 4.039 |
| P-value | 0.652 | 0.044 | 0.142 | 0.046 |
| Wu-Hausman F | 0.201 | 3.992 | 2.152 | 3.990 |
| P-value | 0.654 | 0.047 | 0.144 | 0.048 |
| Montiel-Pfleuger | 159.208 | 80.144 | 99.604 | 122.675 |
| Observations | 220 | 220 | 200 | 200 |
| R-squared | 0.005 | 0.791 | 0.366 | 0.757 |

Source: World Bank, ICCA, own calculations. Standard errors in parentheses. Dependent variable is log of GDPpc 2017 (PPP); *** p<0.01, ** p<0.05, * p<0.1

Like a previous approach, we omitted Luxembourg data and estimated instrumental variable approach with subsample. Model (3) shows simple two-stage least square regression and statistically significant coefficient. Statistical tests, however, showed that this model is no suffering from endogeneity, which we consider false. Model (4) includes control variables and shows similar results to model (2). These findings support the assumption that we found causal relationship between GDPs per capita and MICE tourism.

**Table 5**. Instrumental Variable Regression Models – First stage

| | Full sample | | Subsample (LUX omitted) | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Average Distance | 0.001*** | 0.001*** | 0.001*** | 0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Trade | | -0.005*** | | 0.003*** |
| | | (0.001) | | (0.001) |
| Inflation | | -0.111*** | | -0.070*** |
| | | (0.022) | | (0.018) |
| Investments | | -0.012 | | -0.044*** |
| | | (0.015) | | (0.013) |
| Depreciation | | -0.092 | | 0.517*** |
| | | (0.083) | | (0.089) |
| Constant | 2.784*** | 4.590*** | 3.472*** | 4.104*** |
| | (0.151) | (0.407) | (0.138) | (0.332) |
| Observations | 220 | 220 | 200 | 200 |
| R-squared | 0.422 | 0.596 | 0.335 | 0.552 |

Source: World Bank, ICCA, own calculations. Standard errors in parentheses. Dependent variable is log of MICE.
*** p<0.01, ** p<0.05, * p<0.1

## Conclusion

The MICE activities have been expanding over the examined period and the MICE sector is according to our results considered as a sector which generates a range of benefits to host countries and regional economics.

The present research examined the economic impact of MICE activities in selected European countries. Through the correlation and regression analysis we summarise several conclusions based on the results achieved. Using 3 different econometric methods - OLS, Fixed Effects, and Instrumental variable approach, we have examined the relationship between MICE activities and GDP per capita. Apart from the MICE activities, we have used several other control variables such as trade, inflation, investments, and depreciation which also have impact on the economic growth. Ordinary least squares and fixed effects estimates showed significant positive impact of MICE activities on gross domestic product. However, from theoretical point of view, we believe that there is endogeneity between these variables, therefore estimates are biased. This assumption was tested and passed since endogeneity tests confirmed its presence. To obtain unbiased estimates, we used Instrumental variable approach. Instrumental variable represented by average distance of incoming tourists from TOP 10 source markets proved to be statistically valid. Results showed that 1 % increase in MICE activities leads to 0.15 % increase in income. Since the three assumptions for instrumental variable approach were fulfilled, we believe that this estimated is unbiased and therefore causal. We re-run the whole regression analysis using subsample, which excluded Luxembourg from dataset, because Luxembourg is widely not considered as "common" economy. The results did not vary.

Having performed in depth evaluation of MICE tourism activities in examined countries we conclude that MICE tourism has grown into an important economic sector in European countries. The next possible way of further research is to extend data to other European countries to examine the MICE activities impact on GDP on Europe as a whole.

However, as a research gap we consider the lack of data related to MICE activities which could be useful in terms of reaching more accurate results, such as direct and indirect expenditures of attendees of events and their diversification between all participants. In particulate, economic measures of expenditures attributable to MICE events would allow policymakers to estimate the economic impacts of MICE sector and make more informed decisions more accurately.

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# CHALLENGES FOR CRM TO BE AN ACTIVE PART OF DEVELOPMENT IN EUROPE

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**Abstract**
Many analyses show that economic growth is related to information technology (IT) trends, and CRM (Customer Relationship Management) also has an important place here. This is natural because customer relationships influence sales volume and business success. The most promising issue is artificial intelligence (AI) and its implementation in business processes to support automation, chatbots, data analytics, Internet of Things (IoT), or robotics. In this article, the interest is in the support of automation in CRM systems, which should be an active part of the development in Europe. Selected CRM systems were monitored for AI-based automation and KPIs that demonstrate the benefits of CRM. There are differences in the volume of automated procedures. Some CRM systems are more complex, like Zoho CRM, but others only have a simple solution, like Less Annoying CRM. This reality puts more pressure on marketers and sales people as they have no optimal software to support their activities. A hierarchy tree is created to help with decision-making using specified criteria and alternatives. The criteria focus on scope, template, communication, visualisation, and user support. Alternatives are created by groups of CRM systems.

**Keywords**
CRM (Customer Relationship Management), information technology, development, marketing

**JEL classification**
D81, D83, L86, M31

## Introduction

Development in Europe is based on the sources of economic growth, which is tied to the growth of production factors and productivity. These factors are influenced by education, innovation, technology, and scientific progress. The global information society operates with big data, and it is natural that economic growth is influenced by trends in information technology (IT). There are analyzes to track the impact of IT on the competitiveness of states in Europe through four areas such as e-learning, personal Internet use, e-commerce, and e-government (Zoroja and Bach, 2016). For the year 2021, trends in the development of mobile market, telecommunications and ICT services, cyber security are visible in Europe (Digital trends in Europe 2021, 2021). The positive news is that Europe's global information and communications technologies (ICT) market will continue to grow significantly in 2022. Major interest is estimated (National 5G Observatory, 2021) in data centers (3.6%), business software (10.0%), devices (0.7%), computer services (8.2%), telecommunication services (2.0%), and global ICT (4.7%). In many cases, it is necessary to deliver the right value to customers; therefore, CRM (Customer Relationship Management) systems have an important place in business. This reality affects key trends in Europe (De Vico, 2021) such as the customer experience based on analytics, the creation of new business models online, the construction of 5G infrastructure, or AI (Artificial Intelligence) implementation that have positive results in business, the cloud and IoT (Internet of Things).

The irreplaceable role of information technology is evident in the European goals for 2030 (De Vico, 2021), where the goals focus on ICT professionals and basic digital skills, secure and sustainable digital infrastructures with computing (the first quantum-accelerated computer) and digital transformation business based on cloud, AI, and big data. The most promising issue is AI implementation in business processes, which IT users see as supporting automation, chatbots, cloud, data analytics, IoT or robotics. AI implementation is also available in CRM systems. It is natural, because customers are the most valuable to any business and care must be taken to create the most optimal relationship. The question is what is the challenge for the CRM system to be an active part of the development in Europe. Specifically, what is the interest in supporting automation in CRM

systems. To solve this question, a literature search was conducted, the necessary data were collected and processed.

## 1 Literature review

Factors influencing development are such as technology, communication, human resources, education and training. Europe's development requires real-time information on opportunities to create the necessary innovations based on monitoring and expert analysis, partnerships and education (Welcome to European Development Agency, 2022). According to the World Bank data, GDP growth (annual %) is 5.4 for the European Union in 2021. CRM has an important place here. From the available statistics, the value of the global CRM market was estimated to be approximately $52.64 billion in 2020. The value of the global CRM market is estimated to grow by more than 245% by 2028, and the global CRM market is growing at a rate of 12% per year (Todorov, 2022). On a positive note for the day-to-day use of CRM systems, 92% of businesses say that CRM has played an important role in achieving their revenue goals, 47% of CRM users say that CRM technology has an huge impact on their customer satisfaction levels, 92% of customers say they would left the company after two or three negative interactions. Looking at current trends, 85% of marketers say that analytics play a huge role in decision-making by 2022. Another trends are email marketing and artificial intelligence. Artificial intelligence is used to analyze customer data, predict potential leads or support automated assistance through chatbots. Good inspiration is the cost savings based on artificial intelligence implementation in CRM in the US. See Fig. 1.

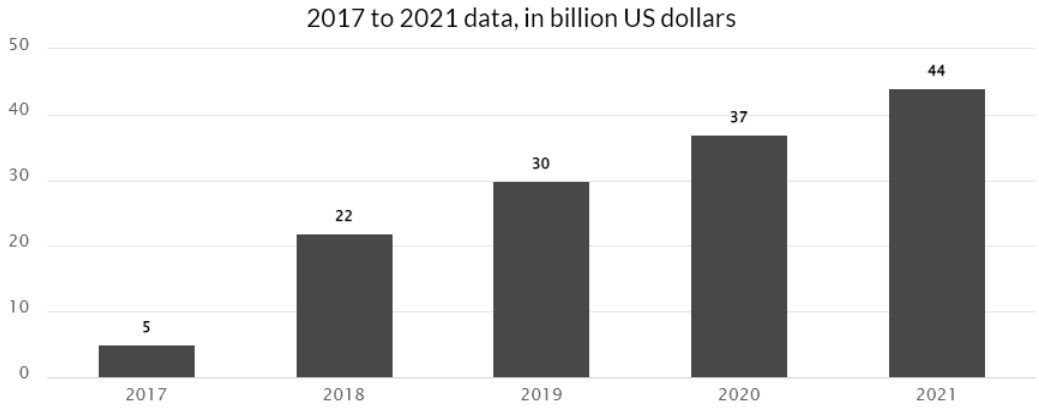


**Fig. 1.** Cost savings based on artificial intelligence implementation in CRM in the US (Source: IDC, 2022)

Email marketing is estimated to deliver a 360% ROI and the uses of artificial intelligence in CRM is predicted to grow by over 250% in the next few years. CRM has its place in small business too. In numbers, 33% of small businesses use some form of web-based CRM, 92% of users say CRM is critical to their revenue goals, and 80% of customers are likely to support businesses with personalized customer support. There are different CRM solutions for small business. It is not just complex application like Salesforce. This application is the most prominent CRM system worldwide and holds 19.5% of the total CRM market share. After Salesforce, the next largest CRM systems are SAP and Oracle, each with approximately 4.8% share of the total CRM market. There are many others CRM systems like Hubspot, Sugar or Zoho. To achieve the desired benefits, interest is focused on customers and automation-enabled analytics.

CRM systems bring major benefits to customer contact. This is visible in better customer service, better customer retention, detailed analysis, centralized database, and improved customer segmentation (Kuligowski, 2022). Other sections focus on artificial intelligence, customer experience, everything as a service, Internet of Things, mobile CRM, self service CRM, voice and conversational user interface (Basu, 2020). The importance of artificial intelligence for data-driven marketing and sales is shown here. See Fig. 2.


**Fig. 2.** Application of artificial intelligence in CRM (Source: Basu, 2020)

It is evident from mentioned numbers and trends that advanced AI capabilities are creating a major demand for CRM. The reason for this is the processing of a large amount of stored data, which helps marketers make smarter and faster decisions. Einstein from Salesforce (Salesforce, 2022) is a good example. There is an artificial intelligence that analyzes data from various sources and predicts where new leads will come from. It helps customers solve problems on real-time through chat.

CRM systems bring also disadvantages at the level of implementation, customer dissatisfaction, suboptimal relationship building or unsatisfactory organization (Chauhan, 2022). It is easy to say that customer satisfaction depends on the procedures to get what customers want. In some cases, the time is not optimal, navigation on the site is difficult and customer has to search. This reality causes the customer to go to the competition and satisfaction is at a low level. In many such cases, customers share their experiences on social media and negative news is not good for the brand. A business needs optimal customer relationship so that customers stay longer and buy more. Artificial intelligence helps through chatbots for better orientation and quick recommendation of solution with CRM. Sharing customer relationship ratio is also a good helper to know what the customer prefers and how satisfied they are. A traditional opportunity is to expand the offer through up-selling and cross-selling, and thus customers are better oriented in the product and its combination.

Another problem is the CRM implementation. This process is not easy, and has many requirements. Information technology has proven methods to prevent IT project failures, but the practice is different. For many reasons, problems are caused by a suboptimal schedule and timescale, no optimal testing and feedback, bad communication, or hard demands on the solution team (Lee-Bourke, 2022). Artificial intelligence has the potential to help in this situation. The advantage is that artificial intelligence has the ability to make optimal decisions faster and more accurately than people (Marr, 2021). The implemented processes create a large volume of data, and AI can search for hidden facts in these data structures. A good example is marketing, where modules are used to determine leads and expected purchases from potential customers. Such processing works with approximately 175 billion variables and data points to make optimal decisions. IT users evaluate code-free user interface for creating programs, web pages or interactive systems with only graphical elements, and code-free AI systems creates the necessary modules with specific data. An example of a drag and drop process is Sway AI (Sway AI, 2022) or wizard-based such as Akkio (Akkio, 2022). Azure Machine Learning Designer (Azure, 2022) from Microsoft and Appian (Appian, 2022) are known for creating applications.

## 2 Methodology and data

Based on the literature review, CRM systems are monitored as one of the important source of productivity growth. Clear trends are visible to influence the competitiveness of AI implementations for automation, chatbots and data analytics. To monitor the current situation in CRM, two things were selected for detailed monitoring. It is AI-based automation and KPIs that show the benefits of CRM according to the topic of the article, which focuses on the current opportunities for CRM to be an active part of the development in Europe. The method solution of this topic is based on:

(1) Literature review on CRM capabilities.

(2) Determining a hierarchical tree that is useful for further analytical hierarchy process (AHP) with the extension of decision-making under uncertainty with a fuzzy approach to show optimal CRM automation.

(3) Interest focuses on automation with KPIs in CRM to support CRM benefits.

(4) The necessary data was collected from the monitored selected CRM systems.

(5) The next step is to specify the fuzzy pairwise comparison matrix for further analysis to specify the optimal automation care in CRM.

Entering the right interest in AI-enabled automation is an important step to address this issue. There are many lists of CRM systems, one may choose according to preferences or read about positive and negative customer experiences with their implementation. But it is about the IT background and people who work for customers through information technology. This article discusses CRM opportunities and their relationship to development in Europe. From a CRM perspective, the interest in artificial intelligence through CRM systems is not the same. There are comprehensive solutions like in Zoho CRM, but also minimal support like in Ivinex CRM.

There are many proven methods and methodologies for CRM implementation, but none are at a general level with adaptation to current conditions, which is important. The beginning of the implemented activities is aimed at starting the hierarchical tree. This tree is about decision hierarchy for optimal CRM automation for selected groups of CRM systems. See Fig. 3.

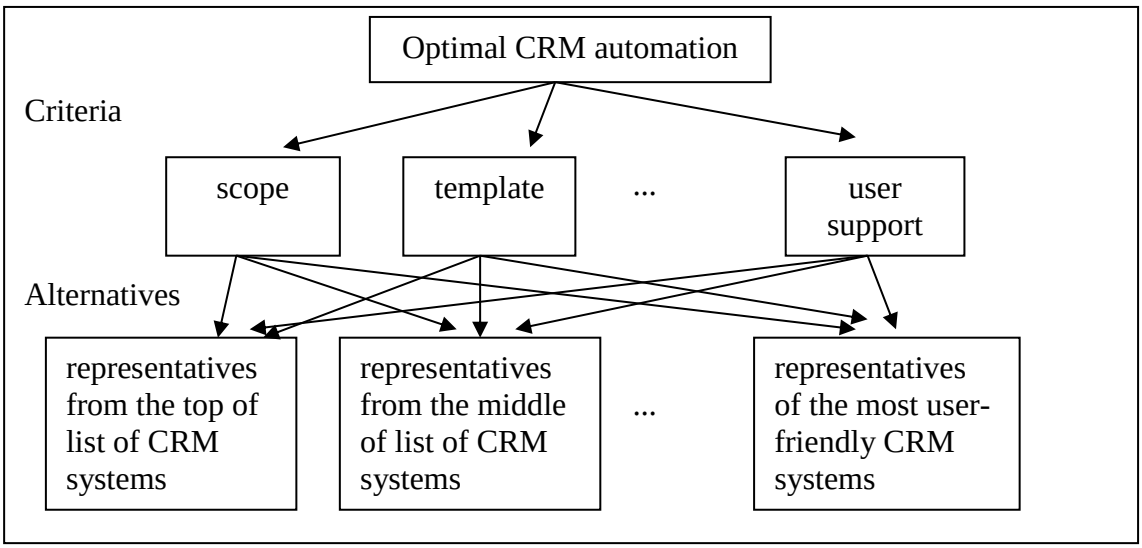


**Fig. 3.** Hierarchy tree for the analytical hierarchy process (AHP)
(own work)

For IT users, it is important to automate the implemented processes as friendly as possible through a template, an online guide or a current trend based on artificial intelligence. The reason is better support for working with the application and minimization of weaknesses. Perhaps all IT users know the need to have the right processes with optimal data, but the difficulty has been caused by not knowing how to implement the right processes according to customer requirements and business opportunities; therefore, there is interest in appropriately supporting CRM systems in automation and KPIs to show real benefits. For the evaluation of individual automation in CRM systems, fuzzy pairwise comparison matrix example was created for the specified criteria. See Table 1.

**Table 1:** Fuzzy pairwise comparison matrix for specified metrics

| | scope | | | template | | | communication | | | visualisation (road map) | | | user support | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| scope | 1 | 1 | 1 | 1/6 | 1/5 | 1/4 | 1/4 | 1/3 | 1/2 | 2 | 3 | 4 | 2 | 3 | 4 |
| template | 4 | 5 | 6 | 1 | 1 | 1 | 2 | 3 | 4 | 9 | 9 | 9 | 6 | 7 | 8 |
| communication | 2 | 3 | 4 | 1/4 | 1/3 | 1/2 | 1 | 1 | 1 | 6 | 7 | 8 | 2 | 3 | 4 |
| visualisation (road map) | 1/4 | 1/3 | 1/2 | 1/9 | 1/9 | 1/9 | 1/8 | 1/7 | 1/6 | 1 | 1 | 1 | 1/4 | 1/3 | 1/2 |
| user support | 1/4 | 1/3 | 1/2 | 1/8 | 1/7 | 1/6 | 1/4 | 1/3 | 1/2 | 2 | 3 | 4 | 1 | 1 | 1 |

Source: own work

This approach uses Saaty scale definition fuzzy triangular scale and reciprocal fuzzy scale (Ogrodnik, 2019), where 1 = equally important has Fuzzy Triangular Scale (1, 1, 1) and Reciprocal Fuzzy Scale is (1, 1, 1). Other values are 3 = weakly important with (2, 3, 4) and (1/4, 1/3, 1/2); 5 = fairly important with (4, 5, 6) and (1/6, 1/5, 1/4); 7 = strongly important with (6, 7, 8) and (1/8, 1/7, 1/6); 9 = absolutely important with (9,9,9) and (1/9, 1/9, 1/9). Further work needs to focus on consistency, which is checked using the Consistency Ratio (CR), where CR < 0.1 is acceptable. Similarly, a fuzzy pairwise comparison matrix needs to be created for selected groups of CRM systems according to specified criteria. This data is for normalized priority vectors and calculation of final ranking based on weight and priority vector for selected groups of CRM systems.

## 3 Achieved results

Selected CRM systems were checked to monitor the current status of CRM systems. The interest is in automation and the possibility that CRM systems offer for IT users. KPIs are also of further interest as these metrics have the ability to show the benefits of CRM. For IT users, it is better if CRM systems have templates and guides on how to use them. CRM systems were grouped as representatives from the top of list of CRM systems, representatives from the middle of list of CRM systems, representatives of the most popular CRM systems, representatives of the most affordable CRM systems, and representatives of the most user-friendly CRM systems and their representatives have been chosen. See Table 2.

**Table 2**. Scope of automatic procedures with KPIs for selected CRM systems

| Selected CRM systems | Automatic procedures | KPIs |
|---|---|---|
| representatives from the top of list of CRM systems | | |
| amoCRM | 4 | 2 |
| Cooper | 4 | 3 |
| Emerald | - | 2 |
| HarmonyPSA | 5 | 2 |
| Salpo CRM | 3 | 1 |
| representatives from the middle of list of CRM systems | | |
| itracMarketer | 7 | 1 |
| Ivinex CRM | 1 | 4 |
| Jigawatt Solar Tech | 2 | 1 |
| Jumplead | 4 | 1 |
| junariCRM | - | - |
| representatives of the most popular CRM systems | | |
| Odoo | 4 | 1 |
| Saleforce | 1 | 3 |
| SugarCRM | 3 | 2 |
| SuiteCRM | 3 | 2 |
| Zoho CRM | 9 | 7 |
| representatives of the most affordable (by price) CRM systems | | |
| Apptivo CRM | 2 | 1 |
| eWay-CRM | 8 | 2 |
| Snapforce CRM | 3 | 1 |
| SutiCRM | 2 | 4 |
| vtiger CRM | 1 | 1 |
| representatives of the most user-friendly CRM systems | | |
| Agile CRM | 4 | 1 |
| HubSpot CRM | 7 | 2 |
| Insightly | 4 | 2 |
| Less Annoying CRM | 1 | 1 |
| Teamgate | 2 | 2 |

Source: Own work.

For example, Zoho CRM is one from the most popular CRM systems and this solution is very complex in many areas for social network integration, customization and data management. Automation is available for performance analysis, sales processes, e-mail activities, task scheduling, web forms or workflow. Zia intelligence is available to generate notes, predict the results of sales activities, detects anomalies, and automate tasks performed on stored data. The implementation is also very good for KPIs, where example metrics are given to inspire IT users to optimal use. Useful metrics are Lead ScoreDeal Conversion Percentage, Average Deal size, Lead Conversion Time, Number of Signups, or Number of Tasks, Revenue this Month, Top Industries from Leads Generated.

The well-known Czech CRM system is eWay CRM with contact and customer management, sales and projects or marketing. The automation is linked to a category system for better contact segmentation to created campaigns and optimal feedback. It is possible to track communication with automatic reports through marketing campaigns, or workflow steps automatically generate tasks and data is available using access rights. Automatic notifications or information about changes and upcoming deadlines are important for project management. It is natural to create an aggregated view

of projects, goals, profitability, invoice and human resources. Marketers use different templates to segment the database and create the a list of respondents based on specific criteria. There is also room for evaluation.

Such a good situation is not in all CRM systems. The situation is different in Less Annoying CRM, where there is an interest in customization, leads and pipelines, activity reports through leads and team members, or virtualization support and mobile access. The benefit is simplification of implemented processes, but automation and KPIs are only addressed at a basic level for contacts and communication with them. Due to its intuitive and simplified interface, this CRM system is one of the representatives of the most user-friendly CRM systems.

## Conclusion

This article focuses on CRM systems and their possibility to be an active part of the development in Europe. Information technology affects production and productivity. Current trends are the mobile market, telecommunications and ICT services. Key trends focus on online business models creation and artificial intelligence implementation. The most promising issue is AI implementation in business processes to support automation and data analysis. Automation also has its place in CRM systems. Artificial intelligence is used to analyze customer data, predict potential customers and leads, or support automated assistance via chatbots. Marketers have positive experiences with processing large volumes of stored data to support smarter and faster decisions.

Current status monitoring was realized for selected groups of CRM systems. Perhaps all CRM systems have some kind of implementation automation for customer management or marketing campaigns. There are comprehensive solutions like Zoho CRM or Salesforce with implemented intelligence such as Zia or Einstein, but some CRM systems only have basic solution. The question is to choose the optimal CRM implementation for a given business according to the specified criteria and alternatives through a hierarchical tree. The specified criteria are scope, template, communication, visualisation (road map) and user support. An alternative creates selected groups of representatives of CRM systems. This work forms the beginning for the future evaluation based on the classification of the specified criteria of automation with artificial intelligence in CRM systems using a fuzzy pairwise comparison matrix. This step will be useful to continue this topic with Saaty method to know more about optimal automation in CRM.

## Acknowledgement

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# HOUSEHOLD DEBT AND ITS IMPLICATIONS FOR MONETARY POLICY CHANNELS: RISK OR ANOTHER CREDIT GROWTH OPPORTUNITY?

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**Abstract**

The macroeconomic environment in the Czech Republic is characterized by a low level of household debt, which has been growing strongly over the past decade. Household debt can alter the functioning of monetary policy channels and it is essential to study these effects. I construct a Bayesian SRVAR model and then interpret it using response function analysis for the period from 2000 to 2021 and examine the impact of monetary policy shock on economic environment in the Czech Republic at low and high debt levels. After a monetary restriction, there is a decline in output, price level, and household debt. Relatively lower and relatively high household indebtedness does not significantly shift the channel of monetary policy transmission. Results suggest dampening effects of the lender effect on the cash flow channel. Evaluating the high-debt and low-debt models, I find that when households are relatively more indebted, debt-to-GDP does not respond to the monetary restriction, and the decline in debt does not occur as in the case of relatively low debt. Conventional monetary policy and interest rate normalization contribute positively to financial stability. Borrowing of household sector cools down after monetary restriction shock.

**Keywords**

Monetary Policy, Household debt, Monetary policy channels, Structural Vector Autoregressions, Sign restrictions.

**JEL classification**

E; E52; E58; C11; C22

## Introduction

Growing household indebtedness, the development of financial markets, and international capital movements are igniting a debate on the changing effects of domestic monetary policy and its effectiveness. Flodén et al. (2021) argue that in standard macroeconomic models, the primary transmission mechanism is the interest rate channel of monetary policy, which operates via intertemporal substitution. However, monetary policy has had a stronger effect on the real economy than predicted by the interest rate channel alone. Thus, the research results suggest that there are other important mechanisms at work in the background that reinforce the overall effect of monetary policy. The paper aims to assess the impact of the unexpected monetary shock on household debt, but also to observe possible changes in the transmission of monetary policy in the Czech Republic in a situation of relatively high and relatively low household debt to GDP. The Czech Republic is characterized by a lower level of household debt compared to developed countries, but with a significant growth dynamic since 2001. The household sector debt factor can be expected to play an increasingly important role in the future.

When evaluating the model situations of high and low debt, I find that when households are relatively more indebted, debt-to-GDP does not respond to monetary restriction and the decline in debt does not occur as in the case of relatively low debt. The household debt differential does not fundamentally alter the transmission of the monetary shock to output and the price level. The median responses for these macroeconomic variables are within their confidence intervals throughout the period. On impact, I observe that inflation responds more strongly in a situation of relatively higher debt, and the opposite is true for economic output. But why do we not observe any fundamental change in the transmission mechanism? Due to still relatively low household debt, the creditor effect reduces the efficiency of the cash flow channel, which in turn does not deepen transmission at higher debt levels. Rather, households have ample liquidity, do not reduce consumption as much, and are not as burdened by debt.

The exchange rate responds with a more pronounced depreciation at higher levels of debt after the second quarter, which only wears off more than a year after the initial currency shock. The possible

disappointment of investors from the lack of currency appreciation in the early periods and the possible higher risk stemming from a more indebted household sector lead to the depreciation of the domestic currency. It is confirmed that after monetary restriction the nominal exchange rate responds by appreciating even in low and high debt situations.

The outline of the paper is as follows: In Section 1, I describe the general theoretical framework. Section 2 presents the SRVAR models, the empirical model, and the data. Section 3 illustrates and discusses the estimation results. The last section contains the conclusion of the paper.

## 1 The issue of household debt and its link to monetary policy

### 1.1 Background of dynamic household indebtedness in the Czech Republic

Since the beginning of the 21st century, the economic environment in the Czech Republic and other countries around the world has been changing significantly. These dynamic changes of the last 20 years have also affected household debt and the changing transmission mechanisms of central banks - changes in debt are affected by the pass-through of interest rates through consumption to changes in the price level and aggregate demand. Households that are burdened with debt are consequently more sensitive to changes in interest rates. In general, there are changes in household behaviour.

The Czech Republic is one of the countries with a relatively lower household debt-to-GDP ratio. Compared to the average household debt in developed countries, the Czech Republic is less than half of it (see Fig. 1.). With a debt-to-GDP ratio of 34.3% in the third quarter of 2021, it is close to the values achieved in Poland and Hungary, for example, when compared within the EU. Particularly important are the dynamics of household indebtedness, which has been significant since 2000. Fig. 2. reports an increase in household debt to GDP of over 400% from 2000 to 2021, from 6.6% to 34.3%. Since 2010, we observe that the growth of household debt in the Czech Republic has partially stabilized.

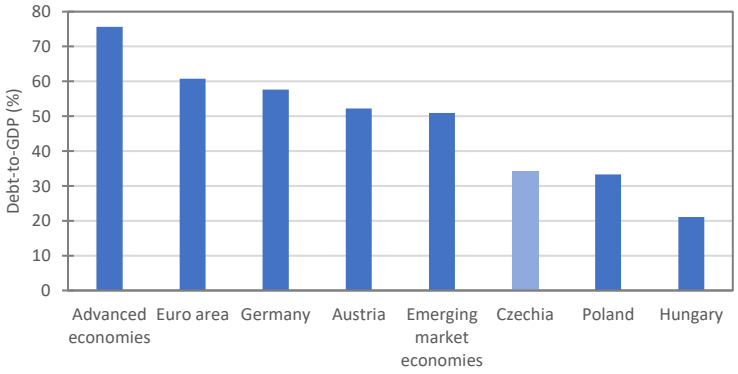


**Fig. 1**. Household Debt-to-GDP for selected countries (in %), 2021Q3 (Source: BIS)

The CNB (2003) states that historically the growth in household debt in the Czech Republic has been caused by several factors. In particular, a characteristic feature that foreshadowed the future development of household debt was the favourable initial situation (see Fig. 2.) - even in 2000, the household debt base was relatively low at CZK 151 billion and there was space for further credit growth. Banks have also lent relatively less in the past because of the ongoing consolidation of the banking sector. However, this has changed in the subsequent period and households have become a target for banks and bank lending. The low riskiness of the sector and the gradual recovery of banks have also contributed positively. Commercial banks took advantage of this opportunity and, along with the growth in credit supply, began to introduce a range of credit products that attracted the interest of liquidity-constrained households. Moreover, the trend was accompanied by growing demand due to rising real household incomes and falling interest rates.

From 2019 onwards, we observe a slight cooling in household sector borrowing, driven by the rise in interest rates during 2018 (see Fig. 3.). The rise in interest rates hits household borrowing with a slight lag, which corresponds to the pass-through of interest rates in the credit market. The monetary

policy response to the start of the COVID-19 pandemic has been fatal for the sector. The fall in interest rates, combined with expectations of future monetary policy normalization, led to an upsurge in lending to households - interest in mortgage lending was enormous. Households were not so much affected by the crisis and accumulated surplus income, which was reflected in savings. The mortgage boom, accumulating savings, and ample capital led to significant pressures on house prices, construction, and wages. In addition, real estate has also become a favourable investment asset in the portfolios of households with surplus capital.

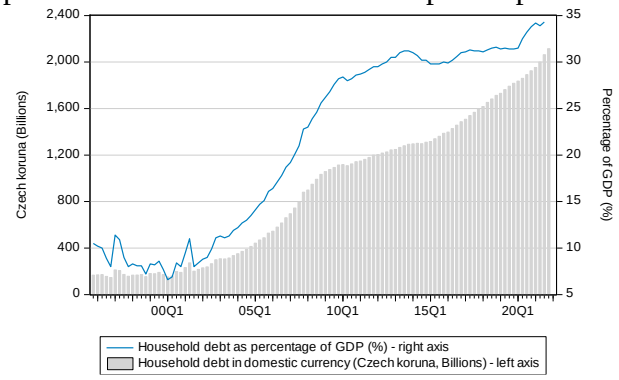


**Fig. 2.** Household debt in the Czech Republic from 1995Q4 to 2021Q4 (Source: BIS)

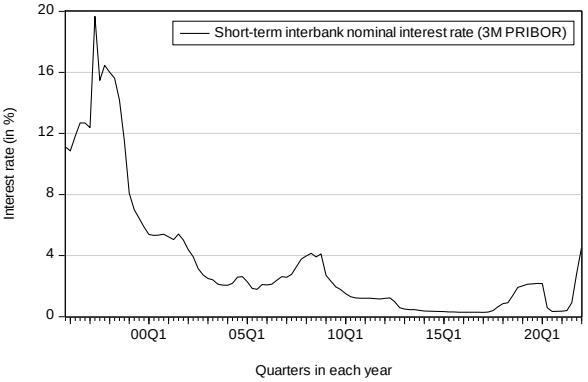


**Fig. 3.** Short-term nominal interbank interest rate (%) (Source: CNB)

Inevitably, the CNB had to intervene and interest rates are being raised again. Households will react by reducing their interest in loans and the market will stabilize again. We can see the signs now, but the changes will only become more noticeable on the monetary policy horizon. The CNB (2022a) argues that rising interest rates accompanied by rising house prices will contribute to lower demand for housing loans, which (see Fig. 4.) form the dominant component of household debt. On a quarter-on-quarter basis, housing loans are growing faster than consumer credit (see Fig 5.). The overall tightening of credit conditions will lead to a slowdown in housing credit growth in 2022, in line with the tightening of monetary policy. Furthermore, the quarter-on-quarter percentage change in real output and real household debt is uncorrelated, r(88)= .11, p= .32. However, if there is a year-on-year increase in real output, real household debt also increases at the same time and there is a direct correlation between these variables, r(88)= .26, p= .013. Thus, we cannot conclude that higher real economic growth is accompanied by an increase in debt.

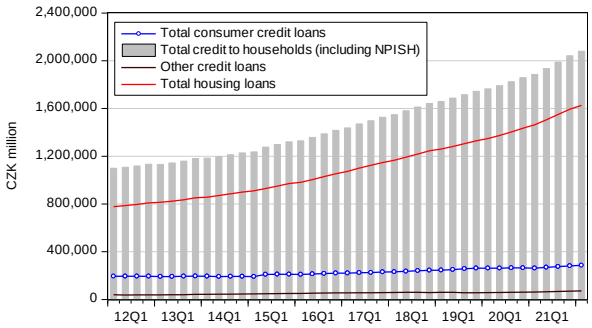


**Fig. 4.** Total loans to the household sector (CZK million) from all financial intermediaries (Source: CNB)

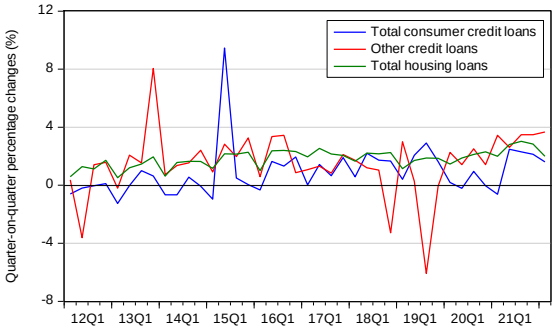


**Fig. 5**. Quarter-on-quarter changes (%) in the stock of loans to the household sector from all financial intermediaries (Source: CNB)

In addition to the Czech Republic, other EU countries, such as Poland and Sweden, are also experiencing debt growth. The United Kingdom is another example. In the euro area, there was a rise in household debt in particular until 2010, followed by a significant decline in debt until the COVID-19 pandemic (BIS, 2022). Di Casola and Iversen (2019) show that against the backdrop of rising household debt dynamics, a global phenomenon of falling interest rates is taking shape, which has also been observed in the Czech Republic recently. However, once the pandemic subsides, the interest

rate environment normalizes again - rates rise - and monetary policy becomes restrictive. The whole sector should gradually stabilize.

### 1.2 Monetary policy transmission in an environment of rising household debt

Rising household indebtedness, the development of financial markets and international capital movements are sparking a debate on the transformation of domestic monetary policy and its effectiveness. Filardo (2009) argues that the upward trend in debt is generally positive for households, as it reflects good economic conditions and the financial environment. On the other hand, there is a risk that households will not be able to cover their liabilities in the future when economic developments deteriorate and their incomes fall. In addition, an economy with significant household debt may be vulnerable - personal bankruptcies may become a systematic risk with macroeconomic implications. In a positive economic environment, lending is profitable for commercial banks, but credit defaults with excessive debt can cause serious problems for the operation of the banking sector.

Transmission mechanisms answer the question of how the central bank can influence real economic developments and how the monetary authority's decisions are passed on to the price level and income (Taylor, 1995; Bernanke and Mihov, 1998). Central banks can influence the household sector through the main transmission channels, which according to Mishkin (1995) and Boivin et al. (2010) are: interest rate, credit, exchange rate, and asset price channels. Mishkin (1996) classifies the exchange rate channel under the asset price channel group, but in the case of small open economies, it is probably preferable to classify the channel separately because of the importance of the exchange rate. The final channel of monetary policy transmission is the money flow channel (Flodén et al., 2021; La Cava et al., 2016), which comes to the fore as household debt rises (Song, 2019). To understand the effects of monetary policy on aggregate demand, a fundamental question is an impact on consumption itself.

The credit and interest rate channel are closely linked to savings and investment. Monetary policy influences economic activity through the incentives of households and firms. An increase in the interest rate (i.e. restrictive monetary policy) will lead to an increase in the price of money and a preference for future consumption over current consumption. This is the so-called inter-temporal (intertemporal) substitution of consumption (Hall, 1988). Households will prefer to build up savings and reduce non-essential consumption. At the same time, credit (mortgage and consumer) becomes more expensive, leading to a cooling of consumption and the housing market. Filardo (2009) argues that household debt can play an influential role in the propagation of macroeconomic shocks through borrowing constraints in the credit channel. A higher level of debt would, other things equal, reduce net worth and thus increase the cost of borrowing. The level of debt may also increase the incidence of credit rationing. In these ways, the level of household debt can affect aggregate consumption and thus affect business cycle dynamics.

Changes in the asset price channel affect the consumption of a household with a mortgage (Song, 2019). Higher interest rates can lead to a decline in asset prices (higher interest rates typically reduce the expected return on those assets), which translates into a decline in the lifetime wealth of the household (wealth channel). The decline in wealth leads to a rationalization of perceived wealth and a decline in consumption that offsets the decline in the price of owned assets. In addition, assets become less attractive relative to better interest-bearing bank deposits.

The interest rate, which monetary policy can adjust, influences the decisions of households and firms through the disposable income they spend on goods and services. The cash flow channel or also the income channel (Flodén et al., 2021; Di Maggio et al., 2017) is particularly crucial for economic agents that have limited liquidity due to debt burden. Changes in interest rates can affect household spending by directly affecting household interest income and payments, and consequently the amount of liquidity available for household consumption (La Cava et al., 2016). Song (2018) argues that, for example, a rise in interest rates can directly affect the cash flows of mortgage borrowers through an increase in interest costs, leading to an increase in their consumption. For lenders, on the other hand, an increase in interest rates increases the amount of income that households and firms receive from

deposits - in this case, restrictive monetary policy can lead to an increase in consumption. However, La Cava et al. (2016) show that the money flow channel is more pronounced for borrowers, and the impact of monetary policy restrictions on consumption will be negative.

### 1.3 Literature review

Flodén et al. (2021) argue that in standard macroeconomic models, the primary transmission mechanism is the monetary policy interest rate channel, which operates based on intertemporal substitution. However, monetary policy has a stronger effect on the real economy than predicted by the interest rate channel alone. Thus, the research results suggest that there are other relevant mechanisms at work in the background that reinforces the overall effect of monetary policy. These reinforcing channels may be the wealth channel (Ando and Modigliani, 1963) and the money balance channel (Bernanke and Gertler, 1989). This paper discusses the channels of transmission concerning household debt and the changing impact of monetary policy in the case of relatively high and relatively low debt. Household debt is appreciably heterogeneous over time, but also across world economies.

Nucu (2012) argues that authors dealing with the implications of rising household debt and monetary policy can be divided into two groups. The first group argues that higher household debt increases the effectiveness of monetary policy because it increases the sensitivity of households to changes in the key interest rate. According to Flodén et al. (2021), monetary policy has a stronger effect on real economic activity when households are highly indebted and have an adjustable-rate mortgage (ARM). For homeowners with a debt-to-income ratio around 3 and an ARM, the estimated response corresponds to a marginal propensity to consume of 0.5%. Calza et al. (2013) confirm that the transmission of monetary policy shocks is more pronounced for countries with more developed mortgage markets and increases for variable rate contracts. The response of liquidity-constrained indebted households to a positive income shock induced by expansionary monetary policy increases with the overall level of indebtedness (Agarwal and Qian, 2014; Baker, 2018). The findings confirm the theoretical operation of the cash flow channel and its increasing effectiveness as households in a given economy become more indebted.

The second group argues that excessive household indebtedness may limit the effectiveness of monetary policy, as fewer households can borrow for consumption and a positive monetary shock should not be as pronounced in this situation. The findings are confirmed by Alpanda and Zubairy (2019), who report that monetary policy is less effective when households are overly burdened with debt. In particular, the impact of monetary policy shocks is smaller on GDP, consumption, housing investment, house prices, and household debt during high debt states. The reason for the decline in the effectiveness of monetary policy is the weakening of the housing credit channel when the initial level of debt in the economy is high. A decrease in the effectiveness of monetary policy could also occur if the money flow channel is dominated by lenders, but La Cava et al. (2016) refute this situation.

## 2 Methodology and data used

### 2.1 Sign restriction VAR (SRVAR) model

The method used in this research is referred to as a sign-restricted VAR model and is based on the work of Faust (1998), Canova and De Nicolo (2002), and Uhlig (2005). The sign-restricted VAR (SRVAR) model became fundamental to macroeconomic analysis relatively quickly after its inception. In particular, the advantage of the sign restriction is that it only provides bounds for the impulse response function. These bounds are then relatively easy to defend based on economic theory and knowledge of the action of individual variables. A completely new approach is to use a combination of sign and zero restrictions (Arias et al., 2018). Sign-restricted VAR models are a modification of structural VAR models but are not based on a Cholesky decomposition architecture.

I follow the approach of Uhlig (2005). Uhlig (2005) first characterizes the basic VAR model:

$$Y_t = B_{(1)}Y_{t-1} + B_{(2)}Y_{t-2} + \cdots + B_{(l)}Y_{t-l} + u_t, t = 1, \ldots, T, \quad (1)$$

where $Y_t$ is an $m \times 1$ vector of data at time $t = 1 - l, \ldots, T$, $B_i$ is a matrix of coefficients of size $m \times m$, and $u_t$ is one step ahead of the estimation error with variance-covariance matrix $\Sigma$, and $u_t$ is white noise with normal distribution $u_t \sim N(0, \Sigma)$. A time trend and a constant can also be added to equation (1).

More clearly, the VAR model (1) can be modified as follows:

$$Y_t = BY_{t-1} + u_t \quad (2)$$

The purpose of any structure vector autoregression (SVAR) is to map the estimation errors in the reduced form $u_t$ to the structural shock $\varepsilon_t$. This process should have a clear economic interpretation and the relationship between $u_t$ and $\varepsilon_t$ is orthogonal.

According to Uhlig (2005), the relationship between the reduced form and structural shock is as follows:

$$u_t = A\varepsilon_t \quad (3)$$

Thus, according to Uhlig (2017):

$$\Sigma = AA' \quad (4)$$

If we assume that the matrix $A$ is square, then according to Uhlig (2017) there are as many structural shocks as observed time series. The sign restriction method identifies a set of $A$ matrices consistent with the theoretical signs of response functions to structural economic shocks.

However, it is still necessary to define a response function for applying sign restrictions. Uhlig (2017) states that in the case of a horizon $k = 0, 1, \ldots, K$, a shock $j$ of one standard deviation and a positive sign, the response function can be defined as follows:

$$\tilde{r}_k = \tilde{B}^k \tilde{A} e_j \quad (5)$$

where $e_j$ is a vector of the same magnitude as $\varepsilon$ with only zero inputs, except for 1 in input $j$. The response functions for each time series are read from $\tilde{r}_k$. Sign restrictions are commonly imposed on the inputs in $\tilde{r}_k$ at different horizons $k$.

The method used for estimation follows Uhlig (2005, 2017). It is a Bayesian approach (BVAR), which is a computationally simple and computationally clean method of creating a tolerance band for response function analysis (Sims and Zha, 1998, 1999).

Model (2) is then estimated using the maximum likelihood method (MLS) according to Uhlig (2005). The estimates for $(B, \Sigma)$ are given as follows:

$$\hat{B}_i = (Y'_{t-1}Y_{t-1})^{-1}Y'_{t-1}Y_t, \hat{\Sigma} = \frac{1}{T}\left(Y_t - Y_{t-1}\hat{B}_i\right)'\left(Y_t - Y_{t-1}\hat{B}_i\right). \quad (6)$$

Uhlig (2005) claim that the priors and posteriors for $(B, \Sigma)$ belong to the Normal-Wishart family $\mathcal{W}_m\left(\frac{S^{-1}}{v}, v\right)$ with $E[\Sigma^{-1}] = S^{-1}$. The coefficient matrix in column vector form $vec(B)$ follows the normal distribution $\mathcal{N}(vec(\bar{B}, \Sigma \otimes N^{-1})$ .

## 2.2 Definition of empirical model

I follow the methodology of Bauer and Granzier (2016) and analyse the median response of the debt-to-GDP ratio to a monetary policy shock in the Czech Republic across time. Rather than building a cross-country model - which may have a problem with considerable heterogeneity in household debt (see Fig. 1.) - I focus specifically on a small open republic with close ties to the euro area and a typical debt path that allows me to assess periods with lower and higher debt. Thus, I obtain three outputs: for the whole period under consideration, for the period with low debt, and for the period with higher debt. In general, this is an augmented small macro model with an unexpected monetary shock, which is constructed for the period 2000Q1 to 2021Q3. The low debt period (average household debt was 13.61% of GDP) is from 2000Q1 to 2008Q2 and corresponds to the pre-crisis period. The period with higher debt (average household debt was 30.28% of GDP) is from 2008Q3 to 2021Q3 and corresponds to the post-crisis period.

The core of the extended small macro model includes real economic output $(y_t)$, inflation $(\pi_t)$, and the short-term nominal interest rate $(i_t)$. The interbank short-term interest rate is used as a proxy

variable for the central bank's main interest rate because of its higher volatility since changes in the main interest rate tend to occur in steps with less frequency. An extension is then the inclusion of a variable for the household debt gap ($debt_t$). In addition, the ability to export to foreign markets and the evolution of the external environment are important for a small open economy. To control for this information, the model is augmented with the nominal exchange rate ($e_t$). In terms of (2), the system endogenous variables are $Y_t' = [\ y_t \ \ \pi_t \ \ i_t \ \ debt_t \ \ e_t\ ]$. The sign-constrained SRVAR(1) first-order model will be:

$$Y_t' = A + \sum_{l=1}^{p} B_l Y_{t-l}' + u_t \tag{7}$$

where $Y_t'$ is a $K \times 1$ vector of endogenous variables $[\ y_t \ \ \pi_t \ \ i_t \ \ debt_t \ \ e_t\ ]$, $A$ is a $K \times 1$ vector of intercepts, $B_l$ is a $K \times K$ matrix of autoregressive coefficients, and $u_t$is a $K \times 1$vector of errors with $u_t \sim N(0, \Sigma)$.

I estimate model (7) using the maximum likelihood method (MLM). The sign restriction procedure uses the rejection method (Uhlig, 2005, 2017). I construct Bayesian SRVAR models with two lags, and a constant, and the IRF is estimated over 15 periods with 68% confidence intervals. I use 200 posterior selections and 200 subsamples from each posterior selection to construct an impulse vector and a possible candidate impulse response, to which the rejection method is then applied. The total number of accepted selections is 1000. I apply sign restrictions for 2 periods (K=2), starting from the first. Thus, these are the restrictions applied to the impact. I verify the stability of the models not only graphically by using the expiration of the response to the monetary shock, but also by using the inverse of the autoregressive polynomial. All published models pass this test and the IRFs are stable. The specification test for the VAR models is also the price puzzle effect, which will also be verified and the published models satisfy all the conditions of the correct econometric framework.

SRVAR models are constructed with the smallest possible delay (p). This is mainly due to the shorter analysis period and fewer observations. A larger lag and a significant decrease in degrees of freedom could also distort the econometric framework. The precision of the specification is checked using information criteria: SBIC (Schwarz-Bayesian Information Criterion), HQIC (Hannan-Quinn Information Criterion), AIC (Akaike's Information Criterion), and FPE (Akaike's Final Prediction Error).

The monetary shock is identified using sign restrictions (Uhlig, 2005, 2017) and follows Uhlig's (2017) Principle I and II: (I.) if you know it, impose it! (II.) If you do not know it, do not impose it! I apply restrictions such that there can be no real output growth and no inflation after a monetary shock of one standard deviation. However, Uhlig (20017) argues that output can respond positively or negatively. If one truly believes output to react negatively, then this must arise from some additional identifying restrictions, other data, or a priori reasoning. For this reason, a restriction is also added to the nominal exchange rate, which cannot react positively (cannot depreciate). Thus, I do not assume that real output would respond positively in the presence of a monetary restriction and an appreciating exchange rate.

I do not restrict the debt gap response and follow Principle II (Uhlig, 2017). Bauer and Granziera (2016) report that for the numerator of household debt to GDP, an increase in the interest rate is likely to discourage lending by raising borrowing costs. However, a higher interest rate will also reduce the inflation rate, which on the one hand will further increase the real cost of borrowing, but on the other hand, will increase the real value of existing debt. The overall effect of a monetary policy shock on the real debt will therefore depend on how monetary policy interventions translate into mortgage interest rates and inflation. In the denominator, the shock will cause output to fall. The response of the debt-to-GDP ratio and the debt gap is, therefore, a priori unclear and depends on the relative magnitudes of the debt-output responses.

### 2.3 Variables and time-series

For the analysis, I have created time series for the period 2001Q1 to 2021Q3. The data source is a combination of BIS (2022), CNB (2022b), and Eurostat (2022) databases. Descriptive statistics along with descriptions of the variables are located in Table 1. I do not use the period before 2000 because it was a significantly turbulent period in the Czech Republic but also in other CEE countries. Frequent structural breaks may distort the econometric framework. I do not avoid the Covid-19 pandemic period because I subsequently interpret the VAR models using response functions. I acknowledge that it would be acceptable to omit observations in parameter estimation (Lenza and Primiceri, 2020).

I obtain the real variables by deflating the nominal variables using the HICP (all components). When possible, the time series are obtained as seasonally and calendar adjusted. In the case of the price level (HICP), this was not possible and additional seasonal adjustment was necessary using Census X-13 (Findley et al., 1998). Inflation ($\pi_t$) is the quarter-to-quarter percentage change in the HICP. Real economic output ($y_t$) is the quarter-to-quarter percentage change in real output as measured by real GDP. The nominal exchange rate ($e_t$) is also expressed as the quarter-to-quarter percentage change, i.e., nominal appreciation and depreciation. I adjusted the debt-to-GDP ratio ($debt_t$) using a one-sided HP filter ($\lambda = 1\,600$) as the percentage deviation from the trend (debt gap). The interest rate ($i_t$) is a proxy variable for the main CNB interest rate and is expressed as the 3M interbank rate (PRIBOR), monthly average in %.

**Table 1**. Descriptive statistics and sources of input variables, 2001Q1 to 2021Q3

| Variable | Data source | Description of the variable | Min | Median | Max | Sdev |
|---|---|---|---|---|---|---|
| $y_t$ | Eurostat (2022) | Quarter-on-quarter percentage change in real output (real GDP), seasonally adjusted. | -8.49 | -0.07 | 5.41 | 2.20 |
| $\pi_t$ | Eurostat (2022) | Harmonised Index of Consumer Prices (HICP), 2015=100, seasonally adjusted, quarter-on-quarter percentage changes | -0.57 | 0.47 | 3.05 | 0.56 |
| $i_t$ | CNB (2022b) | 3M Interbank Offered Rate, monthly average in %. | 0.28 | 1.85 | 5.41 | 1.53 |
| $e_t$ | CNB (2022b) | Nominal exchange rate, CZK/EUR, quarter-on-quarter percentage changes | -4.70 | -0.49 | 8.91 | 2.16 |
| $debt_t$ | BIS (2022) | Credit to Households and NPISHs from All sectors at Market value - Percentage of GDP - Adjusted for breaks, adjusted using a one-sided HP filter as a percentage deviation from trend. | -1.59 | -0.08 | 2.22 | 0.67 |

Source: own calculation of descriptive statistics performed in EViews10.

All observed variables are subjected to unit root tests. These are specifically the Augmented Dickey-Fuller (ADF) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. Except for the interest rate, all variables are stationary. Thus, one non-stationary time series will enter the VAR model, but the possible distortion of the econometric framework is checked by using the inverse of the roots of the autoregressive polynomial.

## 3 Empirical results and discussion

Throughout the period of analysis (see Fig. 6), I first observe that restrictive monetary policy leads to a decline in output and inflation. The response of these variables is statistically significant from the first three quarters. However, while output gradually stabilizes, inflation still declines slightly by -0.08% (peak) before it too begins to gradually return to a stable value. The fall in output corresponds with a strengthening of the nominal exchange rate in response to rising yields in the domestic economy and investor interest in the domestic currency. I also observe that economic output responds

more strongly (peaking at -0.3%) than inflation itself. The results are consistent with VAR studies, and Bauer and Granziera (2016) confirm that inflation also declines, but less than output and the response to monetary restriction becomes insignificant after one year.

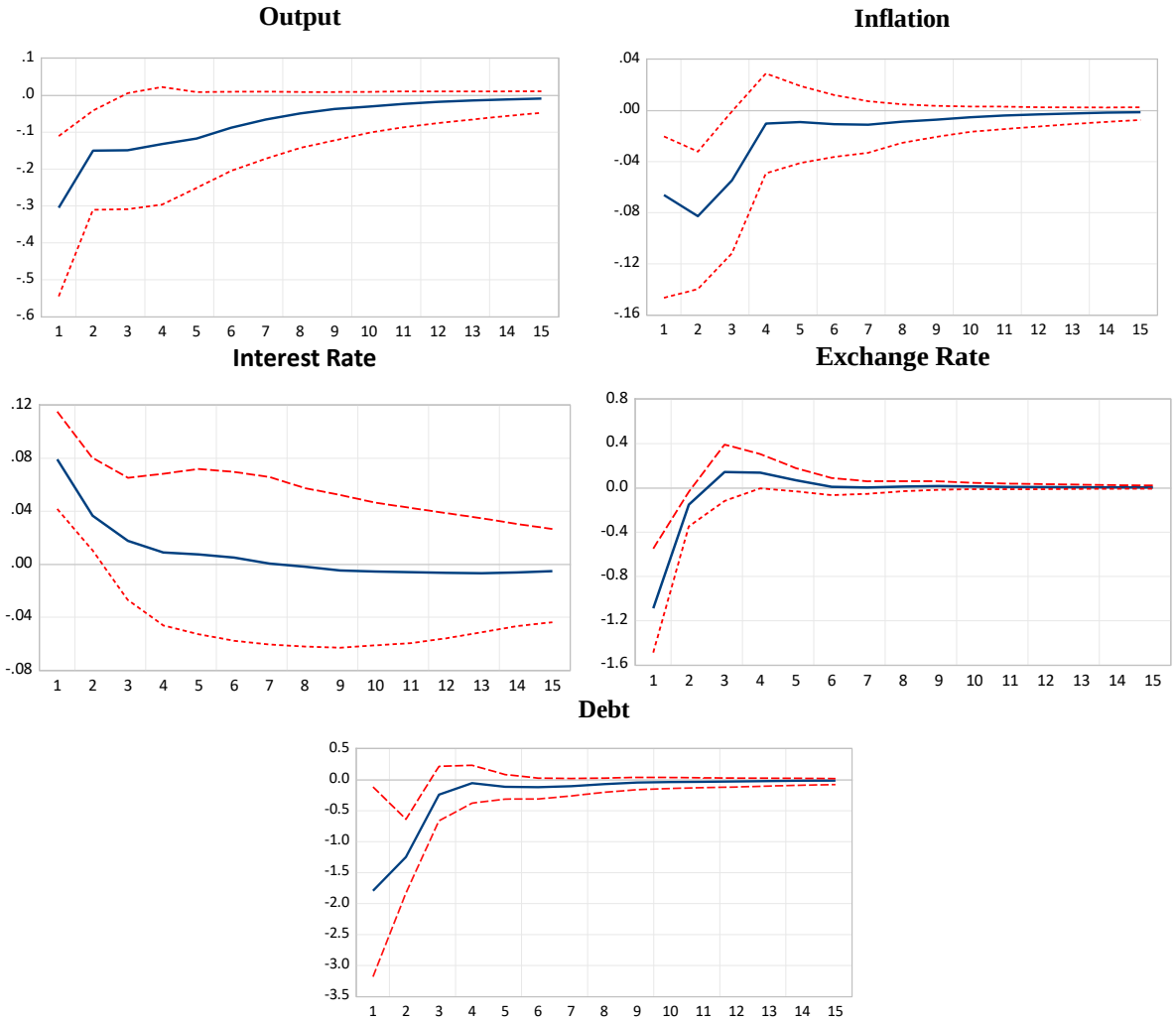


**Fig. 6.** Responses to a Monetary Policy Shock (Source: own research)

**Note:** Impulse responses to a contractionary monetary policy shock one standard deviation in size, using the pure-sign-restriction approach with $K = 2$. The error bands are 68% error bands around the median, i.e. the upper and the lower line are the 84% quantile and the 16% quantile of the posterior distribution.

For the exchange rate, I observe that there is a statistically insignificant appreciation from the third quarter onwards before the response subsequently stabilizes again - the effect may be due to investors' disappointment with the lack of (expected) appreciation of the koruna following the monetary policy contraction and subsequent exit from koruna positions. However, similar results can be found in other papers, for example, Di Casola and Iversen (2019), using a response function analysis of the BVAR model, show that the real effective exchange rate tends to depreciate in the long run following a period of significant appreciation.

Over the first three quarters, household debt has been falling in response to rising borrowing costs. At the same time, inflation is falling, further increasing the real cost of debt. The fall in real GDP is unable to offset these effects and the resulting effect is negative. The fall in debt is larger than the fall in economic output. If, on the other hand, the central bank was to conduct a monetary expansion, GDP, debt-to-GDP, and house price growth would follow, with a peak between 8 and 10 quarters (Alpanda and Zubairy, 2019). Other research confirms that monetary tightening leads to a decline in household debt-to-GDP, consistent with the results (Fig. 6.) (Laseen and Strid, 2013; Goodhart and

Hofmann, 2008). Alternatively, there is a short-term increase in debt-to-GDP followed by a decline in the medium and long run (Robstad, 2014; Bauer and Granziera, 2016).

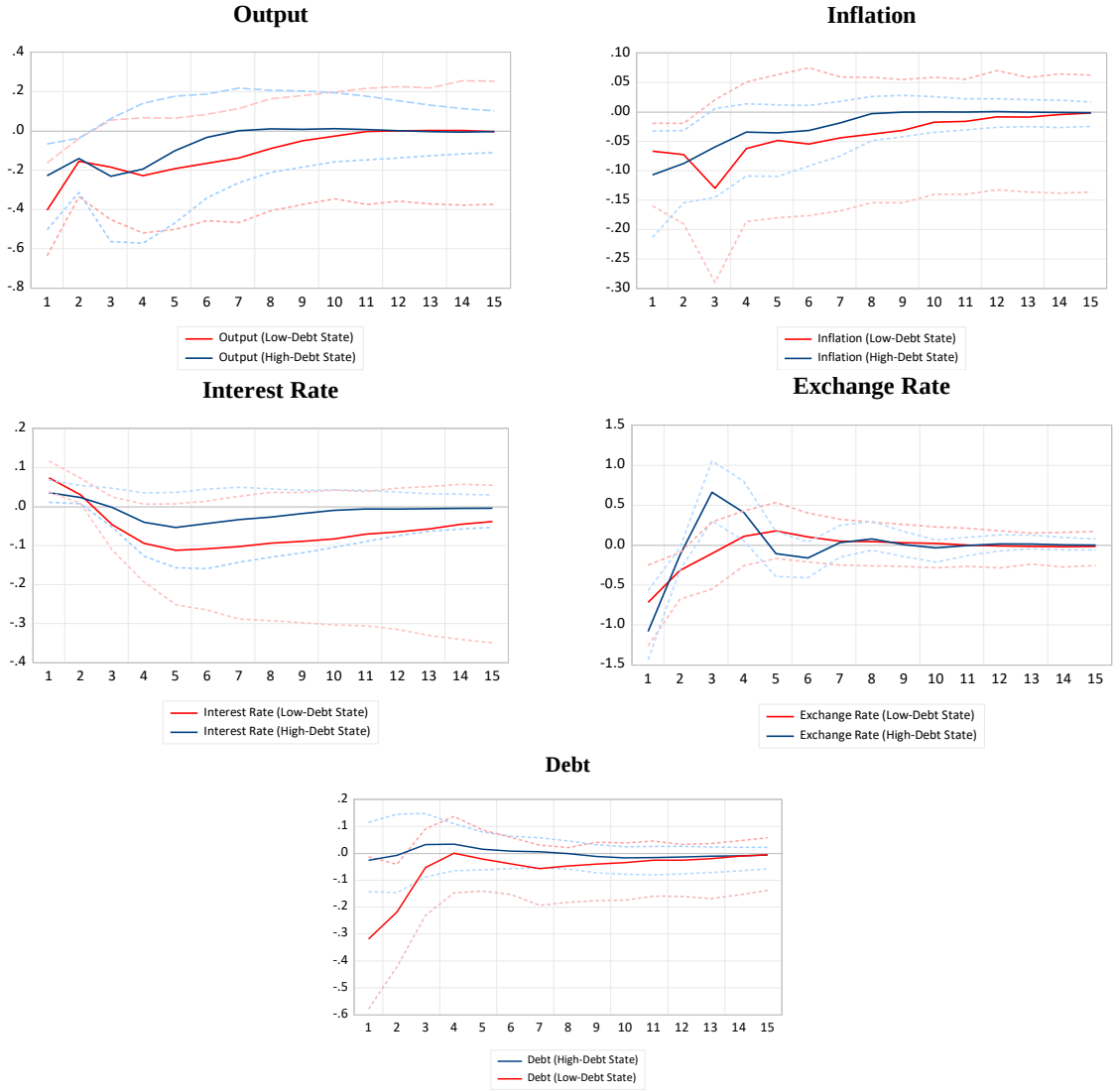


**Fig. 7.** Responses to a Monetary Policy Shock (Low-Debt and Hight-Debt State) (Source: own research)
**Note:** Impulse responses to a contractionary monetary policy shock one standard deviation in size, using the pure-sign-restriction approach with $K = 2$. The error bands are 68% error bands around the median, i.e. the upper and the lower line are the 84% quantile and the 16% quantile of the posterior distribution.

The results suggest that the central bank is able to achieve a less risky financial sector in the short run despite affecting household debt. In the longer run, the results are rather inconclusive. Filardo (2009) argues that monetary policy should be restrictive in a period of rising household debt that reflects rising asset prices. High household debt dynamics increase the likelihood of asset price bubbles (Bauer and Granziera, 2016), which leads to overheating of the economy. We also see in Fig. 6. that higher interest rates dampen aggregate demand and output through the interest rate channel, but also increase the chance of pricking asset price bubbles by reducing household debt.

Evaluating the high and low debt models (see Fig. 7.), I find that when households are relatively more indebted, debt-to-GDP does not respond to monetary restriction and the decline in debt does not occur as in the case of relatively low debt. Rising interest rates do not capture the decline in financial sector riskiness and the likelihood of asset price bubbles in the short run. The result seems paradoxical, but it is consistent with the economic reality in the Czech Republic after 2008, which is characterized - like global developments - by a significant decline in interest rates (see Fig. 3.), which are close to their technical zero (i.e. the zero-lower bound). In this situation, money is already so cheap that households do not react to the rise in borrowing costs as strongly as in a situation of higher

interest rates. Debt falls partly, but not more than GDP so the resulting impact on the household debt-to-GDP ratio is insignificant. The normalization of interest rates is essential for a healthy economy and it appears that the central bank needs to react to possible asset price bubbles and overheating in advance, as later (corrective) action is not as effective.

Differential household debt does not fundamentally alter the transmission of the monetary shock to output and the price level. The median responses for these macroeconomic variables are within their confidence intervals throughout the period. Nonetheless, on impact, I observe that inflation responds more strongly in a situation of relatively higher debt, and the opposite is true for economic output. The monetary shock wears off more quickly for output and the price level, so the results may be partially similar (Alpanda and Zubairy, 2019*). But why do we not observe any fundamental change in the transmission mechanism?* It is important to consider that the debt ratio in the Czech Republic is still among the lowest in the developed world and the creditor effect may still play an important role. For this reason, the cash balance channel does not yet play such an important role and does not deepen transmission at higher debt levels.

An insightful finding is that the exchange rate responds to higher debt with a more pronounced depreciation after the second quarter, which only wears off more than a year after the initial currency shock. The possible disappointment from the lack of currency appreciation in the early periods and the possible higher risk stemming from a more indebted household sector lead to stronger sales of the koruna and a depreciation of the domestic currency. Household indebtedness leads to increased risk and volatility in the foreign exchange market.

## Conclusion

The aim of the paper is to assess the impact of unexpected monetary policy on household debt, but also to monitor possible changes in monetary policy transmission in the Czech Republic in a situation of relatively high and relatively low household debt to GDP. The Czech Republic is characterized by a lower level of household debt compared to developed countries, but with significant growth dynamics since 2001. The household sector debt factor can be expected to play an increasingly important role in the future.

I follow the methodology of Bauer and Granzier (2016) and analyze the median response of the debt-to-GDP ratio to a monetary policy shock in the Czech Republic across time. Rather than building a cross-country model - which may have a problem with considerable heterogeneity in household debt - I focus specifically on a small open republic with close ties to the euro area and typical debt paths that allow me to assess periods with lower and higher debt. I estimate the model using the maximum likelihood method (MLM) and employ a Bayesian SRVAR model. The sign restriction procedure is based on the rejection method (Uhlig, 2005, 2017).

In evaluating the high- and low-debt models, I find that when households are relatively more indebted, debt-to-GDP does not respond to monetary restriction and the decline in debt does not occur as in the case of relatively low debt. The household debt differential does not fundamentally alter the transmission of the monetary shock to output and the price level. It is confirmed that following a monetary restriction, the nominal exchange rate responds by appreciating even in low and high debt situations.

## Acknowledgement

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# GOVERNANCE OF MIGRATION IN TURKEY-EU RELATIONS: POLITICAL AND LEGAL DIMENSIONS

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**Abstract**

Migration has been the most intense issue on the agenda of Turkey and the European Union in recent years. Turkey is a close neighbor of the regions where most immigrants and refugees come from and is located in a first transition region on the migration routes to Europe. Faced with a massive influx of refugees after the Syrian crisis, Turkey is experiencing intense immigration pressure. While the European Union feels that it is under migration pressure, it prefers to cooperate with Turkey, which is one of the main centers of migration flows towards it. This study focuses on the political and legal analysis of migration management in Turkey-EU relations. How mutual obligations and political decisions are reflected in practice will be revealed by the approaches of both sides. In addition, answers to various questions regarding possible developments in bilateral relations will be sought: What are the details of the EU's agreement with Turkey on migration, what are the promises to Turkey and what are the possibilities of realizing the expectations from Turkey? Despite the stagnation of the Turkey-EU partnership, can the two sides meet on a common ground on migration, potentially leading to the revival of the alliance?

**Keywords**
EU Migration Policy, Migrants and Refugees, Readmission Agreement, Turkey-EU Relations

**JEL classification**
N40, N90, N94, N340

## Introduction

Migration is a phenomenon shaped by economic, political, demographic, geographical, environmental and other factors, and there are different types of migration in the worldwide. Today, the most common type of migration that causes various threats is the trend of international migration from crisis and conflict zones to developed countries.

As stated in the report prepared by the International Organization for Migration (IOM), the total number of international migrants in 2020 is estimated to be 281 million. About two-thirds of these immigrants are labor migrants, making up 3.6% of the world's population (IOM, 2022). The number of people who are internally displaced and forced to migrate internationally due to forced migration is increasing dramatically. At the end of 2021, 89.3 million individuals worldwide were forcibly displaced as a result of persecution, conflict, violence, human rights violations or events seriously alarming public order (UNHCR, 2021a).

In 2021, the increase in the number of existing and new conflicts in the world started to attract more attention. According to World Bank data, 23 countries with a population of 850 million faced high or medium-intensity conflicts. While the number of countries affected by conflict has doubled in the past 10 years, women and children have been disproportionately discriminated against and vulnerable (The World Bank, 2022). Although international migration has decreased somewhat due to the limitations in international mobility during the Covid-19 period, this situation is temporary and will continue to increase.

The fact that international migration has gained a global dimension in recent decades without a process specific to a particular region has made it one of the priority issues of the global political agenda. The widening and complexity of the problems arising from international migration have made it impossible for states to deal with them alone. With its current dimensions, international migration requires the adoption of global solution mechanisms, cooperation and responsibility approaches.

The New York Declaration for Migrants and Refugees, unanimously adopted at the United Nations General Assembly in September 2016, initiated a new process in which the international community understood that immigration has become a priority global policy issue beyond being a national public policy area (UNHCR, 2022). The fact that it is possible to control the effects of migration, which has now become a global problem, finds more supporters. The addressees of the migration problem are more in need of a migration governance that covers the transit and destination countries starting from the countries of origin of migration.

Since the beginning of the 21st century, the mass and irregular migration wave, which has accelerated due to reasons such as regional crisis and conflict, civil war, political and economic instability, has deeply affected Turkey and the European Union (EU), which are located on the migration route. In such an atmosphere, a new obligatory cooperation area has emerged for the two actors with a long zig-zag history of partnership. Both actors had to manage this process by taking various measures and assuming joint responsibilities in the face of the mass irregular migration flow. Regarding migration governance, there are many points where both sides meet and diverge on common ground. This study comparatively analyses the differences and reconciliations in migration governance of Turkey and the EU within the framework of migration policies.

## 1 Turkey in the face of migration reality: A brief history and political process

Turkey’s geography has the feature of witnessing the phenomenon of migration throughout history. Turkey's strategic and geopolitical location has caused it to be on the route of migration movements in every period of history and to host millions of immigrants. Since the beginning of the 20th century, Anatolian lands have been a region settled by immigration for various reasons, as well as a region of departures. From the Republic of Turkey to European countries, labor mobility has accelerated since the 1960s, and later on, this mobility has continued for very different reasons. Turkey’s agreement with the Federal Republic of Germany in 1961 was a turning point regarding migrant worker history. The Turkish migrant worker mobility, which started with this agreement, left its place in the process of reunification of worker families with the decreasing demand for labor after the 1973 Crisis.

In the 1980s, Turkey was among the countries where asylum applications were made to Europe both as a source country and as a transit country. At the same time, Turkey has become a target country that has been flooded with immigration due to the war and instability around it. Among the developments that led Turkey to become a transit and destination country of immigration, the following are particularly influential: the 1979 Iranian Revolution, the Soviet Union's invasion of Afghanistan (1979-1989), the Iran-Iraq war (1980-1988), 1991 Gulf Crisis, 2003 invasion of Iraq, Afghanistan war (2001-2021) and Syria Crisis.

Turkey is a country that does not hesitate to take on international obligations regarding international migration and refugees. It signed the 1951 Geneva Convention adopted by the United Nations in the same year, and ratified it in 1961 based on the "geographical limitation", and became a party to the 1967 Additional Protocol. Until the 1990s, it tried to participate in international migration governance by complying with the obligations brought by international conventions, despite the deficiencies in the domestic legislation in the field of migration and asylum. While becoming a member of the IOM in 2004, it started to work on the preventing of irregular migration and human trafficking (Ministry of Foreign Affairs, 2021).

Turkey maintains the principle of “geographical limitation” until today, allowing only those coming from the member states of the Council of Europe to apply as refugees. In Turkey, international protection is provided with three different statuses as “conditional refugee”, “secondary protection” and “temporary protection”. None of these statuses allow the transition to long-term residence status. “Temporary protection” provides foreigners who come to or cross the borders en masse in order to find immediate and temporary protection. Foreigners with this status are people who have been forced to leave their country and cannot return. Turkey considers it necessary to use the status of "conditional refugee" in order to ensure the sustainability of the resettlement program in third countries (Ergüven

and Özturanlı, 2013). However, this practice has not only kept the migration mobility on its borders under control, but has also made Turkey a temporary waiting point.

Since the 2000s, Turkey has begun to harmonize its migration policies with the EU legislation. As a part of Turkey's EU accession process, the issue of migration has been included in the scope of studies that are expected to be carried out in the short and medium term. Within the scope of harmonization with the Union's legislation, a special task force has been established to bring together different government departments in charge of Turkey's border control, migration and asylum.

Turkey's National Action Plan, published in 2005, is an essential reference in terms of Turkey's current immigration policies. According to the National Action Plan, a bureau was established in 2008 to harmonize the migration administration with the EU acquis and make plans for the future. As a result of the work done by the bureau, *Law 6458* on *Foreigners and International Protection(LFIP)* came into force in 2013. *LFIP*, which constitutes the legal framework of Turkey's current immigration policy, is a comprehensive law. In the *LFIP*, foreigners' entry to Turkey and visa procedures, residence and travel of foreigners in Turkey, deportation of foreigners from Turkey, stateless, international protection and administrative organization are regulated. The Presidency of Migration Management, which was established with this law, is responsible for implementing and coordinating all asylum and migration policies in Turkey (Ministry of Foreign Affairs, 2021).

In recent years, Turkey has increased in the ranking of countries to migrate to. This situation shows that Turkey has become not only a transit country but also a country of immigration due to the political and economic crises in its immediate surroundings. However, there was a more balanced rate in terms of irregular migration mobility in Turkey in the 2000s.The humanitarian crisis caused by the civil war in Syria has accelerated the rise in irregular migration since 2014. Since the beginning of the Syrian crisis, Turkey has applied the "open door policy" and the "non-refoulement principle" for anyone fleeing the war environment without discrimination. As a result of this, since 2015, it has become the country hosting the highest number of refugees in the world. As of August 2022, 3,651,683 Syrian citizens live in Turkey under the status of "temporary protection" (Presidency of Migration Management of the Ministry of Interior, 2022b).

Even though the foreigners who entered Turkey illegally come from many different regions and countries, it is not overlooked that the nationalities of Afghanistan, Pakistan and Syria are predominant. According to the records of the Presidency of Migration Management of the Ministry of Interior records (2022a), a total of 2,171,847 foreign nationals entered Turkey illegally between 2005 and 2022. The number of people coming from the Middle East, Central Asia and African countries who applied for international protection and continued to live in Turkey until this process is concluded is more than 330,000 as of September 2021 (UNHCR, 2021b).

Following the escalation of the migration flow from Syria to its peak, the inadequacy of existing national measures and legal regulations necessitated new measures. For Turkey, which has become a transit route for irregular migrants due to its land and sea borders with the EU, a migration policy in line with EU migration policies has become inevitable. The continuation of Turkey's full membership process also encouraged cooperation with the Union on migration. Turkey and the EU signed a Readmission Agreement in 2013 in order to control the irregular migration towards the EU through its borders. With the treaty, Turkey has committed to readmit the citizens of other countries who have illegally travelled to EU countries through its territory. In the treaty, it is foreseen that third country nationals or stateless persons who enter all EU countries illegally, except Denmark, England and Ireland, can be sent to Turkey. At the last stage of the agreement, it has become possible to send back to Turkey any unwanted immigrant who enters EU territory through Turkey, regardless of their citizenship ties (Göçmen, 2014).

Turkey was not willing to be a party to the Readmission Agreement before, since there was no incentive. In fact, the Turkish side did not take kindly to such an agreement in order not to be the country where those who come from North African countries, Afghanistan and other South Asian countries and try to cross into Europe gather. After 2009, it decided to carry out The EU-Turkey Readmission Agreement simultaneously with the visa exemption as a prerequisite for the accession

negotiations with the EU. The fact that the EU began to grant visa exemptions to Western Balkan countries in exchange for the Readmission Agreement encouraged Turkey to sign such an agreement. The European Council, on the other hand, decided to start visa liberalization in a gradual and long-term manner in parallel with the signing of the Readmission Agreement.

While there were various disruptions and bottlenecks in the implementation of the 2013 Readmission Agreement, irregular migration continued. Since the critical threshold of the irregular migration crisis was already exceeded in 2015, the conditions forced the Turkish and EU sides to take new measures. The parties tried to implement them by making various decisions at the summit meetings. The decisions taken at the summit of 18 March 2016, where Turkish and Union officials came together, include the articles related to the expanded version of the 2013 Readmission Agreement: Accelerating the accession process, cooperation with neighbouring states, putting the EU's voluntary humanitarian admission plan into practice. After the 18 March Agreement, it has been observed that illegal crossings to the EU borders and the number of deaths during the crossing have decreased. The practice of placing a Syrian under temporary protection in the EU in return for each person repatriated from the Greek islands, known as the one-to-one policy after the 18 March Agreement, did not work as expected.

## 2 European Union and migration: Externalisation and securitization of the crisis

The European continent, which hosts 30.9% of the international immigrant population, is the most crowded destination with 87 million immigrants. The wealthy countries of Europe remain attractive to immigrants. It is known that the decline and aging of the population in European countries cause difficulties in meeting the need for qualified personnel and cheap labor. This situation has increased the tendency of some countries to accept people who will contribute to their workforce as refugees. A significant number of people from countries outside the EU acquire EU citizenship every year. In 2020, this number was 620,600 people, making up 85% of all citizens. In 2021, asylum seekers came from the EU to around 140 countries. In 2021, a total of 681,200 people were identified illegally in EU countries (European Commission, 2021a).

The uncompromising approach of the countries on the European continent, which has become the preferred destination for immigrants, has encouraged irregular migration. The Immigrants' difficulty in crossing the European borders by immigrants has increased the number of illegally crossing and asylum applications. The fact that immigrants who came to Europe illegally filled the gap in certain jobs created the basis for the illegal immigration market. This situation has confronted European countries not only with legal immigration, but also with the problem of illegal and irregular immigration. While some of the irregular migrants have applied for asylum, a significant amount of the remainder continue to reside in EU countries as illegal immigrants.

Due to the developments caused by the irregular migration wave in recent years, both the EU and the states have had to take various measures in terms of management of migration flows and combating irregular migration. The EU's efforts to protect its borders have caused the issue of immigration to become a domestic security issue of the EU. The reflex of ensuring the security of the borders against irregular migration and planning the minimum level of refugees to reach Europe has led to the characterization of "Fortress Europe", which means an isolated and high-walled Europe (Guardian, 2021).

The EU has gone through important stages in migration until it reaches the stage of creating Migration and asylum policy of the EU. On the one hand, steps were taken according to cyclical developments, on the other hand, efforts were made to build a sustainable migration policy. Since the 1990s, the economic crisis has introduced a new dimension regarding the migration phenomenon in the EU. Due to high unemployment and low employment in EU member countries, studies have been started to control migration. With the Maastricht Treaty of 1992, visa, asylum and immigration issues related to immigration policy were added to the Justice and Home Affairs column. With this step, immigration policies rose to an intergovernmental position. In 1999, the Amsterdam Treaty, the most

crucial treaty regarding the Union's common migration policy, came into force. It has been made possible to regulate the issues of free movement, migration and asylum, which are included in the section added to the Treaty, within the framework of the Union's acquis. In this way, efforts have been made to prevent new migrations and harmonize existing immigrants with society. After the Amsterdam Treaty, the implementation of the readmission agreement powers was transferred to the Union, while the content of the Schengen Agreement became the EU common acquis (European Parliament, 2021). In addition, the European Court of Justice has been given the authority to make binding decisions on immigration, visa and asylum issues.

After the arrangements in the Amsterdam Treaty, the steps taken regarding the common migration policy continued. Among the preferred tools for creating a common migration policy are the summits held at the level of heads of state and government, programs covering five-year periods that structure the activities of the union, secondary legal sources such as regulations, directives and decisions. In this context, steps such as the Vienna Action Plan, the Tampere Summit and The Hague Program are also important tools for the common migration policy. Migration policies were further developed and systematized in the Lisbon Treaty, which entered into force in 2009. With the Dublin System, the framework of the EU's policies and practices regarding asylum has been drawn. This system has become functional with institutional structures such as European Asylum Dactyloscopy Database (EURODAC), European Border and Coast Guard Agency (FRONTEX), and European Asylum Support Office (EASO).

The border security mechanisms created due to the increasing irregular migration since the 2000s became insufficient after 2010. The EU has tried to take measures against irregular migration with readmission agreements, which have a key role in the control of border security. In addition to the security mechanisms it has created behind the EU borders, it has preferred to sign readmission agreements with the states on the migration line.

While the Schengen application was questioned after 1 million people reached the EU's borders in 2015, the Union focused on creating a new agenda on migration. In the EU's New Agenda on migration, a shared responsibility is emphasized not only among EU member states, but also among non-EU countries of origin and transit, used by migrants, to manage all aspects of the migration crisis. Within the framework of cooperation with third countries, cooperation with Turkey, Lebanon, Jordan and North African countries has come to the fore. With such cooperation, the EU has focused on objectives such as the implementation of readmission agreements of the countries in the region in the short term, preventing of migration flows and combating human smuggling. In the long term, cooperation with these countries aims to increase job opportunities, reduce poverty, ensure security and stability, and especially in the fight against terrorism (European Commission, 2015).

The EU uses its own financial instruments to support and complement member states' efforts within the Union in the areas of migration, asylum and border. It allocates budget through grants and other financial support for refugees to be used both inside and outside the borders. Despite the recent increases accepted by EU institutions and member states after the 2015-2016 refugee crisis, the share of the EU budget for asylum, migration and external borders is low (European Parliament, 2022).There are various budget items in which the financial resources that the EU has allocated over the years are used to secure its external borders against the effects of migration: Humanitarian aid, security and border control, fight against terrorism, trust fund for Syria, education and health, return of refugees and displaced persons, Turkey Convenience for Refugees in Africa, EU Emergency Fund for Africa.

The desire and determination to manage migration at the continental level in Europe are evident from the institutional reforms covering the Schengen area. The European Commission announced the EU Migration and Asylum Pact in September 2020. The aim of the pact is to streamline the EU migration management system and strengthen solidarity between the Member States through greater responsibility sharing, better and faster migration and asylum procedures, and calls for the resettlement of asylum seekers and the return of unsuccessful applicants. The pact also proposes to

reform the Common European Asylum System and strengthen the European Asylum Support Office to increase Member States’ cooperation (Terry, 2001).

## 3 Migration in Turkey-EU relations: Cooperation or disagreement?

Turkey-EU relations are a long, narrow and bumpy road, almost equal to the age of the EU. The foundation of relations was laid with the “Agreement Establishing an Association Between the European Economic Community and Turkey” (Ankara Agreement) signed on September 12, 1963. Within the framework of the principles of the Ankara Agreement, Turkey entered the Customs Union in 1995, and a significant progress has been made in economic relations. Turkey was officially declared an EU candidate in 1999, 12 years after its application for full membership in 1987. The decision of Turkey to start full membership negotiations was determined as 2004 at the Copenhagen Summit in 2002.

Turkey's EU accession negotiations officially started in 2005 and are carried out in 35 chapters within the scope of the Negotiation Framework Document. A total of 16 chapters were opened in the negotiations, and the 33rd chapter on Fiscal and Budgetary provisions was opened most recently in 2016. The remaining 14 chapters were blocked due to the political obstacles of the European Council and the Greek Cypriot Administration (Delegation of the European Union to Turkey, 2021). Uncertainty in the negotiations continues due to complicated issues to resolve. In recent years, the EU and Turkey relations have reached a standstill, apart from the agreements signed on trade and immigrants. However, both parties continue to cooperate due to certain policies that the partnership continues.

The readmission agreement and the provision of Schengen visa exemption for Turkish citizens are among the important processes of the Turkey-EU partnership in the last period. When the Readmission Agreement was signed, the roadmap on which Turkey undertook legal and administrative reforms regarding visa exemption was accepted. The Visa Liberalization Roadmap is a technical document that includes the steps to be taken by Turkey in order to obtain visa exemption for EU countries. It includes the expectations of the EU side from Turkey in the fields of "document security", "migration and border management", "public order and security" and "fundamental rights" (Ministry of Foreign Affairs, 2020).

With its report on the Visa Liberalization Dialogue published on May 4, 2016, the European Commission stated that Turkey has fulfilled 65 of the 72 requirements included in the Visa Liberalization Roadmap (European Commission, 2016). The most challenging of the 6 criteria expected to be fulfilled by Turkey is the changes requested to be made in the anti-terror legislation. The EU insists on amendments to the Anti-Terror Law, the Criminal Procedure Code and the Turkish Penal Code regarding punishment and detention. The Turkish side, on the other hand, expects understanding from the EU regarding the anti-terror legislation. Other criteria that the EU expects to change include cooperation in criminal matters, agreement with Europol, and anti-corruption regulations. The criteria that the EU side expects from Turkey as a prerequisite for progress in the accession negotiations and visa exemption lay the groundwork for political debates in Turkey. The non-implementation of visa liberalization on the Turkish side, the failure of the promised financial support to reach Turkey and the lack of expected progress in the accession negotiations are put forward as a red line. It is emphasized that if the expectations are not met, it can lead to various consequences, from the cancellation of the Readmission Agreement to the prevention of people trying to cross the EU illegally. With the one-to-one policy with the readmission agreement, a change was realized far below what was promised. Slightly more than 28,000 Syrians resettled from Turkey to the EU from March 2016 to March 2021, well below the planned 72,000 (European Stability Initiative, 2021). The Turkish government's response was to allow migrants to cross their territory and reach the EU (Greece) border in the spring of 2020.

EU aid allocated to Syrian temporary refugees in Turkey since 2011 has approached 10 billion Euros. This includes EUR 6 billion under the Facility for Refugees in Turkey, which consists of EUR

3 billion from the EU budget, and EUR 3 billion in contributions from the Member States, integrated into the EU budget as external assigned revenue (European Commission, 2022). 3 billion Euros of humanitarian assistance and 3.8 billions of development assistance. More than €4.6 billion of the project-based budget has been spent under the Facility for Refugees until the end of 2021. With the financing of the EU, the basic needs of refugees such as health, education and protection were met with an amount of 2.4 billion Euros (European Commission, 2021b). Supports such as basic livelihood support, children's access to education, construction of schools and hospitals and providing protection services for asylum seekers were provided through various projects.

EU decision makers are aware that they have strategic interests in developing a cooperative and mutually beneficial relationship with Turkey. At the European Council of March and June 2021, they expressed their readiness to establish a gradual, proportionate and reversible relationship with Turkey in a number of areas of common interest in EU-Turkey relations, especially migration (European Commission, 2022). In October 2021, the EU-Turkey High Level Dialogue meeting on migration and security was held in Ankara.

## Conclusion

Despite the bottleneck in the world economy with the effect of Covid 19, even if there is a partial slowdown, the regular and irregular migration flows will not stop, the EU territories will continue to be affected by the migrations from the south and east. The efforts of the EU, as a supra-national organization, to take initiatives for a common solution to the migration crisis are noteworthy. However, it cannot be said that EU member states have fully embraced the responsibilities and decisions taken by the Union regarding migration. On the other hand, the EU will continue its externalizing and securitizing practices with overprotective reflexes to control the migration flows.

The protectionist reflex that emerged in Europe regarding migration stems from concerns about the protecting of the continent's welfare and economic standards and the socio-political and socio-cultural problems that immigrants may cause. The possibility that the European population will undergo ethnic, religious, cultural and linguistic changes due to irregular and uncontrolled migration also increases the threat perception. The EU's concern for migration-related destruction in areas such as the economic system, public order and cultural identity has also influenced migration policies.

It is a fact that the approach of keeping the immigration problem outside the EU borders as much as possible finds its supporters to a large extent within the EU. For this reason, it was not possible for a common will couldn’t be formed within the Union regarding the sharing of obligations regarding refugees. Instead, the Union prefers to develop new policies by applying various measures and expanding the network of cooperation in order to resolve the migration crisis as far as possible outside the borders. It is observed that there is a remarkable slowdown in the flow of irregular migration, thanks to the financial support provided by the EU to the transit countries that have to host refugees through readmission agreements.

Turkey's partnership relationship with the EU, which lasted for many years but came to a standstill, gained momentum again after the migration crisis. Thanks to the Readmission Agreement signed to correct the negativities with the EU and reviving the accession negotiations, the hope of visa-free travel to Europe arose for Turkish citizens. Turkey's expectations could not be met due to reasons such as the disruptions in the implementation of the treaty and the failure to fulfill some of the criteria put forward within the scope of visa exemption. In parallel with the increase in the migration flow from Turkey's borders to the EU, cooperation with the EU was re-established with the new agreements in the field of migration, and migration governance was continued.

The EU tends to make full use of the financial, political and legal instruments to ensure the refugees in Turkey's territory stay in place. It is certain that the EU's negative attitude towards Turkey, including various sanctions for many reasons, changed its attitude towards Turkey due to its key role in migration, which is the result of "migration pragmatism". The EU will continue to ensure that

Turkey's responsibility towards refugees continues, by putting more financial burden on migration governance and giving the green light to revive the stalling accession negotiations.

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# EXAMINING THE LOGIC OF THE STATE IN ORGANIZING FOR PUBLIC VALUE: A CONCEPTUAL ANALYSIS

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**Abstract**

The main aim of this paper is to understand and illuminate he ties between institutional logics of the state and public values produced by public agencies conceptually. For this aim, we conduct a literature review approach to examine possible linkage between those concepts. In the end, for fulfilling its own roles and functions in the context of creating values for public the state (more clearly its visible agencies) must depend on its institutional logics and these logics finally become apparent in the decisions and actions of these public organizations more concretely. Hence, public values can be seen as an indicator of state's character. If a state wants to be in a value focused character, it should be a "servant" or a "steward" in its nature. It means, it should organize its existence and provide meaning to its social reality in accordance with a welfarist state logic rather than an abstract ideological one.

**Keywords**
Institutional logics, State, Values, Public value

**JEL classification**
D70, H70, H75,

## Introduction

Values in the meaning of an output created by government through goods and services, laws […], regulation and other actions for public (Kelly et al., 2002; Meynhardt, 2009; Moore, 1995) have attracted scholarly attention in recent years. A bulk of studies have been devoted to analyzing values from different perspectives (e.g. Moore, 1995; Van der Wal, 2014; Stoker, 2006). According to Van der Wal (2014) values are one of the main tasks of both elected and appointed government elites in pursuing the public interests. By doing so, they will be able to satisfy citizen's needs and demands better (Spano, 2014) on one hand, and on the other they can make sense for public through public services. Stoker (2006), by taking a political perspective, defined values as an output of a process which contains political efforts to reconcile efficiency and democracy, pursuing the former but keeping politics at the center of the public arena. Moore (1995), in the same direction, considered values as a potential output of a given political and institutional setting substantively valuable for a given public. If so, values may be a function of the programs of political and institutional actors to some extent. Hence, public and political managers as individual actors must ensure that what they are going to do is valued by stakeholders, and be able to attract legitimacy from the environment and that is feasible in technical terms (Moore, 1995). In that case, public value can also be seen as a vital tool for gaining organizational legitimacy and through this way providing continuous resource flows and finally ensuring organizational survival (Ferlie et al. 2003; Guthrie and Russo, 2004; Moore, 1995; Meyer and Rowan, 1977). More concretely, public values also include among others welfare provision (Antonsen and Jorgensen, 1997) and thereby provides a link between legitimacy and the capability to improve the financial and political support for public organizations (Guthrie and Russo, 2004). Hence, public and political managers' own fates depend on how well they accomplish defined goals in accordance with the institutional logics of their situation (Jackall, 1988).

Institutional logics have been defined as socially constructed historical patterns of materials, practices, assumptions, values, rules and beliefs that shape the cognition, decision making and behavior of actors, as well as their conception of ends and means within fields of activities and constitute organizing principles (Friedland and Alford, 1991; Battilana, 2006; Dunn and Jones 2010;

Scott, 1987). By institutional logics individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality (Thornton & Ocasio, 1999). It has been argued that institutional logics originate within societal sectors, such as the market, the state, the family, religions, corporations, and professions, in which actors share beliefs and rules (Thornton, Jones & Kury, 2005). Institutions like organizations and professions have been thought to follow a dominant institutional logic providing identities, vocabularies, and guides for actions (Thornton et al., 2005). In this sense logics provide the context for decisions and outcomes both for individual and organizations (Goodrick and Reay, 2011).

Since modern society is, in half-truth, a society of organizations and organizations in public administration field are creatures of public authorities, organizing is supposed to be everywhere largely a precipitate of polity contained with public value (Jepperson and Meyer, 1991). When considering values in public sector, institutional logics are also expected to undertake a pivotal role in creating and providing values by public organizations. In this sense, the relation between pursuit of public value and organizing of the state must be established and structured by institutional logics of the state, since institutional logics are supra-organizational patterns of activity (Friedland and Alford, 1991). In institutional tenets, institutional logics of the state depict rationalization and regulation of human activity by legal and bureaucratic hierarchies (Friedland and Alford, 1991: 248) and thereby the expansion of the state (Thomas and Meyer, 1984). Although there are ample scholarly studies addressed different types logics in the literature, a scarcity of the research on operationalization of institutional logics of the state is also defined by scholars (e.g. Greenwood et al. 2010). If so, analysis on this theme should primarily be focused on to explore the state's actions and activities in relation to create different [types] organizational forms (Skocpol, 1985) to produce and provide values. In the literature, there are no clear evidence about the link between institutional logics and behavioral patterns of states in organizing and the pursuit of public value, in spite of fruitful studies (e.g. Scott et al. 2000; Gumport, 2000).

## 1 Institutional Logics of the State and the Values in the Context

Institutional logics, in a different saying, are supra-organizational patterns of activity through which humans conduct their material life in time and space, and symbolic systems through which they categorize that activity and infuse it with meaning (Friedland and Alford, 1991). In this respect, institutional logics can also be addressed as contradictory organizing principles based on differences in practices and beliefs (Friedland and Alford, 1991; Thornton and Ocasio, 2008). Logics also shape practices by structuring individual and organizational attention vis-a-vis rules and conventions for deciding what issues are important and thus worth resolving (Thornton, 2002). In this sense logics provide the context for decisions and outcomes both for individual and organizations (Goodrick and Reay, 2011). Values as outputs of organizational production processes may gain their contexts under the control or mandate of institutional logics. When specifically considering state, which is most important rationalizer for this era and should also have its own logics, for regulating human activities through legal and bureaucratic hierarchy (Friedland and Alford, 1991), public organizations must comply with this state's logics which dominate fields and determine the rules of the game in producing public values.

In other words, the logic of the state is related to individual or organizational activities by depending on a command-control frame (Lee and Lounsbury, 2015). From a different perspective, Greenwood et al. (2010) claim that a logic of the state does not necessarily refer to specific policies or regulation. Similarly, Currie and Guah, (2007) claim also that, in some countries, the state can intervene in public affairs and take direct responsibility to guarantee both the well-being and health of its citizens, as a legally coercive force (Streeck ve Schmitter, 1985). More specifically, in the ideal type state logic, governmental managers determine the appropriate quality standards and the scope of practices and the knowledge (Goodrick and Reay, 2011) in particular at the sub-organizational level. At that point, Thornton and Ocasio (2008) emphasize, in the context of institutional logics of the state, that states depend on a welfare capitalistic approach as an economic system for providing public

goods and services. Actually, in the Western Europa today the bulk of the state's business is concerned with economic regulation and organization on one hand, and welfare activity on the other (Cowling, 1985).

In sum, for fulfilling its own roles and functions the state (more clearly its visible agencies) necessarily depends on institutional logics and these logics finally become apparent in the decisions and actions of these public organizations more concretely (Greenwood et al. 2010). Hence, public managers as individual actors must ensure that what they are going to do is valued by stakeholders, and be able to attract legitimacy from the environment and that is feasible in technical terms (Moore, 1995) through public organizations. In that case, public value can also be seen as a vital tool for creating organizational legitimacy and in this way providing continuous resource flows and finally organizational survival (Ferlie et al. 2003; Guthrie and Russo, 2004; Moore, 1995; Meyer and Rowan, 1977). More concretely, public values also include among others welfare provision (Antonsen and Jorgensen, 1997) and thereby provides a link between legitimacy and the capability to improve the financial and political support for public organizations (Guthrie and Russo, 2004). Hence, managers' own fates depend on how well they accomplish defined goals in accordance with the institutional logics of their situation or state (Jackall, 1988).

Public value as an ultimate aim and outcome of the public governance (Van Der Wal, 2014) should also be considered as an imperative of the logics, since these logics at the same time represent a field's shared understandings of what goals to pursue and how to pursue them (Friedland and Alford, 1991; Scott, 1987). For this aim, actors need to possess a privileged role in acting consciously or intentionally. Scott (2001) describes this role as the ability to intentionally pursue interest and to have some effect on the social world, altering the rules or the distribution of resources. These organizations may, depending on usage, be a government organization, an organization charged with operating in the public interest, or one with goods and services having public goods characteristic (Bozeman and Bretschneider, 1994). Finally, from this point of view, public organizations are accepted as means for allocating decision-making capabilities in order to provide public goods and services responsive to the preferences of individuals in different social settings (Ostrom and Ostrom, 1971). Depending on these, it may be concluded that public value as a public sector conception, which is necessarily consumed and enjoyed by public (Alford, 2002), can also be labeled an institutional production that is designed, created and provided in accordance with institutional logics by a state (Clegg, 2010). Simply put, organizational actors within public sector may create and provide public goods and services with value(s) just in the direction of state's institutional logics, and then they may use state's rationalizing and regulative authorities (Friedland and Alford, 1991) as agencies, since institutional arrangement for goods and services is the mix of political authority best serving public values (Bozeman, 2007). According to van Eijck and Lindemann (2014) findings, public managers use different strategic practices as they deal with conflicting factors, such as institutional pressures and organizational (self-)interests. Clearly put, they should seek, find, and exploit opportunities to create public value, and produce, in the end, value creating organizations (Moore, 1995) to advance common goods (Denhardt and Denhardt, 2007).

## 2 Methodological Approach

With this study we aim to understand and illuminate the ties between institutional logics of the state and public values produced by public agencies conceptually. We expect in this way to explain these ties first from institutional logics of the state to values and then from values to institutional logics of the state. It means, we attempt to use bidirectional lens for our analysis. Our research question in this direction is formulated as "What kind of ties are there between institutional logics of the state and values?" and "How these ties are structured?" By getting answers for these questions, the effect of institutional logics on the organizing, behaviors, and practices of public organizations in producing values might be explained by taking a different but functional tool for analysis. To this end, we collected relevant scholarly documents (i.e. books, papers, articles and other published documents)

on both institutional logics and public values. Then analyze them by using a systematic literature review approach.

In collecting data, we used "institutional logics" and "public value" as keywords and for eliminating inappropriate resources we read abstract of the relevant paper first. Each literature item identified was reviewed by the authors and assessed in terms of both rigour and relevance. If we can detect any approach to state or statist perspective related to public value in the abstract then we attempted to read rest of the paper and tried to understand whether it would be useful for our analysis. After that we added appropriate papers in our paper pool which contains relevant papers for our analysis.

In analysis we used a context analysis approach in exploring the possible linkage between institutional logics of the state and public value.

## 3 Results

According to Greenwood and colleagues (2010), state logics refer to "the basic orientation of the state in securing social and political order". The state logic's basis for its norms is citizenship, and strategies are aimed at the notion of the common good (Saz-Carranza & Longo, 2012). In the ideal type state logic, governmental managers determine the appropriate quality standards and the scope of practices and the knowledge (Goodrick and Reay, 2011) in particular at the sub-organizational level. Thornton and Ocasio (2008) emphasize, in the context of institutional logics of the state, that states depend on a welfare capitalistic approach as an economic system for providing public goods and services. Actually, in the Western Europa today the bulk of the state's business is concerned with economic regulation and organization on one hand, and welfare activity on the other (Cowling, 1985).

When considering state logic, current developments show us that it should possess a welfarist infrastructure since the main role of modern state is to produce welfare and provide it justly among its citizens. The welfare state logic can be described as a merger of political (democratic) and bureaucratic logics. The perspective clearly includes the welfare of society as a whole and is concerned with the common good and public health (Stenius & Storbjork, 2019). The welfare state logic emphasizes public responsibility for welfare, including funding of actual service provision (Linden & Ervik, 2022). Such processes might be contingent on an enabling state logic and that community processes may be less evident in more centralized and/or intolerant setting (Greenwood et al., 2010). In a welfare state system, the public sector has the primary responsibility for provision of social services, including those of addiction treatment (Stenius & Storbjork, 2019). In fact, state logic in different sectors and different contexts shape public servants' perceptions of their role vis-à-vis citizens in policy implementation and produce opportunities and barriers for co-production with citizens (McMullin, 2021).

The welfare policy regards provision of financial benefits and social services to those in need as a route to general social security, social equality, and a participatory society. The logic also stresses the rights of more marginalized citizens to the services they need – even if these services are at times conditional on needs assessment. The welfare of citizens is a public responsibility. Services are tax funded and redistributed both horizontally (across the life course) and vertically (towards the least well off) by political decisions according to acknowledged needs, in a politically planned and cost-conscious way and with the help of a bureaucracy that acts according to transparent rules (laws and other regulations) and with professional expertise (Stenius & Storbjork, 2019).

In sum, for fulfilling its own roles and functions the state (more clearly its visible agencies) necessarily depends on institutional logics and these logics finally become apparent in the decisions and actions of these public organizations more concretely (Greenwood et al. 2010). Hence, public managers as individual actors must ensure that what they are going to do is valued by stakeholders, and be able to attract legitimacy from the environment and that is feasible in technical terms (Moore, 1995) through public organizations. In that case, public value can also be seen as a vital tool for creating organizational legitimacy and in this way providing continuous resource flows and finally organizational survival (Ferlie et al. 2003; Guthrie and Russo, 2004; Moore, 1995; Meyer and Rowan,

1977). More concretely, public values also include among others welfare provision (Antonsen and Jorgensen, 1997) and thereby provides a link between legitimacy and the capability to improve the financial and political support for public organizations (Guthrie and Russo, 2004). Hence, managers' own fates depend on how well they accomplish defined goals in accordance with the institutional logics of their situation or state (Jackall, 1988).

Public value as an ultimate aim and outcome of the public governance (Van Der Wal, 2014) should also be considered as an imperative of the logics, since these logics at the same time represent a field's shared understandings of what goals to pursue and how to pursue them (Friedland and Alford, 1991; Scott, 1987). For this aim, actors need to possess a privileged role in acting consciously or intentionally. Scott (2001) describes this role as the ability to intentionally pursue interest and to have some effect on the social world, altering the rules or the distribution of resources.

Organizational actors within public sector may create and provide public goods and services with value(s) just in the direction of state's institutional logics, and then they may use state's rationalizing and regulative authorities (Friedland and Alford, 1991) as agencies, since institutional arrangement for goods and services is the mix of political authority best serving public values (Bozeman, 2007).

## Conclusion

Institutional logic of the state, in particular in a welfarist nature, is a useful tool in creating and providing values for public. Public values in the eye of public in general are relatively new phenomena in meeting public demands and needs. From this point of view, it helps public servants and further organizations to understand what is valued for public and which services are important and irreplaceable. Thus, they prioritize most valuable services by public and neglect others to some extent.

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# REAL ECONOMIC CONVERGENCE OF THE V4 COUNTRIES AFTER THE FINANCIAL CRISIS

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**Abstract**
This paper focuses on the process of economic convergence between the four Central European EU countries, which represent the Visegrad Group (V4): the Czech Republic, Hungary, Poland and the Slovak Republic. The aim of this research work is to present the real convergence between the V4 countries and compare it with other EU member states, especially with countries that adopted the euro before 2004 (EA12). We have analysed both β and σ convergence among V4 and EU countries based on GDP per capita in the period 2004-2021 and we made a comparison with the development in the most recent period 2009-2021. The V4 countries are well positioned to catch up with the EA12 average, however, the experience of the EA12 countries shows that convergence cannot be taken for granted.

**Keywords**
Economic growth, beta convergence, sigma convergence, catching-up, Visegrad group, European Union

**JEL classification**
F15, F43, O47, O52

## Introduction

The contemporary European Union consists of 27 member countries, whose economies are very dissimilar in both size and performance. Some new EU member states have already joined the Eurozone, and 19 EU members currently use the common currency euro. The four Central European countries: the Czech Republic, Hungary, Poland and Slovakia, which make up the Visegrad Group (also called the Visegrad 4 or V4), have all been members of the EU since 2004. They have made considerable progress in economic transformation and integration into the European Union. They also contributed significantly to the real convergence in the EU, which occurred as a result of the catch-up of Central and Eastern European (CEE) economies in the period under review.

The different sizes of individual economies of EU member countries are illustrated by these facts, based on Eurostat (2021) data. In three largest EU member states being involved in 46.97 % of the total population of the EU, 54.42 % of the European union´s GDP (at market prices in euro) was created in 2021, correspondingly, more than 50.8 % of the European union´s GDP adjusted by purchasing power standards (PPS, EU27 from 2020). In contrast, in the smallest eight EU member states, in which 3.18 % of EU citizen dwells, only 2.31 % of the European union´s GDP was generated, or 0.61 % of the European union´s GDP adjusted by purchasing power standards (PPS, EU27 from 2020). The V4 countries account for 14.25% of the EU population, their share on the European Union's GDP is 7.35 %, and in the case of EU GDP adjusted by PPS, it is 11.24 %. Since a comparison of V4 will also be made with the EA12 countries (countries that adopted the euro before 2004), it should be noted that these countries represent 73.25% of the EU population. Their share in the GDP of the European Union is 82.86% and the share in the GDP of the EU in PPS is 77.92%.

The different performance of the economies of the EU member states can also be appropriately assessed by comparing the most commonly used indicators of the economy's output per capita in terms of purchasing power parity units, such as levels of gross domestic product (GDP) per capita or levels of gross national income (GNI) per capita converted to purchasing power parity. Using these indicators, the economies of the EU countries also show significant differences. In 2021, for example, GDP per capita in the purchasing power standard in the most advanced EU economy (Luxembourg) was more than 5 times higher than in the economy with the lowest value of this indicator (Bulgaria).

Considerable differences in the economic level of EU member states measured by the GDP per capita indicator in PPS in 2021 are evidenced by the following data. On the one hand, the EA12

countries reach 106.1% of the EU average, while the most advanced Luxembourg and Ireland even reach 277.3% and 220.5% of the EU average, respectively. Conversely, on the other hand, the least developed Bulgaria shows only 55.3% of the EU average. In the case of the V4 countries, GDP per capita in PPS in 2021 ranged between 68% (Slovakia) and 91.5% (Czechia) of the EU average, respectively between 64.1% and 86.3% of the EA12 average. The corresponding values for Poland were 77.4% of the EU average and 72.9% of the EA12 average, and for Hungary 79.9% of the EU average and 71.6% of the EA12 average. In general, however, the V4 countries, as well as other poorer new EU member states, grew faster than the richer, highly developed EU economies. Not only for these reasons, is the economic convergence of EU member states constantly at the forefront of intense interest of representatives of economic theories and economic policy makers.

The ultimate objectives of the EU include, as stated in Article 3 of the consolidated version of the Treaty on European Union, the convergence of economic performance and economic and social cohesion. However, an important question arises related to current and future trends regarding economic convergence in the circumstances of the 2008-2009 financial crisis and its consequences, as well as the effects of the Covid-19 crisis. The aim of this research work is to present the real convergence between the V4 countries and compare it with other EU member states, especially with countries that adopted the euro before 2004 (EA12 countries). We analysed the β and σ convergence between the V4 countries and the EU based on GDP per capita. The results of the analysis for the entire observed period of 2004-2021 are compared with the results for two sub-periods: the period 2004-2008 (the period before the financial crisis) and the period 2009-2021 (the period after the financial crisis).

This article consists of five sections. In the first part, an introduction is already presented, where the goal of the contribution is stated. The following section, with the theoretical framework of the research, explains how real convergence combines with European integration. The third section presents the methodology and data. The fourth part is the empirical part and presents the results focused on the comparison of individual countries for the entire period of 2004-2021 and two sub-periods of 2004-2088 and 2009-2021. In the last part, the results were summarized and discussed together with the conclusions.

## 1 Literature review

Economic convergence can be defined in two concepts: nominal convergence and real convergence. In this article, we will focus on real convergence measured by real GDP per capita, although in practice it is necessary to monitor the interdependence of real and nominal convergence. The convergence criteria established by the Treaty on the Functioning of the European Union (Maastricht criteria), which measure nominal convergence, are therefore outside the scope of this article. We study real GDP per capita convergence among the V4 countries and their catch-up towards the EA12 member states. Real convergence means the process of narrowing the gap in the economic level of the compared countries, or bringing the economic level of the compared country closer to the reference country or group of countries. Similarly, Dvoroková (2016) characterizes economic convergence as the process of differences reduction in the economic level and efficiency of individual countries. The opposite is a divergence when there is an increase of differences in the economic level and economic efficiency. These two terms can describe the economic development similarity (Majerova and Feijie, 2020) and capacity for sustainable transition stability (Drastichová, 2014). The focus is not only on whether the differences are increasing or decreasing, it is also important to examine how quickly these changes occur. These findings are elements of economic comparisons and allow formulating theoretical implications (Kulhánek, 2012; Kulhánek and Dvoroková, 2020).

Research of real convergence occupies a special place in the literature on the development of European integration. Economic convergence is also dealt with by a number of theoretical works thematically focused on the issue of the economic theory of growth, because in both cases it is an examination of the factors that cause changes in the rate of economic growth in member countries.

Through this statement, they try to explain the differences in real per capita incomes. The convergence terminology was developed in the context of neoclassical theories of economic growth (Solow, 1956) and popularized by Barro (1989), Mankiw et. al. (1992) and Barro and Sala-I-Martin (2003).

A number of empirical studies on the effects of the enlargement of the European Union, including the convergence of incomes between EU countries and regions, have been published. In this context, Rapacki and Prochniak (2019) directly emphasize that it is not possible to list them all here. The trend towards equalization of income levels in the examined countries in the analysed periods is confirmed, for example, by empirical studies by Halmai and Vásáry (2010); Szeles and Marinescu (2010); Staňisić (2012); Tatomir and Alexe (2012) dedicated to the real convergence of the new EU member states. Economic convergence is examined not only with a focus on new EU member countries (Stoica, Roman and Diaconasu, 2019, Visković, Burnać and Ramljak, 2020), but also on EU candidate and potential candidate countries (Siljak and Nagy, 2019)

As a result of the financial crisis of 2008-2009 and the debt crisis in the Eurozone, empirical studies pointing to the emergence of trends in income differences in the EU at the regional level are also becoming more frequent. Other studies suggest divergent tendencies based on the hypothesis of club convergence or convergence occurring within subgroups of countries (Monfort, Cuestas, Ordóñez, 2013; Borsi and Metiu, 2015). Nagy and Šiljak (2022) hypothesize that the financial crisis had a negative impact on sigma and beta convergence. After the financial crisis, a whole series of empirical studies also focused on the process of catching up with the new member states and especially the CEE and SEE countries. The European Central Bank (2015) noted that the countries of Central and Eastern Europe have been catching up with the EU average over the past 15 years, but there has been disappointing convergence between the 12 countries that made up the Eurozone (EU-11 plus Greece) during this period. Forgó and Jevčák (2015) show that between 2004 and 2014, most of the ten Central and Eastern European (CEE) countries that joined Europe between 2004 and 2007 achieved significant real and nominal convergence vis à vis the EA12. Cieslik and Wcislik (2020) examined real GDP per capita convergence between the CEE-8 and their catch-up with the old EU-15. They came to the conclusion that even in the group of CEE-8 economies there is a weak but overall relative convergence. The results also suggest that there are no clear convergent patterns in the EU-15. However, there is convergence among the CEE-8 countries. They reject the hypothesis of convergence of the CEE-8 to the old EU-15, but it seems that the CEE-8 is converging towards the two largest EU countries: Germany and France.

## 2 Methodology and data

Convergence of GDP per capita levels in EU member states in this paper will be assessed according to two concepts of convergence: sigma (σ) convergence and beta (β) convergence. Sigma convergence assumes that all countries converge to the same level of economic performance. Sigma convergence thus occurs when the dispersion of GDP per capita diminishes over time. It is therefore defined as a reduction of variance (or the coefficient of variation) of the logarithm of real GDP per capita among countries over time. Variation coefficient will be used to achieve sigma convergence in the empirical part. It is given by:

$$CV = \sigma t / \mu t \quad (1)$$

where $\sigma_t$ is the standard deviation and $\mu_t$ is the sample mean $\ln(y_{it})$.

In order to verify the σ convergence hypothesis, we estimate the trend line of the coefficients of variation of GDP per capita. In the medium term, the development of GDP per capita is influenced by the economic cycle. Therefore, the development of σ convergence, measured by the coefficient of variation, is influenced by the degree of synchronization of the business cycle in the monitored countries. For the analysis of sigma convergence, the development of potential GDP per capita will

therefore be used as an alternative. Potential GDP was obtained for these purposes by the filtering method using the Hodrick-Prescott filter.

Beta convergence is based on the idea that the initially poorer (less developed) countries have a higher growth rate than developed countries, since there is a gradual convergence between countries and differences in their maturity are shrinking. The beta convergence occurs when lower income economies grow faster than higher-income economies, i.e. they experience a process of catching up. In this concept, the GDP growth is negatively dependent on the initial economic level. Assuming the usual definition by means of relative distances sigma and beta convergence are equivalent, which means that in the circumstances of a faster economic growth in countries with lower initial GDP per capita levels, the coefficient of variation of GDP per capita among countries surveyed will reduce over time.

In order to verify β convergence hypothesis, we estimate regression:

$$1/T \ln(yi,T / yi,0) = \alpha 0 + \alpha 1 \, . \ln(yi,0) + \varepsilon t \quad (2)$$

where $y_{i,T}$ and $y_{i,0}$ are GDP per capita at PPS in country *i* in the last year *T* and the first year *0* of the analysed period.

The regression equation was estimated by using the method least squares. Estimates were again performed alternatively for V4, EU27, EA12 and EA12xx (EA12 excluding Luxemburg and Ireland).

The data for this analysis come from two sources. Data for the size of the GDP and the size of the population of individual countries are obtained from the Eurostat database (Eurostat, 2022). Data for per capita GDP (in PPP) are obtained from the AMECO-online database (DG EFCIN, 2022). The values of the potential hopper capita GDP were obtained statistically through the Hodrick-Prescott filter with the implicit value of the smoothing parameter lambda=100. The annual growth rates and indices used are the author's own calculations.

## 3 Empirical results

The countries of the Visegrad Group (V4) have made significant progress in economic transformation and integration into the European Union. In the analysed period of 2004-2021, the economies of the V4 countries grew at a higher rate than the EA12 countries. As a result, GDP per capita in purchasing power parity (PPP) also increased more in V4 countries compared to EA12. As can be seen from Fig. 1, its level approached the EA12 average in all V4 countries. In 2004, GDP per capita in PPS units in EA12 was 1.43 to 2.24 times higher than in V4 countries. In contrast, in 2021 this indicator was only 1.16 to 1.56 times higher. It is also clear from Figure 1 that the dynamics of GDP per capita growth was different in the individual V4 countries. It was also significantly affected by the effects of the 2088-2009 financial crisis and subsequent recession.

Focusing on the entire analysed period 2004-2021, all V4 countries showed higher growth compared to EA12. The highest growth was achieved by Poland, where GDP per capita increased 2.24 times. In Hungary, Slovakia and the Czech Republic, GDP grew 1.84 times, 1.77 times and 1.73 times, respectively. In EA12, on the other hand, it grew only 1.4 times. This corresponds to average annual growth rates of 5.17% (Poland), 3.72% (Hungary), 3.59% (Slovakia) and 3.46% (Czechia) compared to EA12 growth of 2.09%.

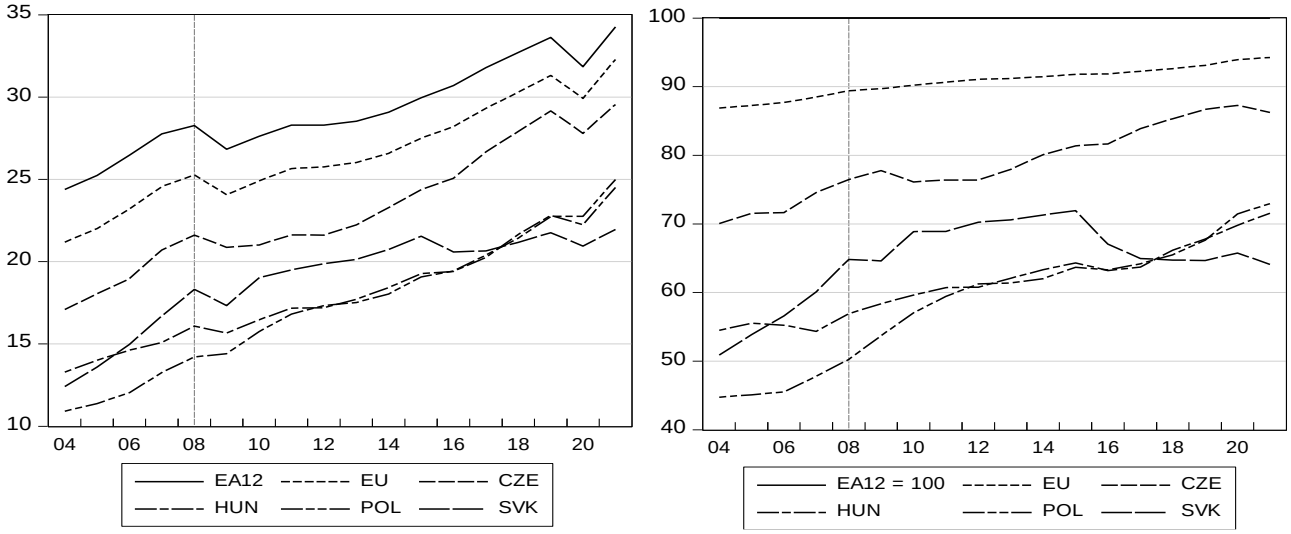


**Fig. 1.** GDP per capita development (1000 PPS, EA-12=100). (Source: Own calculations based on DG EFCIN)

The different dynamics of GDP growth per capita in the period 2004-2008 and in the period 2009-2021 is documented in Table 1. In all V4 countries, GDP growth per capita was lower in the period after the financial crisis. In all V4 countries, similarly to the EA12 and the EU, GDP per capita growth was lower in the post-financial crisis period. In Slovakia, which before the crisis showed the highest average annual growth of all V4 countries (9.5%), growth practically stopped after 2015. For the entire period 2009-2022, Slovakia showed an average annual growth of only 1.4%, which is less than the growth in the EA12 and the EU. The average annual growth rate in the post-crisis period fell to only 4.4% in Poland and 3.3% in Hungary. As a result of this development, both Poland and Hungary have a higher GDP per capita than Slovakia. In 2021, Slovakia (after Greece and Bulgaria) is the third EU country with the lowest GDP per capita.

**Table 1**. Average annual growth rate of GDP per capita (%)

| Countries | 2004-2021 | 2004-2008 | 2009-2021 |
|---|---|---|---|
| Czech Republic | 3,5 | 6,2 | 2,4 |
| Hungary | 3,7 | 4,8 | 3,3 |
| Poland | 5,2 | 7,1 | 4,4 |
| Slovakia | 3,6 | 9,5 | 1,4 |
| EA12 | 2,1 | 3,7 | 1,5 |
| EU | 2,2 | 3,7 | 1,6 |

Source: Own calculations based on DG EFCIN.

As can be seen from Table 1, the Czechia also recorded a significant decrease in the average annual rate of GDP per capita from 6.2% to 2.4%. However, since the average growth in the EA12 in the post-crisis period reached only 1.5%, at the end of the analyzed period, the Czechia reached more than 86% of the level of GDP per capita of the EA12 countries.

Sigma convergence simply refers to a reduction of disparities among countries in time. If the dispersion of GDP per capita in a group of countries decreases over time, it means that the countries are converging in the sense of sigma convergence. In this paper, we use the coefficient of variation as a measure of sigma convergence. If the coefficients of variation decreases, it indicates decreased dispersion and sigma convergence. If the coefficient of variation increases, it indicates sigma divergence. The coefficients of variation of real variables per capita were determined in two variants: on the one hand, based on the GDP per capita in PPS, and on the other hand, on the basis of the development trend of potential product per capita in PPS. They were assessed for V4, the whole of EU27, EA12 and EA12xx (i.e. EA12 without divergent Luxembourg and Ireland). The development

of coefficients of variation for GDP per capita is shown in the left part of Fig. 2, the development of coefficients of variation based on potential GDP is shown in the right part of Fig. 2.

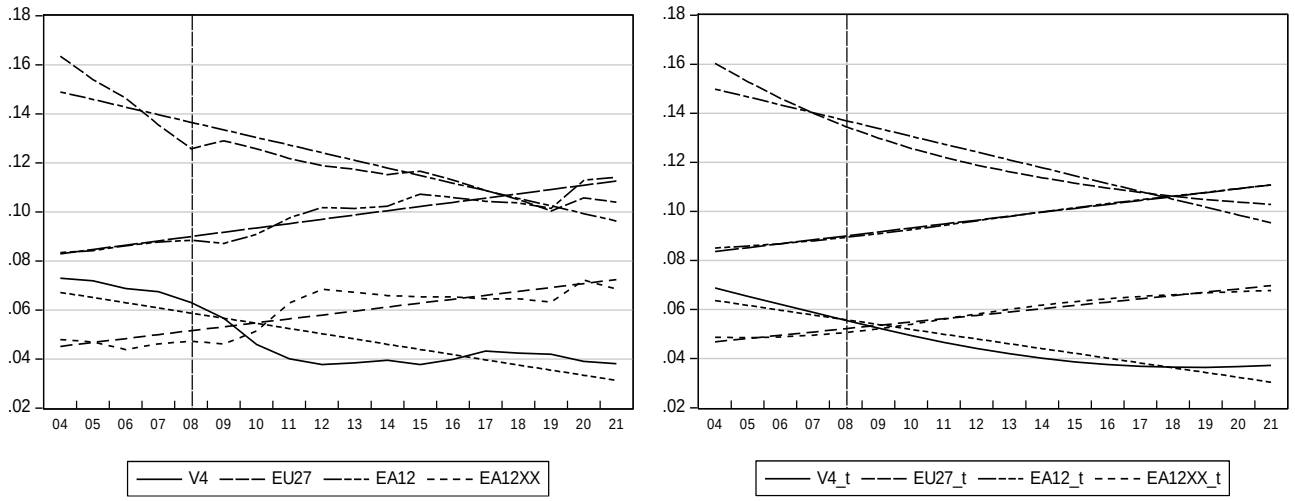


**Fig. 2.** Coefficient of variation development (GDP per capita, potential GDP per capita). (Source: DG EFCIN)

Fig. 2 shows a tendency for the coefficients of variation to decrease for V4 and EU27. In most years, a faster or slower convergence was recorded, only in some years there was stagnation or divergence in development. The opposite situation is in the case of EA12 and EA12xx, which show a tendency towards divergence. As a result, the convergence of EA12xx countries as measured by the coefficient of variation has been lower than that in V4 since 2009. The coefficient of variation of EA12 was higher than that of V4 throughout the analysed period. As of 2018, it is also higher than in the EU27. Similar conclusions about the divergence of EA12 and EA12xx can be made based on both GDP per capita and potential GDP per capita analysis.

To verify the hypothesis of sigma convergence, we estimate linear trends in the development of variation coefficients for the entire analyzed period 2004-2021 and for two sub-periods 2004-2008 and 2009-2021. The results of linear trend regressions for the period 2004-2021 shows Table 2.

**Table 2** Results of linear trend estimates for coefficients of variation

| Countries | Variable | Param. | St. errorr | t-stat. | Prob. | Adj. R2 |
|---|---|---|---|---|---|---|
| V4 | Interc. | 0.067096 | 0.00338 | 19.852 | 0.0000 | 0.6897 |
| | Slope | -0.002114 | 0.00034 | -6.2279 | 0.0000 | |
| V4_t | Interc. | 0.063601 | 0.00162 | 39.247 | 0.0000 | 0.8939 |
| | Slope | -0.001955 | 0.00016 | -12.011 | 0.0000 | |
| EU27 | Interc. | 0.148835 | 0.00289 | 51.432 | 0.0000 | 0.8688 |
| | Slope | -0.003096 | 0.00029 | -10.656 | 0.0000 | |
| EU27_t | Interc. | 0.149782 | 0.00229 | 65.564 | 0.0000 | 0.9195 |
| | Slope | -0.003206 | 0.00023 | -13.973 | 0.0000 | |
| EA12 | Interc. | 0.082876 | 0.00153 | 54.131 | 0.0000 | 0.8830 |
| | Slope | 0.001748 | 0.00015 | 11.370 | 0.0000 | |
| EA12_t | Interc. | 0.083611 | 0.00025 | 339.03 | 0.0000 | 0.9959 |
| | Slope | 0.001599 | 2.48E-05 | 64.559 | 0.0000 | |
| EA12xx | Interc. | 0.045081 | 0.00232 | 19.445 | 0.0000 | 0.7314 |
| | Slope | 0.001601 | 0.00023 | 6.8765 | 0.0000 | |
| EA12xx_t | Interc. | 0.046815 | 0.00058 | 81.471 | 0.0000 | 0.9696 |
| | Slope | 0.001345 | 5.77E-05 | 23.313 | 0.0000 | 0.6897 |

Source: Own calculations based on DG EFCINI.

As the data in Table 2 document, for V4 and EU27 the slope parameter of the trend line is negative in all cases, so there is sigma convergence, or the hypothesis is verified. As is clear from the data in Table 2, in the period 2004-2021 for V4 and EU27, the slope parameter of the trend line is negative in all cases, so there is sigma convergence, or the hypothesis is verified. The trend line slope parameter for EA12 and EA12xx shows positive values as expected.

To test the sigma convergence hypothesis for sub-periods, we estimate the linear trends of the coefficients of variation also for the sub-periods 2004-2008 and 2009-2021 (results not reported here). For V4 and EU27, the slope parameter was negative and statistically significant in all cases. In contrast, for EA12 and EA12xx, the curve slope parameter was positive in most cases. The only exception was EA13xx in the 2004-2008 sub-period, but the negative parameter was not statistically significant. Focusing on the pre-crisis and post-crisis sub-periods, some temporal convergence between EA12xx occurred only before 2007 and between 2013 and 2019.

Beta convergence occurs when less developed countries grow faster than more developed countries, meaning that there is a negative relationship between initial GDP per capita level and its growth rate. In order to verify beta convergence hypothesis, regression equation (2) was estimated by using the method last squares. In order to achieve convergence during the entire period of 2004-2021, as the initial level of GDP per capita was chosen the size of this indicator in 2004. Estimates were again performed alternatively for two groups of EU member countries: the EU27 and V4. The results of regression equation estimations for the period 2004-2021 are shown in Table 3.

**Table 3** Beta convergence in the EU and V4 (2004-2021)

| Countries | Variable | Param. | St. errorr | t-stat. | Prob. | Adj. R2 |
|---|---|---|---|---|---|---|
| V4 | Interc. | 0.108451 | 0.00714 | 15.1873 | 0.0043 | 0.9704 |
| | Slope | -0.029956 | 0.00301 | -9.9601 | 0.0099 | |
| EU27 | Interc. | 0.041603 | 0.00979 | 4.2511 | 0.0003 | 0.0072 |
| | Slope | -0.003333 | 0.00306 | -1.0904 | 0.2859 | |
| EA12 | Interc. | 0.011313 | 0.06982 | 0.1620 | 0.8745 | -0.0977 |
| | Slope | 0.003150 | 0.02173 | 0.1450 | 0.8876 | |
| EA12xx | Interc. | 0.017044 | 0.07897 | 0.2158 | 0.8345 | -0.1247 |
| | Slope | 0.001094 | 0.02451 | 0.0446 | 0.9655 | |

Source: Own calculations based on DG EFCIN.

The conducted empirical analysis shows that V4 and EU27 converge in the analyzed period. The beta coefficients are negative and highly significant (see Table 3). In contrast, neither EA12 nor EA12xx diverge and the beta coefficients are positive.

## Conclusion

This paper focuses on the process of economic convergence among the V4 countries in the period 2004-2021. To assess the impact of the financial crisis on the convergence of the V4 countries, the analysed period was divided into the period before the financial crisis (up to 2008) and after the financial crisis (from 2009). Sigma convergence and beta convergence were analysed.

The dispersion of per capita GDP and potential per capita GDP of the V4 countries decreased during the monitored period. However, the highest reduction was recorded between 2008 and 2012. In the following years, the dispersion stagnated, a slight divergence was recorded, and a slight convergence occurred from 2017. These findings require a more detailed analysis for the future, probably with a breakdown of the development into shorter time periods. Differences in per capita GDP in the EU are also decreasing, but compared to the V4 they are significantly higher. The dispersion of per capita GDP in the EU decreased the most during the financial crisis, and its decline

slowed in the following period. These conclusions are also confirmed by the results of the beta convergence analysis of V4 and EU.

A comparison of the real convergence of the V4 countries with the countries that already adopted the euro before 2004 (EA12 countries) confirmed the divergence tendencies of the EA12. In a highly simplified form, it can even be stated that the convergence of V4 and the divergence of EA12 take place at the same speed. Although GDP per capita is still lower in V4 compared to EA12, the dispersion of GDP per capita in V4 is already lower due to real convergence.

The growth rate of per capita GDP in the V4, similar to other countries, decreased in the post-financial crisis period. V4 countries continue to catch up with EA12. The speed of convergence and the difference in GDP per capita compared within the V4 suggest that convergence to the EU average will be a long-term process.

## Acknowledgement

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# MAPPING THE SKILLS NEEDED FOR ADVANCED TECHNOLOGIES USE IN EUROPE

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**Abstract**
The digitalization of economies is an ongoing process requiring complex and dynamic structural changes at the organizational levels. The implementation of advanced technologies in companies, especially industrial ones, depends on the employees' skills necessary for this implementation. In our paper, we use available data (based on European Commission Advanced Technologies for Industry Survey in 2019 and 2020) for mapping the attributes of required skills in the European Union and the changes that have appeared with the COVID-19 pandemic challenge. We aim to identify the specific features of necessary skills (with a special emphasize to digital skills) and their changes according to country, company size, and industry segment. The implications both at the company and regulatory levels are identified to contribute to bridging the European gap in the digitalization process.

**Keywords**
Digitization, Digital Skills, Advanced Technologies, European Union, COVID-19 pandemic.

**JEL classification**
J24, Z13

## Introduction

Digitalization of economies is a dynamic and complex process requiring adaptation at all levels – not only technical infrastructure adaptation, but also human capital adaptation. As being stressed by Mukhuty, et al. (2022), "*human actors remain central to Industry 4.0, while the social responsibility component of sustainable development is a key prerogative for industry, championed through the UN sustainable development goals and European Commission*". The adaptation of sustainable human capital requires the development and modification of necessary skills of employees to make this capital suitable to answer new challenges and opportunities. Thus, the necessity of human capital adaptation to current digitalization processes, catalyzed by the COVID-19 pandemic impulse, represents an important and actual research question.

The structural changes of economies in the European Union could be analyzed both at the macroeconomic and microeconomic level. In our paper, we focus on the micro-view provided by the companies about their perception of acquired employees' skills. The disposable skills could eventually differ from the skills needed for the current socio-economic development. This gap could be different in the EU Member States and various factors could play a role: current level of socio-economic development of the country, level and dynamics in digitalization processes, education system, cultural aspects, etc. The gaps between the existing and necessary needs could also vary by industry segment and company size. In addition, the more detailed knowledge about the changes of these gaps provoked by the COVID-19 pandemic could lead to the identification of implications at the company and at the regulatory levels contributing to bridging the European gap in the digitalization process.

## 1 Literature review

There is a variety of authors ( e.g. Neumann et al. (2021), Sgarbossa et al. (2020), Mukhuty et al. (2022), etc.) who argue that the digital transformation process is highly dependent on the human actors: the systems related to digital transformation are anthropogenic (Schneider and Sting, 2020).

In this context, Agostini and Filippini (2019) confirm that entrepreneurs and managers need to be aware that digital transformation requires not only focusing on the application of the technologies but also on the development of a series of organizational and managerial practices (to bridge the capability gap, as well as overcome cultural barriers, etc.) that become key to facing the digital transformation. According to Mukhuty et al. (2022), the literature describes the following sociological challenges and barriers linked to digital transformation processes: automation and resistance to change, digital skills gaps, threats to current employment (for example Freddi (2018) underlines that mainly robots have received a great deal of attention while the consequences of other emerging technological opportunities such as 3D printing, Internet of Things, Augmented reality, Big Data Analytics, etc., have not been studied yet), widening socio-economic inequalities (Kuráková et al., 2021), collaboration challenges, leadership, and organizational culture. In our paper, we mainly focus on the digital skills gaps research stream and their relative position in the complex system of employees' skills.

Before the COVID-19 pandemic, the authors (Agostini and Filippini (2019), Liboni et al. (2019); Raj et al. (2020)) confirmed the visible gap in the employees skills to develop and implement new and sophisticated technologies. Petrillo et al. (2018) underline that these skills are represented by new skills in automation, digitization, and information technology (technical skills and digital skills), without forgetting soft skills (self-management, teamwork, stress management, time management, etc.) which remain also very important in a digital area.

The size of a company plays a crucial role in the digital transformation processes. Váně et al. (2020) find out that larger companies clearly consider advanced technologies more often and see them more significantly as a key success factor. The authors argue that the digital transformation to advanced technologies is approached by larger companies first because they are more sensitive to customer satisfaction, are looking for new opportunities, and have greater resources to cover the costly implementation of innovations.

Although the digitalization processes represent an opportunity for all sectors, industry and especially the manufacturing sector is often presented as its flagship (Duraivelu, 2022). Digital or smart factories are now a reality. Smart manufacturing has gained a grip to increase effectiveness and efficiency in the existing manufacturing processes and methods.

At the international level, cross-country comparisons of both development levels and tendencies in digitalization processes are crucial. Wang et al. (2020) indicate that the development of human capital, accompanied by the accumulation of knowledge and R&D, are important factors explaining technological innovation in G7 countries.

Recent literature is stressing the impact of COVID-19 pandemic, boosting online business activities and supporting the development of out-of-social-contact solutions (robotization, automatization etc.) at various levels. The current research question is whether this pandemic experience was either catalyzing the differences among countries, companies, and individuals or was rather playing the role of a mitigator of cross-country, cross-industry, cross-companies and individual differences and inequalities. For example, Grishchenko (2022) found an inverted digital divide during Covid-19 pandemic in the EU countries and in the most digitally developed countries. However, with the further penetration of digital technologies, this divide might spread.

Fareri et al. (2020) summarize the key actors which could be interested in knowing about the skills gap: institutions and companies. "In particular, the need to recruit the workforce whose characteristics accurately reflect their needs, as well as to identify the lack of internal skills, is increasingly strategic for enterprises. Moreover, in this phase of rapid technological evolution, the Institutions have the need (and objective) of: to predict which will be the main consequences on the labor market, facilitating change through ad hoc policies, acting as an effective bridge between the University offer and the market demand". In this paper, we share this vision that the implications of mapping the skills needed for advanced technologies should be identified both at the company and regulatory levels.

In our paper, we aim to identify the specific features of necessary skills (with a special emphasize to the digital skills) and their changes according to country, company size, and industry segment.

Moreover, we are focusing on the recent changes in this area which are linked to COVID- 19 pandemic. Our findings lead to the implications both at the company and regulatory levels to contribute to bridging the European gap in the digitalization process.

## 2 Methodology and data

To meet our goal, we use the data gained by the European Commission within the 'Advanced Technologies for Industry' (ATI) project (for more details, see European Commission, 2021). The ATI business survey conducted in 2019 was a telephone survey of 11 countries across Europe, using those countries that represent best the anticipated adoption of new technologies. The survey focused on a single high-level decision maker that covers adoption of the advanced technologies within their organisation.

In the 2019 survey, one of the questions concerned the finding of which skills are the most needed in the company to implement advanced technology-based products and projects. From the eight offered skills such as: general IT skills, professional IT skills, management skills, customer handling skills, technical, practical or job-specific skills, and numerical and data analytics skills, respondents could choose a maximum of three skills. The research involved 900 companies from eleven EU countries including the UK and three CEE countries: Czech Republic, Hungary and Poland. We have included to our analysis only six Western European countries and Poland from CEE countries in order to be able to compare the data obtained with the year 2020, when the survey was conducted in only seven countries.

In 2020, the survey methodology was modified. The question relevant to capture the skills needed to advanced technologies adoption has changed. While in 2019 companies selected the three most important skills out of eight, in 2020 they expressed importance of skills using Likert-type scale. Therefore, in 2020, we considered the most important skills to be those whose importance companies expressed using the Likert-type scale as relevant and extremely relevant. For this reason, it is not possible to calculate exactly the changes that have taken place after a year, but it is possible to depict the overall tendencies to meet our goal.

## 3 Empirical results

In 2019, technical, practical or specific skills were ranked first in all countries, although in Poland only 49% of companies ranked them as the most needed skills (Table 1). Additionally, in Czech Republic it was only 46% and in Hungary only 30%. Even greater differences between Western European and CEE countries were found in numerical and data analytics skills. From 60% of companies in Denmark to 42% of companies in France considers these skills as the second most important in the implementation of advanced technology-based products and projects. On the contrary in Poland, numerical and data analytics skills are less needed, only 19% of companies consider these skills important (as is the case in Hungary - 20% of companies and in Czech rep. – 14 % of companies). Significant differences between Western European and CEE countries are also in the need for general IT skills. They are less needed in France (7% of companies), Italy (9% of companies) and Sweden (12% of companies) while, for companies in the CEE countries, these skills are among the most important. In the Czech Republic, 42% of companies consider general IT skills a necessity, in Hungary 40% and in Poland 36%.

**Table 1**. The most needed skills to implement advanced technology-based products and projects (2019)

| | Denmark | France | Germany | Italy | Spain | Sweden | Poland |
|---|---|---|---|---|---|---|---|
| General IT skills | 16% | 7% | 17% | 9% | 21% | 12% | 36% |
| Professional IT skills (e.g., programming) | 36% | 34% | 47% | 36% | 45% | 36% | 42% |
| Management skills | 22% | 21% | 30% | 26% | 24% | 26% | 40% |
| Customer handling skills | 26% | 37% | 22% | 32% | 17% | 28% | 32% |
| Problem solving skills | 20% | 27% | 34% | 23% | 20% | 26% | 47% |
| Foreign language skills | 8% | 3% | 10% | 5% | 7% | 2% | 23% |
| Technical, practical or job-specific skills | 76% | 68% | 58% | 66% | 58% | 74% | 49% |
| Numerical and data analytics skills | 60% | 42% | 33% | 49% | 48% | 44% | 19% |

Source: European Commission, ATI report.

The change in the perception of *general IT skills* is proving to be the most fundamental (Figure 1). While in 2019 almost all selected Western European countries considered these skills to be the second least needed, in 2020 these companies identified them as the first or second most needed. The reason for this increase may be the changed working conditions under the influence of the COVID-19 pandemic, which has caused an increased need to work using digital technologies. The share of telework (from home) has increased and so has the need to use basic, general IT skills. On the contrary, in Poland, the need for general IT skills has hardly changed. The biggest change in Poland compared to 2019 was the increase in the need for skills in numerical and data analysis. The explanation may be that in Poland, as in other CEE countries, the need for general IT technologies skills was considered the most important even before the pandemic.

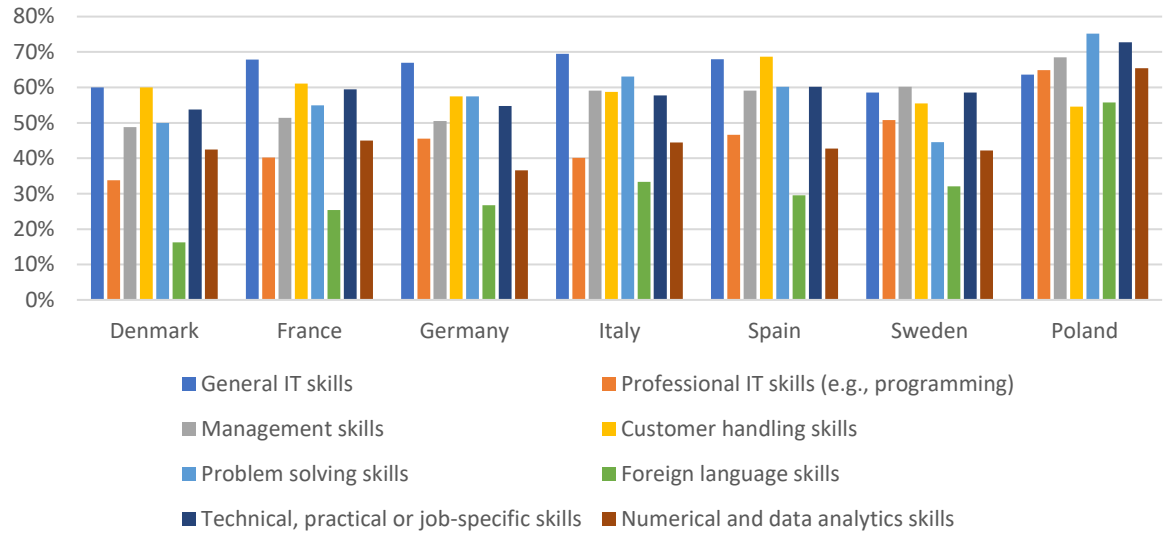


**Fig. 1.** The most needed skills to implement advanced technology-based products and projects in 2020 (Source: European Commission)

In terms of company size, skills needed for the implementation of advanced technology-based products and projects did not differ much (Table 2). In 2019 the technical, practical or job-specific skills were the most important for all size categories of companies, and numerical and data analytics skills were in second place, with the exception of companies with the lowest number of employees (from 10 to 249). In third place, companies listed professional IT skills, with the exception of companies with the lowest number of employees again, who considered professional IT skills to be the second most important. The least required skill in all size categories of companies was foreign language skills.

**Table 2.** The most needed skills according to the company size (2019)

| | 10-249 employees | 250-499 employees | 500-999 employees | 1,000+ employees |
|---|---|---|---|---|
| General IT skills | 21% | 21% | 18% | 16% |
| Professional IT skills (e.g., programming) | 40% | 39% | 41% | 37% |
| Management skills | 23% | 32% | 36% | 27% |
| Customer handling skills | 29% | 23% | 30% | 32% |
| Problem solving skills | 30% | 27% | 37% | 23% |
| Foreign language skills | 11% | 8% | 7% | 10% |
| Technical, practical or job-specific skills | 57% | 62% | 63% | 64% |
| Numerical and data analytics skills | 33% | 42% | 43% | 50% |

Source: European Commission.

When assessing changes in the required skills in terms of size categories of companies in 2020, the need for general IT skills increased the most (Figure 2). This trend is evident in all size categories of enterprises, but in the structure of skills needed, in terms of enterprise size, in 2020, as in the previous year, there are only minimal differences. The octagons for each size category have an almost identical shape, which indicates that their preferences for individual skills are very similar.

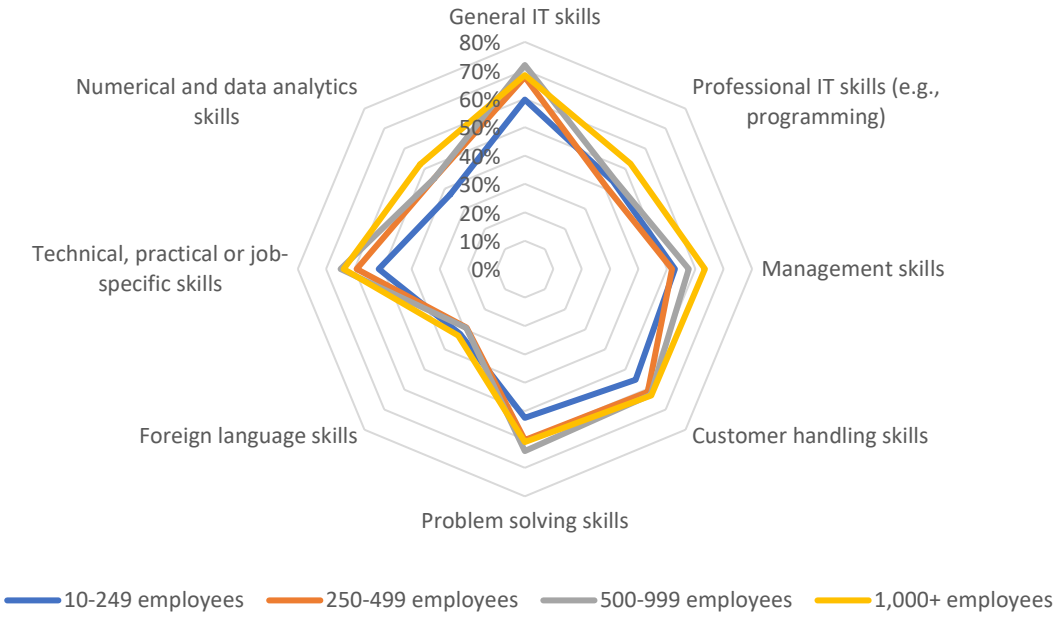


**Fig. 2.** The most needed skills according to the company size in 2020 (Source: European Commission)

If we focus on the most needed skills in terms of industry segment (Table 3), then technical, practical or job-specific skills clearly prove to be the most important in all segments. Professional IT skills are the second most important in all industries except Finance, Healthcare, Retail and Wholesale, Utilities, Oil, Gas, and Agriculture. These industries prioritize numerical and data analytics skills in second place. General IT skills are among the least important, except for foreign language skills, in almost all segments of the industry.

**Table 3**. The most needed skills according to the industry segment (2019)

| 2019 | Finance | Gov/Edu | Healthcare | Manufacturing - discrete | Manufacturing - process | **Professional Services** |
|---|---|---|---|---|---|---|
| General IT skills | 14% | 18% | 21% | 27% | 21% | 16% |
| Professional IT skills (e.g., programming) | 37% | 42% | 35% | 41% | 41% | 45% |
| Management skills | 30% | 37% | 25% | 27% | 32% | 29% |
| Customer handling skills | 42% | 16% | 28% | 15% | 24% | 33% |
| Problem solving skills | 23% | 29% | 35% | 24% | 35% | 25% |
| Foreign language skills | 14% | 8% | 9% | 8% | 8% | 12% |
| Technical, practical or job-specific skills | 54% | 63% | 68% | 65% | 58% | 59% |
| Numerical and data analytics skills | 54% | 38% | 41% | 41% | 37% | 41% |

| 2019 | Retail, Wholesale | Telecom, Media | Transport/ Logistics | Utilities, Oil, Gas | Agriculture |
|---|---|---|---|---|---|
| General IT skills | 17% | 10% | 27% | 16% | 26% |
| Professional IT skills (e.g., programming) | 38% | 51% | 39% | 33% | 34% |
| Management skills | 29% | 22% | 28% | 30% | 21% |
| Customer handling skills | 43% | 28% | 31% | 17% | 25% |
| Problem solving skills | 29% | 21% | 29% | 40% | 30% |
| Foreign language skills | 6% | 13% | 12% | 1% | 5% |
| Technical, practical or job-specific skills | 53% | 70% | 57% | 70% | 58% |
| Numerical and data analytics skills | 33% | 46% | 23% | 50% | 41% |

Source: European Commission.

Compared to 2019, the need for all the skills examined in 2020 increased in almost all industry segments (Figure 3). This may be partly due to a change in data collection methodology, but the biggest change in general IT skills needed is evident, especially in financial services, professional services, retail and wholesale, telecommunications, media and utilities, oil and gas. The increased need for foreign language skills declared by most sectors is probably due to the changed methodology, as companies in all sectors of industry continue to recognize it as the least necessary when considering the implementation of advanced technology-based products and projects. A slight decrease was recorded only in some sectors in the area of technical, practical, and professional skills, which may be a consequence of the greater importance given to general IT skills.

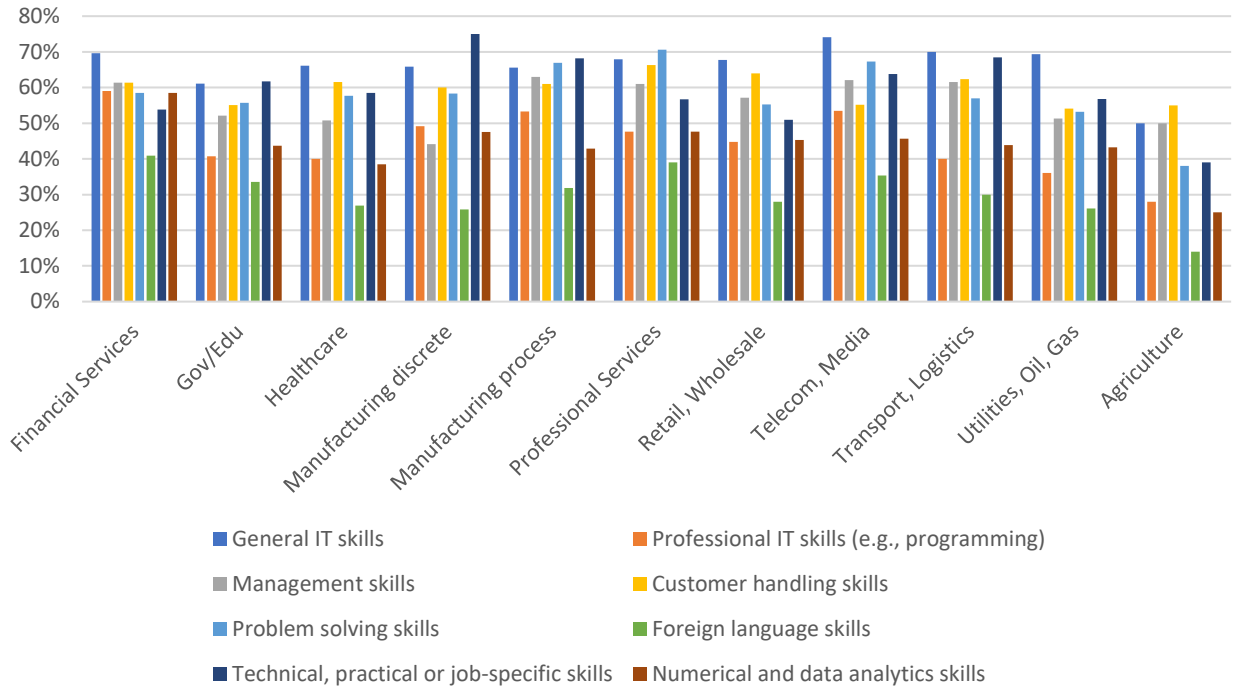


**Fig. 3.** The most needed skills according to the industry segment in 2020 (Source: European Commission)

As the next step of our analysis, we were trying to capture the skills gaps perceived by the companies. The companies could signal an eventual mismatch between the required skills and the disposable skills available inside the company. In 2020 edition of the ATI survey, the companies answered the question: How satisfied are you with the current skillset available inside your organization? From the Likert-type scale of answers, we selected those in which the companies stated that they were satisfied or very satisfied with the given skills (figure 4). Their answers show that companies in all selected Western European countries are most satisfied with the following skillset availability: general IT, customer handlings, problem solving and technical, practical or job-specific skills. Companies thus expressed satisfaction with the same four skills, which they also listed as the most needed for the innovation activities.

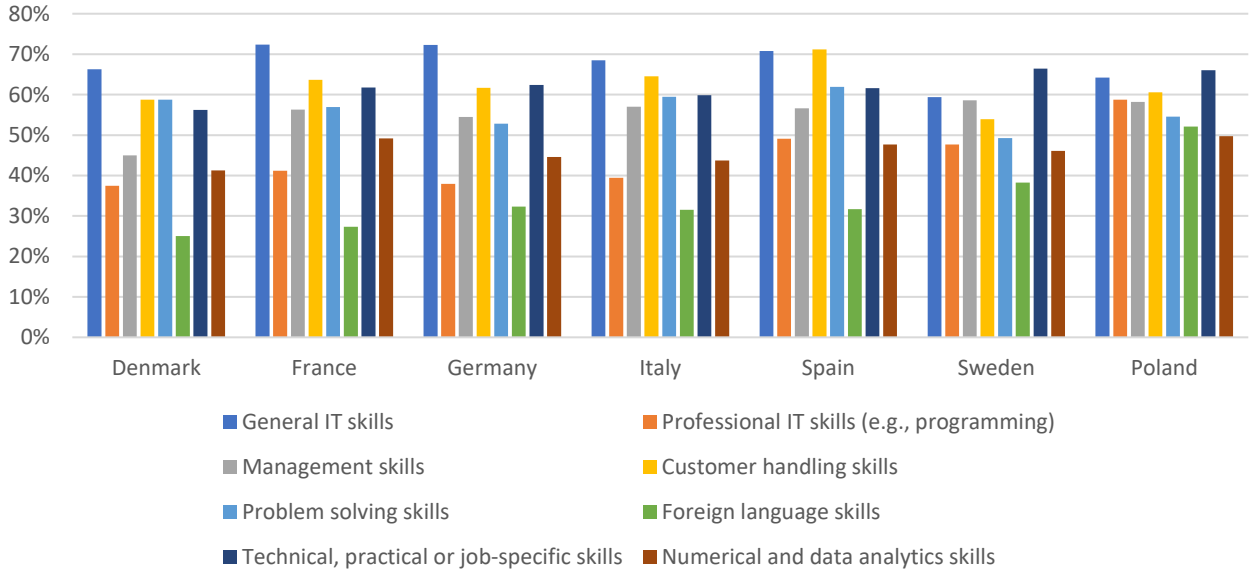


**Fig. 4.** Satisfaction with the skillset available inside the company in 2020 (Source: European Commission)

The situation is different only in Poland, where we found some discrepancy between the needed skills and the areas of the most limited skills gaps: among the four most needed are problem-solving skills, technical, practical or job-specific skills, management skills and numerical data and analytics skills, while the satisfaction of companies was most evident in technical, practical or job-specific skills, general IT skills, customer handling skills and professional IT skills. However, in all EU Member States in the survey, the most visible skills gaps concern the foreign language skills, numerical and data analytics skills and professional IT skills.

## Conclusion

In our paper, we aimed to identify the specific features of necessary employees' skills (with a special emphasize to the digital skills) crucial for digital transformation development. We were trying to capture their attributes according to country, company size, and industry segment. Moreover, we were focusing on the recent changes linked to COVID- 19 pandemic.

Our findings showed the changing relative position (increase) of general IT skills within the whole set of skills needed for an appropriate implementation of advanced technologies in industries. The reason for this increase may be the changed working conditions under the influence of the COVID-19 pandemic, which has caused an increased need to work using digital technologies. The increased need for general IT skills is evident in all size categories of enterprises. Compared to 2019, the need for all the skills examined in 2020 increased in almost all industry segments. The biggest change in general IT skills needed is evident, especially in financial services, professional services, retail and wholesale, telecommunications, media and utilities, and oil and gas. In Poland, as in other CEE countries, the need for general IT technologies skills was considered very important even before the pandemic, which could be partially explained by the existing lags in the digital transformation process in this region at the beginning of the new millennium (Vallušová and Lacová, 2021).

Our findings contribute to the growing stream of research on the implications of digital transformation for organizations and their members. The adoption of re-skilling and up-skilling strategies for the workforce within the organizations are inevitable for their smoother development. One of the solutions for adapting to the skills gap could be in proactive skill development, as recently analysed by Ostmeier and Strobel (2022). The authors suggest that industry maturity in digital transformation is positively associated with employees' perceptions of these developments as controllable and as an opportunity and is negatively related to employees' perceptions of such developments as a threat.

We have not identified any particular current differences among EU Member States in the area of the skills gaps´ persistence after COVID-19 pandemic. The differences between Western and CEE Countries which occurred before the pandemic seem to be mitigated by the advanced development of digital transformation in 2020-2021. Thus, the EU strategy in the digital transformation (Lacová and Šuplata, 2022) which is not taking particular attention and support to some Member States (relatively less advanced in the digital transformation), seems to be appropriate and well-suited.

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# RUSSIAN AGGRESSION ON UKRAINE AND CHANGES IN ATTITUDES TOWARDS REFUGEES – CASE OF THE CZECH REPUBLIC

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**Abstract**
The paper deal with changes of attitudes towards refugees and migration on the European and national context. After Russian invasion in Ukraine Czech Republic belong to the most important host state for Ukrainian asylum seekers. Solidarity with these war refugees contrast with anti-immigrant policy in the recent past – especially during so-called refugee crisis in 2015. The aim of this paper is to show which factors have influenced different attitude towards various groups of refugees in the Czech Republic. Solidarity with Ukrainian refugees in time of the Russian aggression show the willingness to help in different political and international context. Results of opinion polls indicate limits of Czech supports for refugees from Ukraine relating with economic and social consequences of the Russian aggression.

**Keywords**
Migration, Refugees, Ukraine, European Union, Public Opinion.

**JEL classification**
F22, F51, J61

## Introduction

One of significant consequences of the Russian invasion in Ukraine has become massive growth of refugees from attacked country. Czech Republic belong to the most important host state for Ukrainian asylum seekers. Solidarity with these war refugees contrast with anti-immigrant policy in the recent past – especially during so-called refugee crisis in 2015. This crisis has showed, that attitudes towards asylum seekers and towards migration generally influence also the evaluation of the European integration. Different responses to various refugee crises in the case of the Czech Republic revealed importance of its specific context, including the role of political representation and public opinion.

The aim of this paper is to show which factors have influenced different attitude towards various groups of refugees in the Czech Republic. Firstly, paper deals briefly with consequences of refugee crisis in years 2015/2016 and its reflection in the Czech Republic. Special attention is paid to the development of the Czech public opinion relating to refugees in the comparison with other European countries. Second part of the paper focuses on changes of attitudes towards different group of asylum seekers – war refugees from Ukraine. The term refugee is used here according to the definition from United Nations Conventions Relating to the Status of Refugees from 1951.

## 1 Literature review

Refugee crisis from 2015 and its consequences has become topic of many publications. For example, book edited by Menjívar, Ruiz and Ness (2019) analyses critically changes of the asylum policy in chosen European countries in years 2015 and 2016. Various authors dealt with connection between crisis of the Eurozone, refugee crisis, Brexit and perception of the European integration. Schimmelfennig (2018) showed differences between the Eurozone crisis and the refugee crisis, He mentioned also different costs of breakdown in Eurozone and in Schengen. Hooghe and Marks (2019) emphasized differences in consequences of the Euro crisis and the refugee crisis for the European integration. Taggart and Szczerbiak (2018) also compared effects of the three crisis (the Eurozone crisis, the refugee crisis and Brexit) and its influence on Euroscepticism in Europe. According to them, the refugee crisis had strong impacts to attitudes of political parties in post-communist states in Central Europe. Kučerová (2021) included to this comparison also the consequences of pandemic

COVID-19. She pointed out the uniqueness of refugee crisis, which has weakened mutual solidarity and integration tendencies within the EU.

Various authors analysed misusing of refugee's questions in political fights on the domestic or international level. Greenhill (2016) showed how migration has become a kind of weapon used mostly by authoritarian regimes. Later more authors focused on this "weaponization" of the migration as a part of so-called hybrid warfare. This term was firstly described by the former U.S. Marine officer and security analyst Frank Hoffman in 2007 in connection with American and Israeli experiences from conflicts in Afghanistan, Iraq and Lebanon (Řehka, 2017). According to Hoffman (2007) hybrid wars involve *"conventional capabilities, irregular tactics and formations, terrorist acts including indiscriminate violence and coercion, and criminal disorder*". After the Russian annexation of Crimea, the concept of hybrid warfare (or non-linear war) began used prevailly for analysis of Russian revisionist policy (Řehka, 2017, Buchar, 2017). Other scholars researched impacts of hybrid warfare also in the context of refugee crisis in 2015. For example, Veebel (2020) argues, that Russia by its interventions in Syria and Ukraine was responsible for "migration flows" from these countries to the EU. Schnaufer (2017) reminds possible influence of Russian bombing in Syria on deepening of the refugee crisis, although he admits a lack of direct evidence of Russia's intentions. Shoemaker (2019) does not confirm the main responsibility of Russia for the escalation of the refugee crisis in 2015, but he mentions disinformation about the migration spreading by the Russians side. Stengel (2019) or again Schnaufer (2017) point out the Russia´s attempts undermine the trust in the democracy and in the EU by disinformation related to the migration. Gridina and Kasyanova (2019) showed specific impacts of first Russian aggression in Crimea and East Ukraine related to internally displaced persons. In this context can be also reminded the exploiting of refugees as an "weapon" against EU by the Belarussian dictator Lukashenko (Filipec, 2022, Łubiński, 2021).

## 2 Methodology and data

The paper is based on analysis of statistic data from publicly available sources (Eurobarometer, opinion polls of Czech agencies, Czech Statistical Office, documents of the Czech Ministry of the Labour and Social Affairs etc.). The part of the paper dealing with historical context of Czech asylum policy is based partly on qualitative research of the Czech archival sources.

## 3 Impacts of refugee crisis in 2015 and it perception in the Czech Republic

The one of the main impetus for the refugee crisis in 2015 became rebellions against authoritarian regimes in Arab countries, known as the Arab Spring. Protests in Syria due the tough responses of government overgrown to civil war. Terrorist organization so-called Islamic state misused this conflict and took control a large area in Syria (mentioned Islamist radicals already earlier got the rule above also part of Iraq). Especially situation in Syria were complicated by the significant ethnic and religious diversity, and also by the interests of another countries. Civil war in Syria and destructive influence of so-called Islamic state led to massive growth of number of refugees, who sought asylum also in Europe. In 2014 627 000 asylum seekers tried to obtain international protection in the EU, in following two years their number increased to 1,3 million. This growth overcame previous peaks of interest in asylum from 1992 and from the beginning of the 21$^{st}$ century. (Eurostat)

Massive increase of asylum seekers mostly from Syria has revealed the weaknesses of the European asylum system. States on the external border of the EU faced the excessive growth of asylum seekers from Near East and North Africa. European Commission suggested and then Council of the EU agreed supportive measures for help to overloaded Member States. Key and the most controversially point of these measures were temporary relocations of asylum seekers primarily from Greece and Italy to other Member States. But Visegrád group states openly rejected suggested EU's quota system. The Court of Justice of the European Union in case of three countries (Hungary, Poland, Czech Republic) found in violation of their obligations under European Union law. Dispute over relocation system of asylum seekers has become the symbol of different views on future of the

European integration. The problems associated with the refugee crisis have not been resolved. About 3,6 million Syrians under temporary protection remain in Turkey (UNHCR, Refugees and Asylum Seekers in Turkey, 2021). Impacts of refugee crisis and its perception were negatively affected by the growth of Islamist terrorist attacks in Western Europe and also by the combination of different kinds of migration – especially from Africa. How Stockemer et al. (2019) reminded, the refugee crisis had two dimensions – first was "humanitarian crisis" and second is possible to labelled as "crisis of European governance".

Czech Republic was not directly affected by impacts of this refugee crisis. In 2015, the numbers of foreigners with residence permit grew to more 467 000**.** Number of asylum seekers remained low. Economic migration was dominant and main immigrant source countries (Ukraine, Slovakia, Vietnam, Germany, Poland) are mostly culturally near and historically connected with Czechoslovakia this period. International protection was granted to 470 foreigners – most of them obtained the subsidiary protection. In 2016, number of granted asylum increased to 148 asylum seekers, but in following year their number decreased strongly to 29. The total number of asylum seekers in the period was around 1 500 (Czech Statistical Office, Foreigners in the CR). The Czech Republic accepted only 12 out of the pledged 50 asylum seekers within the European relocation system.

Migration has become one of a central topics for European public. Standard Eurobarometer surveys from years 2015-2018 show that immigration was perceived as the most important issue facing the EU. This opinion was more significantly expressed in the Czech Republic in the comparison with European average. For example, 76 % of Czech respondents labelled the immigration as main issue in autumn 2015 (Standard Eurobarometer, 2015). But still in 2019, 53 % Czech respondents choose same answer – on contrary with 34 % in whole EU. Not only strong interest, but also fears connected with migration were typical for the Czech Republic. National opinions polls provided by the Public Opinion Research Centre (Centrum výzkumu veřejného mínění – CVVM) showed that the negative attitude towards refugees by Czechs has long-term character. Since 2015, around 60 % of respondents has rejected the acceptation of war refugees in the Czech Republic. It is interesting, that more than 50 % Czechs began expressed negative attitude also toward to accepting of refugees from Ukraine in 2016. (Centrum výzkumu veřejného mínění – CVVM, 2015-2018).

Perception of refugees from Muslim countries characterised strong tendency to their dehumanization (Prokop, 2020). Opinions on refugee crisis were influenced by its framing, which Entman (1993) defines as selection "*of some aspects of a perceived reality*" and making them "*more salient in a communicating text*". Refugee crisis was framed in the Czech public debates primarily as security problem and as failure of European asylum policy. For example, analysis of television news of the Czech television and TV NOVA during first half of 2015 showed unilateral emphasizing of administrative and security risks of refugee crisis. Only small attention was paid to humanitarian aspects and causes of this crisis (Tkaczyk et al., 2015). According to Prokop (2021), a negative view on migrants in the Czech society can be influenced also by misusing a topic of the migration by populist politicians. Social acceptance of anti-immigrant policy became o new features of attitudes towards migration. In elections in 2017, the populist, Eurosceptic and anti-immigration party Freedom and Direct Democracy (Svoboda a přímá demokracie, SPD) obtained more than 10,6 % and its leader was elected as the Deputy Speaker of the Chamber of Deputies. Anti-immigrant political forces were typically strongly critical towards the EU, and on the contrary they directly or indirectly were supportive for Russia policy. In 2018 and partly also in 2021, the migration became the important topic of the campaign before presidential elections, respectively before parliamentary. Statements of Czech politicians reduce discussion about migration policy to resistance against the mandatory quotas for relocation of refugees, and focus almost only on security dimension of migration.

Ivan Krastev (2018) explained a negative perception of the migration in Central and Eastern Europe by different historical associations connected with multiculturalism, but also by impacts of

the demographic decrease or mistrust of the cosmopolitan mindset. Krastev (2017) also argues that cosmopolitanism for Germany is the way how to overcome the heritage of Nazism. On the contrary, anti-cosmopolitanism of East-European countries "*is partially rooted in an aversion to communist-imposed internationalism*". Krastev consider the refugee crisis as "*a turning point in Central and East Europe*", because local societies have begun more trust in national governments then in EU. In case of Czech Republic Eurobarometer really confirm more long-term and deeper decrease of trust in EU in the Czech Republic in comparison with other Member States. In spring 2015 43 % of Czech respondents trusted in the EU, but in autumn their share decreased to 27 % (the European average was 40 % in spring and 32 % in autumn 2015). The growth of Euroscepticism in the Czech Republic was not connected with significant increase of trust to national institutions. According to Eurobarometer from spring 2015 only 13 % of Czech respondents tended to trust in national parliament, and 28 % of them in national government. These results remained without significant changes also in following periods. But in spring 2017 these numbers decreased again – to 12 % in case of national parliament and to 18 % in case of national government (Eurobarometer 2015- 2017). The Eurobarometer survey showed that trust of the Czech public in the EU remained higher than trust in national government and parliament. Of course, interpretations of these results must take into consideration also other factors which have influenced attitude of public toward national executive and legislative power. But generally, is possible to take in account the lower trust in institutions as one of potential factor determining the Czech perception of migration policy and the role of the European Union.

## 4 Changes of Czech attitudes towards refugees after Russian invasion in Ukraine

Russian aggression on Ukraine caused another refugee crisis, which this time directly affected central and East Europe. United Nations High Commissioner for Refugees (UNHCR) labelled the growth of Ukrainian refugees as "*one of the largest human displacement crises in the world today*". According to estimations of UNHCR from August 2022 there were over 6,3 million present across the Europe. Over 3,8 million refugees from Ukraine have registered for various kind of temporary protection. The largest number of Ukrainian refugees got the international protection in Poland (more than 1,2 million), in Germany (670 000) and in the Czech Republic (more than 400 000) According to OECD massive arrival of Ukrainian refugees is not possible to compare with refugee crisis from 2015/2016. Representatives of OECD mention among the reasons of incomparability previous large diaspora of Ukrainian migrants, specific sociodemographic structure of refugee population and unique response of host institutions and host society in Europe (OECD, 2022). These factors influenced attitude towards Ukrainian refugees also in case of the Czech Republic.

One of the important factors for accepting of war refugees from Ukraine is the presence of numerous communities of Ukrainian migrants across the Europe. At the end of 2020, 1.35 million Ukrainians had a residence permit in the EU. Ukrainian citizens represented the third-largest group of third-country nationals (after citizens of Morocco and Turkey) More than 500 000 Ukrainians were in Poland, 223 000 in Italy, 165 000 in the Czech Republic (OECD, 2022). As wrote Drbohlav and Jaroszewicz (2016) Poland became the most popular EU destination state for migrants from Ukraine primarily due its liberal migration policy. In Czech Republic Ukrainians were employing mostly as short-term workers in less qualified professions. Main residence status of Ukrainian migrants was of a temporary residence, which was connected largely with the economic motive of their stay. (Drbohlav and Valenta, 2014). Drbohlav and Jaroszewicz (2016) argue that migrants from Ukraine in the Czech Republic were successful in the case of the integration into labour market. But their deeper integration into host society were easier only for "*well-off professionals with better jobs*".

After invasion of Russia the migration from Ukraine significantly has changed its character. Mostly economic migrants prevailing in previous periods were replaced by war refugees. Another new tendency of the Ukrainian migration is high share of women and children. Publication of OECD

reminds the example of the Poland, where out of the 1 million registrations by 22 April 2022, 48% were minor children and 92% of the adults were women. Another new characteristic of Ukrainian nationals in Europe is higher share of them are tertiary educated with comparison other refugee (OECD, 2022). This similar sociodemographic structure characterises the situation in the Czech Republic. According to the data from summer 2022 the Ministry of Interior granted the temporary protection to 390 159 refugees from Ukraine. Czech authorities estimate that 15-20 % of them moved back to Ukraine or to another countries. Number of Ukrainian refugees remains still very high and unprecedented in any historical comparison. Report of the Ministry of Labour and Social Affairs from July 2022 shows that majority of refugees are women (44 %) and children (35 %). Refugees are mostly at young age. One third of adult Ukrainian according to the data from July 2022 was younger than 30 years, other 46 % were younger than 45 years. Above average share of refugees (35 %) has higher education (Situation of Ukrainian refugees, Ministry of Labour and Social Affairs, 2022).

Massive increase of war refugees led to unprecedented response on the European and national level. On 4 March 2022, the Council of the EU enacted for the first time ever, the Temporary Protection Directive (TPD), for refugee from Ukraine in the EU. Member States are bound by this Directive and cannot offer a lower set of rights than determine by this legal framework to the beneficiaries of temporary protection. Refugees with temporary protection received a residence permit (or equivalent) for the entire duration of the protection (which can last from one year to three years). The set of rights guaranteed by the Directive involves access to the labour market and housing, medical assistance, and access to education for children (OECD, 2022).

In the case of the Czech Republic, the Ministry of Interior firstly prepared Program of help to refugees from Ukraine, which provided housing and basic material support. Regions in cooperation with the Ministry of the Interior have opened assistance centers for refugees from Ukraine. Ministry of health has established so-called UAPOINTs in providing health care for Ukrainians who cannot to use services of primary care (Government of the Czech Republic, Information related to to Russia's invasion of Ukraine, 2022). Also local authorities, non-profit organizations and public have played important role in the support for refugees. Legal framework for the help to Ukrainian refugees represent so called Lex Ukraine and its novelization, which enable to receive temporary protection and relating financial and other support. Czech Republic as majority of Member States offers temporary protection in duration of one year. Help to refugees includes work rights, access to the education, housing, access to the public health insurance system, financial support, free language courses for jobseekers, vocational training, job assistance, counselling and childcare (OECD 2022).

Attitude towards Ukrainian refugees is influenced also by the high level of interest of the European public in war and by the strong support for Ukraine. According to Eurobarometer the clear majority of respondents feel sympathy towards Ukrainians (54 % totally agree, 35 % tend to agree). Respondents from Czech Republic belong to Member States with the lowest level of sympathy towards Ukrainians (together with Bulgaria, Hungary, Slovakia and Cyprus). But also, in these cases level of sympathy is still high – 42 % of Czech respondents totally agree, 41 % tend to agree). On the contrary in Finland, Ireland, Lithuania and Sweden, more than three-quarters of respondents totally agree they feel sympathy towards Ukrainians. Similarly, the majority of European respondents consider "first and foremost" Russian authorities responsible for the war (52 % totally agree, 26 tend to agree, 10 % tend to disagree, 7 totally disagree). Also 35 % of Czech respondents totally agree with the Russian responsibility, 26 % tend to agree. Only in cases of another six Member states (Hungary, Slovenia, Slovakia, Greece, Bulgaria, Cyprus) were beliefs about responsibility of Russian authorities weaker. Again, clear majority of European respondents (88%) support welcoming in the EU war refugees, including 55% who fully agree and 34% who tend to approve. Czech respondents in comparison with another Member States declared one of the lowest levels of support for refugees – 77 %. Only respondents from Slovakia and Bulgaria declared similar level of the support for welcoming Ukrainian refugees (Eurobarometer, 2022).

Data from national opinion polls confirmed mentioned results founded out on the European level. Opinion polls in the Czech Republic show differences in the perception of various groups of refugees.

While mostly 60 % and more respondents were against accepting war refugees in years 2015-2018, clear majority (75 %) supports temporary residence of Ukrainians fleeing before war in 2022 (See Table 1). With regard on numbers of asylum seekers in different periods is paradoxical, that more respondents in 2016 (69 %) declared more interest about topic of refugees than in 2022 (66 %) (CVVM, 2022).

**Table 1**. Attitude to accepting war refugees in Czech Republic (in %)

| | 10/2015 | 12/2015 | 10/2016 | 10/2017 | 10/2018 | Spring 2022 (Related to refugees from Ukraine) |
|---|---|---|---|---|---|---|
| For permanent residence | 3 | 2 | 2 | 2 | 2 | 10 |
| For temporary residence | 41 | 33 | 30 | 25 | 24 | 75 |
| Against accepting war refugees | 52 | 60 | 63 | 69 | 68 | 13 |
| Don't know | 4 | 5 | 5 | 4 | 6 | 2 |

Source: CVVM.

Also opinion poll of the Centre of empirical researches (Středisko empirických výzkumů – STEM) confirmed significant level of public support for refugees from Ukraine – according to 70 % of respondents is right to accept these asylum seekers. Concurrently 70 % respondents agreed with statement, that consequence of the accepting of refugees will be weakening of social security for Czech citizens. Nearly half of respondents (47 %) consider war refugees as threat for Czech society. According to STEM the relation of Czech public to the Russian invasion in Ukraine is connected primarily with anti-Russians attitudes (STEM, 2022). Prevailing rejection of Russian aggressive policy in the Czech Republic is connected with historical experience, which enable more easily identify with defending victim. In this context, the help to Ukraine is the expression of Western orientation of foreign policy. Supportive attitude towards war refugees from Ukraine influence their cultural closeness and the long-term presence of numerous Ukrainian community. However, mentioned opinion polls reflect mostly supportive views of the Czech public from spring 2022. Some of its results together with international comparison of public opinion based on Eurobarometer polls indicate possible decrease of the support for Ukrainian refugees in the case of significant deterioration of living standard.

Differences in Czech attitudes towards various groups of refugees confirm also the influence of different historical experiences. Pre-war Czechoslovakia was one of important centre for political emigration from Soviet Union, and later from Germany and Austria. The right to asylum was not anyhow published by the legislature and also the status of a refugee was not legally defined. Attitudes towards refugees in the First Czechoslovak Republic influenced also consequences of Great Depression and relating limited access to the labour market. Memorandum of Ukrainian associations in 1934 confirm this dimension of asylum policy in Czechoslovakia. Representatives of Ukrainian refugees in this memorandum reminded their specific status with comparison with other economic immigrants (National Archive). In the pre-War Czechoslovakia, generosity towards foreigners was limited. Declaration of National unity of Northern Bohemia suggesting to concentrate refugees from Germany in camps in the inland can be mentioned as example of xenophobic tendencies in this period. (National archive, b).

Situation principally changed after the Munich Agreement in 1938. Facing huge pressure brought about by the Agreement, proclaimed tolerance towards „foreign emigrants" was replaced by a belief

that it is necessary to promote national interests. The state aid was stated only to Czech re-settlers. According to the prevailing public opinion, the country could not extend help to refugees from other countries and from occupied borderlands. Heritage of post-Munich Second Czechoslovak Republic and experience of Nazi occupation played important role in the post-war transformation of Czechoslovakia into national homogenic state characterised by lack experiences with culturally different immigrants. Since 1948, the asylum policy was limited by the country's integration into the Soviet bloc. Communists Czechoslovakia became a refuge more than 12 000 Greeks who left their war-torn country. Czechoslovak authorities presented the care for refugees from Greece as a significant social and political task. Typical were appeals of the Communistic management to local officials to better understand the political importance of so-called Greek Action and to effect on public opinion. (National Archive c). Historical examples show how the active attitude of politician representation and international orientation of host country influenced the asylum policy.

## Conclusion

The refugee crisis in 2015 strengthened restrictive elements of the Czech migration policy. Limited experiences with culturally different immigrants influenced the perception of Arab refugees as a threat in connection with fears of Islamist terrorism. New feature of attitude toward the migration became the politization of this topic, which supported the increase of critical views on the European integration. Migration in this period was used typically as substitutive pre-election topic serving for the mobilization of voters in the Czech Republic – especially in case of populist politicians. Among factors determining the Czech perception of the refugee crisis in years 2015-2016 belong alsol lower trust in institutions, growth of real security risk, different views on the European integration and medial framing emphasizing security dimension of migration.

Later solidarity with Ukrainian refugees in time of the Russian aggression show the willingness to help in different political and international context. According to various opinion polls on the national and European level the majority of Czech supports temporary protection for war refugee from Ukraine. Clearly understable story of aggressor and victim as a cause of current refugee crisis, specific sociodemographic structure of migrants fleeing before war, their culturally closeness and adaptability, and the presence numerous expatriate community present main factors of supportive attitudes towards Ukrainian refugees in the Czech Republic. Their accepting is presented as an act of solidarity as well as an expression of a political and international orientation. Simultaneously, results of various opinion polls and statements of populist politicians together with historical experiences indicate possible fragility of public consensus in this question.

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# FLEXIBLE WORKING IN PANDEMIC CONDITIONS AND PERFORMANCE PERCEPTION OF PUBLIC EMPLOYEES

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**Abstract**
Technological developments and crises in global world economy are forcing both public and private sector companies to change. In addition, because of COVID-19 pandemic emerged in 2019 all working models and working methods became investigated. As COVID-19 pandemic becomes dangerous, in some time intervals the functioning of workplaces were stopped. In some public and private workplaces, flexible working was introduced. In some public workplaces, officers were off from work for some working hours. In private sector, some private companies asked their employees to work from home without coming to workplace. At the end of the pandemic episode in some countries, working hours are shortened and it is supposed that flexible working will become usual. Postal and Telegraph Corporation (PTT) is a public sector company in Turkey, which is responsible for postal service and cargo. In our research, we tried to measure the perception of PTT employees about flexible working and performance appraisal in Pandemic era. It is concluded that the majority of PTT employees had positive impression about flexible working and that they thought flexible working constitute any problem with respect to performance.

**Keywords**
Pandemic Period, Performance Evaluation, Flexible Working, Part-time Work, Public Sector.

**JEL classification**
M1, M12, M14.

## Introduction

COVID-19 pandemic, which affected the World for three years, has obliged all decision makers to practice crisis management. Since the epidemic became dangerous, some businesses and public sector companies needed to take some preventive measures. Countries and companies took some measures in order to protect their workers by protecting social isolation and to be aware of deathly danger after pandemic. They decided to realise practices like giving workers unpaid leave, distance working, part time working with less payments and by protecting job security. Distance working as a type of flexible working is flexibility in terms of place.

In our study, the effect of flexible working methods on performance management and performance appraisal in public sector was investigated. The effects of pandemic period where the working from home has become more often and even became permanent by some businesses continue. The main subject of our study is that how flexible working affects worker performance in public sector and if flexible working has positive influence over work performance. In the pandemic period, how motivations of workers were affected? Were the workers satisfied with new working methods? What do workers think about the continuatioın of flexible working practice? These questions and similar ones are interesting for all decision makers. Our study is important about distance working or working from home, especially in the public sector, being unplanned and sudden, the kind of effects they have on employees' performance.

Success of the organizations depends on high performance levels of the employees. The main objective of this study is to reveal how flexible working practices affect emplyee performance levels.

## 1 Flexible working at workplace

It is expected that flexibility at workplace will increase the performance of organizations and for employees it will lead to positive results like work-life balance. In this section, in scope of literature review, the concept of flexibility is addressed.

### 1.1 Flexibility

Today, increasing competititon, the necessity to lower operating costs for companies, mergers and acquisitions, and the increased uncertainity of the environment as regards to past years, companies need to have a flexible structure in order to survive, succeed, compete and respond to fluctuations in demand (Valverde, 2000). According to definition of flexibility given in Oxford dictionary, the word "flexible" means "the property that the ability of something to regain its shape after being streched by an outer effect". Second, the word "flexibility" means the ability of someone who can change his behaviours according to changes in different situations." Coming from these definitions, Organizational flexibility means; the competency and speed to adapt to changes in the environmental conditions". This changing environment is defined to be the sum of socio-economical, politicial, and technological changes.

The flexibility is a transformation, which is a product of new technologies developed after 1970's and the economical crisis, which takes place in this period (Oğuz, 2007). As normal working hours become insufficient, developments in economy and their effects to business relations, the shortening of working hours and as the working in several works becomes common leaded to the emergence of new working models (Çamlı, 2010). Being different from classical working methods, flexible working, instead of working under the protection of laws and regulations and with predefined working schedules, is the construction of a liberated and open system where employer and the employee use legal means like labor agreement and labor contract in order to regulate working conditions depending on the needs of both sides.

Flexible working and its applications became prominent as a strategic working tool for both private and public sector organizations in the enclosure period during COVID-19 crisis in 2019. The crisis environment organizations belonging to public and private sector, thanks to mobile and internet technological developments, had the chance to apply flexible working practices. Practices like distance working, flexible and changeable working hours, changeable work types, provide workers to use their time better and more effective and provide employers meet their necessary needs in order to survive in crisis environment.

### 1.2 Definition of flexible working

In business world, traditional working order usually can be defined as working in a defined place (workplace), in defined dates (Sunday –Saturday), and between defined hours (08:00 – 17:00). Those different from this traditional order are named as flexible working (Çamlı, 2010). In other words, flexible working means: "the freedom of defining working hours, work places, working conditions depending on different needs in order to comply with changing and developing conditions in ordered and continous works" (Şahin, 2014).

More and more people are looking to work flexibly; whether to help balance work and home commitments, to reduce travelling time or manage their health and wellbeing (Regus Report, 2013).

A recent survey realized by Timewise, which is a flexible working consultancy firm, asked over 3000 employees whether flexible working mattered to them. The survey found that 63% of full-time workers already had access to flexible working, and 87% wanted it. The demand is there from both men and women, and is strongest in the younger generations (Greater Manchester Health and Social Care Partnership Report, 2019). The survey also asked about the reasons for wanting flexible work. For 29% this was around caring responsibilities, and 14% to help manage a health condition or disability. However, the most common reason given was to give greater control over work-life balance. Also according to the report dated 2013 and prepared by Regus, which provides companies

high quality, fully serviced work places, 72% of workers report that productivity is a direct result of flexibility. Flexible work arrangements are increasingly cited by employees, and job seekers as an important element of determining job satisfaction. Many of these benefits can also be cost-effective for employers and assist in their staffing management efforts (Timewise, 2017).

According to the *2015 Employee Job Satisfaction and Engagement* report from SHRM, 55% of employees cited the flexibility to balance work and life issues as a very important aspect of their job satisfaction. Some of the flexible working arrangements offered by employers are (SHRM, 2015):

- Casual dress day (one day per week)
- Telecommuting (any type)
- Telecommuting on an ad hoc basis
- Flextime (any type)
- Felxtime during core business hours
- Mealtime flex
- Break arrangements
- Casual dress (every day)
- Telecommuting on a part-time basis
- Compressed workweek
- Flextime outside of business hours
- Casual dress (seasonal)
- Telecommuting on a fulltime basis
- Shift flexibility
- Seasonal scheduling
- Job sharing
- Alternating location arrangements
- Results-only work environment.

### 1.3 Advantages of flexible working

Flexible working can be perceived differently by opposing sides of the working relationship. Moreover, attitudes towards flexible working can be shaped around these different perceptions. For exemple, someone who enjoys being with his or her colleagues would perceive flexible working as a means for distancing from social life. Besides someone who lives very far away from workplace can see flexible working as an opportunity to get rid of traffic problems (Avcı, 2019). So flexible working can be seen as an advantage or a disadvantage depending on the attitudes and perceptions of the employee. For this reason, it is worth explaining advantages anad disadvantages of flexible working from both sides of the working relationship that is to say employee and the employer.

Advantages of flexible working from the point of wiev of employees (Avcı, 2019):

- Flexible working can be beneficial for the employees who have difficulties in arranging work-life balance. Because flexible working permits employees to arrange working hours according to their own life plans.
- For those who have control over their working hours compared to those who do not have this control, the flexible decreases work-family conflict.
- Long working hours can bring many problems. For exemple, family –life balance can be destroyed, human health and work security can be endangered or abseenteism and turnover rate can inccrease. Flexible working can be a solution for these problems.
- Short working hours can help employers to have a healthier life. According to Avcı (2019) short working hours have strong effect over workers' drinking and smoking habits.
- Flexible working gives workers the possibility of arranging their working time according to their biological time and they become more productive.

- In addition, workers demand leave of absence with pay. This causes extra costs for the organization. The application of flexible working can eliminate these costs.
- Flexible working can be beneficial when arranging education hours for the employees.
- With flexible working applications, tarditation at workplece can be prevented. Workers who decide to their work hours would show less tarditation and this will lead to an increse in efficiency.
- Flexible working, especially working from home brings many advantages to employees. For exemple, time spent in traffic is eliminated, so the stress and worry of being late to work decrease, and flexibility permits workers to realize their other activities like paying the invoices or rendez-vous with doctor.

Advantages of flexible working from the point of wiev of employers (Ivanauskaite, 2015; Avcı, 2019):

- Flexibility permits organizations to have competitive advantage and survive in unforeseen markets.
- Flexibility creates jobs that are more attractive and this permits organizations to hire toptalents and employee retention. By using flexible working hours, the engagement of the employees will increase and this will result in low turnover rates.
- By flexible work arrangements employer can prevent coming late to the job. So the efficiency increases and costs can be diminished.
- A research realized by Possenriede, Hassink ve Platenga (2014) shows that by the opportunity to arrange working times, absenteeism and related costs could be eliminated.
- Studies show that flexibility increases organizational commitment and work satisfaction, higher performance and organizational citizenship, decreased leave of employment.
- By flexible working arrangements, businesses can stay open outside of official work hours and this yield to increased service time, the use of production capacity increases, the use of very expensive production facilities augments.
- Flexibility can create savings from general expenses by distance working and hot desk application. Parking costs for employees and transportation allowances for employers can be eliminated.
- Flexibility increases organizational commitment. And successively this results in increassed job satisfaction, decrease in turn-over rate, savings from recruitment and education charges, elimination of low motivation charges.

### 1.4 Disadvantages of flexible working

Disadvantages of flexible working from the point of view of employees (Bacak ve Yusuf, 2005; Bolat et al., 2006; Clarke and Holdsworth, 2017; Avcı, 2019):

- In flexible working, working schedules are planned acoording to the needs of the employer and of the work itself. Therefore, the worker has limited influence for planning his flexible working hours. Work and worker match is extremely important while planning flexible working hours.
- In flexible working models like part-time working and job-sharing, wages are relatively low and working hours are limited. For this reason, social benefits and wages are not satisfactory for employees.
- While planning flexible working applications the planners should be fair. Otherwise, the workers will lose their motivation and this will result in lower productivity and efficiency.
- In intensive working, long daily working hours can lead to stress and fatigue among employees. This can reuslt in increased number of accidents and decreased efficiency.
- Employees who practice distance working can have social problems like loneliness. These workers can show lower job satisfaction and work efficiency.
- Lower overtime payments could be a disadvantage for workers while applying flexible work arrangements.

Disadvantages of flexible working from the point of view of employers (Şahin, 2014; Avcı, 2019; Cebeci, 2022):

- Augmentation of number of employees and working hours because of flexible working can cause increase in costs.
- Despite the diminution of working hours and payments in part-time working and job-sharing applications, fringe benefits of employees can result in increased costs.
- A good planning, organization and coordination are necessary for flexible working applications. Lack of these management technics can cost high for employers.
- One of the disadvantages of flexible working for employers is decreased loyalty of flexible working labour force and decreased corporate loyalty.
- Flexible working applications can augment the planning, coordination and supervision costs.
- In flexible working applications the capacity used and shifts increase. As a result, the operation costs of organization augments and this can be counted as a disadvantage.

### 1.5 Flexible working in public sector

One of the most important criticisms to public sector in Turkey is that this sector has a very rigid ordonance. After 1980's, with opening out, the change of competition system, also changes in economic, sociological and information and technology areas have influenced the public sector which has rigid and standardized applications. In order for public services to become efficient, to ensure continuity and to be more effective, a transformation and change in the present system is realized. In this frame, some innovations like privatization in public sector, the realization of employment according to flexible working styles, subcontracting applications are brought. By this way, it is aimed that the system complies with changing social, economical, and technological conditions confortably in a short time.

Flexible working which is supposed to be different and independent from classical working systems, is one of the first privileged health measures taken by countries in the COVID-19 pandemic period, which influenced all of the World. Also in Turkey, in context of pandemic precautions, an urgent regulation was made in the working principals of public sector workers. As the subject is urgent and important, in Turkey, in working methods and hours of public sector workers the flexibility was employed. By a publishing of 2020/4 numbered Presidency Circular in official gazette dated 22 March 2020, regulations about flexible working in public sector were brought.

## 2 Performance appraisal in context of performance management

Studies about performance, which is counted in human resources management strategies, dated back to 1970s continue increasingly. In 1970s, the dimensions like effectiveness, efficiency and being economic were important, but when we came to 1990s, the concepts like quality, customer and employee satisfaction became important. Concept of performance; it is the result of activities that employees do in order to realize objectives and goals of the organization. It is also the evaluation of these results in positive or negative manner. So-called evaluation is done by measuring the indicators like, the quality, the efficiency and labor. Performance evaluation also consists of observing the past activities of workers and having forecasts about their potential work success in the future.

Performance appraisal is the process of determining the level of realization of worker duties in a time interval (Argon and Eren, 2004); and the processs of evaluation of worker performance by observing to which extent given objectives to workers are realized (Budak, 2008).

The complaints about general functioning, general administration and management in public sector, which is the greatest employer in the world, are increasing in public opinion. In Turkey in private sector, increasing importance of concepts like efficiency, effectiveness and quality become also important for public sector. The proper and effective functioning of public services affects all economy of the country and private organizations directly.

According to Köseoğlu and Şen (2014), starting from 1980s, with the augmentation of public administration in public management, the conception that the management technics used in private sector can be used in public area became dominant. The usability of personel and corporate performance measures used in public sector like performance-based charging, rotation, promotion or tangible reward became a current issue. The application of performance appraisal systems to public sector is necessary. In this study, a different way of performance appraisal is followed. In pandemic period, how the flexible working of employees reflects on performance management processes.

In the service sector, the quality of the service provided to the customers is very important. In our study, performance appraisal will be defined from the viewpoint of PTT employees. The scales are developed according to this objective. The research is realised towards the perception of performance of public sector (service sector) employees in Turkey. For exemple, questions like coming to work on time, always being tidy and well dressed, doing his job with the quality demanded etc…were asked in order to measure the performance appraisal of PTT employees. And the resulting answers of employees will be analyzed.

## 3 Methodology and data

In our study, the effect of flexible working over performance was investigated. By using survey method, the opinions of PTT employees were asked. In order to do this, a questionnaire was applied by means of internet. The questionnaire is composed of demographic variables, questions related to flexibility and a performance appraisal scale. Among 74 questionnaires, 70 questionnaires were evaluated. For data analysis, SPSS v26 was used. At the end of the study, it was observed that performance evaluation of the participants is quite high. Besides, the participants announced that they had positive impressions about flexible working applications and that so called applications increased their motivation, efficiency and performance.

The Performance Evaluation Scale's questions used for the evaluation of performance of employees are retrieved from the study of Ateşoğlu (2019) named "Development of "Performance Evaluation Scale" for Housekeeping Staff in the Accommodation Companies and Investigation of the Factors Affecting Performance: Ankara Sample". Performance Evaluation Scale's items are organized as a five Likert scale. (1=Quite insufficient, 2=Insufficient, 3=Medium, 4=Sufficient, 5=Quite sufficient)

The reliability of performance evaluation scale is calculated 0,99, in our study. Compared to value calculated by (Ateşoğlu, 2019) which is 0,97 in the original study, it can be concluded very close to the value in the original study.

A part of the flexible working and performance relationship scale is retrieved from the study of Kırel (1999). In this scale, items are organized as a 5 Likert type scale. (1=Strongly Disagree, 2= Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree). The reliability of the scale is calculated regarding Cronbach's Alpha value and this value is found to be 0.882. This value shows that the flexible working and performance relationship scale is highly reliable as its Cronbach's Alpha value is found between 0.80 and 1.00.

### 3.1 Empirical results

In the study from 70 samples, there are 42 women and 28 men. When we look at the age distribution 4.3% of it stays between 18-25, 47.1% of it stays between 26-35, 38.6% of it stays between 36-45, and 8.6% of it stays between 46-55 ve 1.4% of it lies above 56.

When we look at the marital status, 74.3% of total is married, 25.7% of the total is single. Educational distribution is as follows, 7.1% high school, 8.6% college, 62.9% university and 21.4% graduate degree. 51.4% of the participants are officers, 32.9% contracted staff, 5.7% workers, and 10% other public workers. 8.6% of the sample constitutes managers. 84.3% of the participants have less than 16 years of service durations.

**Table 1.** Demographics

| Demografic Factors | | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Gender | Female | 42 | 60 |
| | Male | 28 | 40 |
| Age | 18-25 | 3 | 4.3 |
| | 26-35 | 33 | 47.1 |
| | 36-45 | 27 | 38.6 |
| | 46-55 | 6 | 8.6 |
| | 56 and over | 1 | 1.4 |
| Marital Status | Married | 52 | 74.3 |
| | Single | 18 | 25.7 |
| Number of children | None | 24 | 34.3 |
| | 1 | 27 | 38.6 |
| | 2 | 16 | 22.9 |
| | 3 | 2 | 2.9 |
| | 4+ | 1 | 1.4 |
| Position | Officer | 36 | 51.4 |
| | Contracted personnel | 23 | 32.9 |
| | Worker | 4 | 5.7 |
| | Other | 7 | 10.0 |
| People living with you other than your spouse or child | None | 64 | 92.8 |
| | Mother and Father | 3 | 4.3 |
| | Mother, Father and Brother | 2 | 2.9 |
| Manageral position | Yes | 6 | 8.6 |
| | No | 64 | 91.4 |
| Years of Service | 1-5 years | 16 | 22.9 |
| | 6-10 years | 21 | 30.0 |
| | 11-15 years | 22 | 31.4 |
| | 16-20 years | 1 | 1.4 |
| | 20+ years | 10 | 14.3 |
| Education | High school | 5 | 7.1 |
| | Vocational college | 6 | 8.6 |
| | University | 45 | 62.9 |
| | Graduate school | 14 | 21.4 |

Source: authors´own calculation

Means and standard deviations of items related to performance and flexible working perceptions and of PTT employees are shown Table 2 and Table 3. The explanations of the items in the questionnaire (Table 2 and Table 3) can be seen in Appendix 1 and 2 in detail.

**Table 2.** Mean and standard deviation values for flexible working

| Variable | Mean | Standard deviation | Variable | Mean | Standard deviation |
|---|---|---|---|---|---|
| Positive 1 | 3.66 | 1.11 | Positive 10 | 3.85 | 0.96 |
| Positive 2 | 3.92 | 1.04 | Positive 11 | 4.01 | 0.90 |
| Positive 3 | 4.04 | 0.85 | Negative 1 | 3.76 | 1.06 |
| Positive 4 | 4.11 | 0.93 | Negative 2 | 3.32 | 1.10 |
| Positive 5 | 4.04 | 1.04 | Negative 3 | 2.60 | 1.03 |
| Positive 6 | 3.14 | 1.35 | Negative 4 | 2.68 | 0.98 |
| Positive 7 | 3.97 | 1.14 | Negative 5 | 2.58 | 1.05 |
| Positive 8 | 4.23 | 0.87 | Negative 6 | 2.38 | 1.00 |
| Positive 9 | 4.07 | 0.94 | Negative 7 | 3.70 | 1.02 |

Source: authors´own calculation

Regarding generally the values to Survey, we can see that the majority of the answers to questions is found in the "Agree" choice. This shows that our research questionnaire represents correctly the possible ideas of employees of PTT. Furthermore, 42.9% of the participants stated that in flexible working period the performance evaluation becomes difficult. 47.1% of the participants enounced that the work could be managed when the flexible working is applied 32.9% of the respondents stated that flexible working diminishes motivation. Interestingly 55.7% of the respondents stated that flexible working creates more time to relax. This result shows that employees work more efficiently and they finish their work on time and this creates more time to spare for relaxing. According to data analysis, 77.1% of the participants agree that flexible working increases motivation. This result is very important in terms of the future of flexible working. If flexible working applications provides more efficiency, then it would be more useful to apply these practices in normal working conditions.

**Table 3.** Mean and standard deviation values for performance perception

| Variable | Mean | Standard deviation | Variable | Mean | Standard deviation |
|---|---|---|---|---|---|
| PA1 | 3.77 | 0.95 | PA24 | 4.01 | 0.80 |
| PA2 | 3. 72 | 0.99 | PA25 | 4.02 | 0.81 |
| PA3 | 3.90 | 0.95 | PA26 | 4.02 | 0.82 |
| PA4 | 3.95 | 0.88 | PA27 | 4.02 | 0.75 |
| PA5 | 3.64 | 0.95 | PA28 | 4.09 | 0.83 |
| PA6 | 3.75 | 0.91 | PA29 | 3.82 | 0.84 |
| PA7 | 3.55 | 0.90 | PA30 | 3.85 | 0.83 |
| PA8 | 3.94 | 0.96 | PA31 | 3.86 | 0.86 |
| PA9 | 3.95 | 0.92 | PA32 | 3.79 | 0.87 |
| PA10 | 3.95 | 0.94 | PA33 | 3.89 | 0.85 |
| PA11 | 4.02 | 0.87 | PA34 | 3.89 | 1.04 |
| PA12 | 3.71 | 1.01 | PA35 | 3.75 | 1.03 |
| PA13 | 3.89 | 0.91 | PA36 | 4.01 | 0.89 |
| PA14 | 3.95 | 0.92 | PA37 | 3.94 | 0.91 |
| PA15 | 3.90 | 0.89 | PA38 | 3.62 | 1.05 |
| PA16 | 3.95 | 0.97 | PA39 | 3.87 | 0.93 |
| PA17 | 3.77 | 0.89 | PA40 | 3.93 | 0.94 |
| PA18 | 3.89 | 0.80 | PA41 | 3.90 | 0.98 |
| PA19 | 3.87 | 0.87 | PA42 | 3.95 | 0.80 |
| PA20 | 3.78 | 1.02 | PA43 | 3.59 | 0.93 |
| PA21 | 3.78 | 0.96 | PA44 | 3.51 | 1.01 |
| PA22 | 3.71 | 0.97 | PA45 | 4.01 | 0.91 |
| PA23 | 3.82 | 0.94 | | | |

Source: authors´own calculation

Another positive effect of flexible working is job engagement according to analysis results. 77.2% of the respondents stated that flexible working increases job engagement. In addition, values obtained data; reveal that flexible working highly improves the performance. For exemple, 85.7% of the respondents agree that flexible working increases performance by protecting the employees from pandemic. 77.2% of the participants reveal also that flexible working diminishes stress and these results in better performance.

The negative effects of flexible working can be deducted from the analysis. For exemple, 64.3% of the respondents agree that if flexible working is applied without regarding equity between personnel, then the performance of the employees would decrease. In conclusion, respondents' opinion is in the sense that flexible working has positive effects more than negative effects. The two main questions about the satisfaction level of employees as worklife satisfaction and family life satisfaction were asked also to respondents. The responses of the participants regarding the first question can be seen in Table 4. Results show that the average value for the worklife satisfaction level

of employees is 3,55 and standard deviation value is 0,779. These results can be interpreted as worklife satisfaction level is lowly above the average value and standard deviation is high.

**Table 4.** Employees' worklife satisfaction

| To what extent are you satisfied with your worklife? | | | | |
|---|---|---|---|---|
| | Frequency | Percent | Valid percent | Cumul. percent |
| Very unsatisfied | 1 | 1,4 | 1,4 | 1,4 |
| Unsatisfied | 3 | 4,1 | 4,1 | 5,4 |
| Neutral | 31 | 41,9 | 41,9 | 47,3 |
| Satisfied | 32 | 43,2 | 43,2 | 90,5 |
| Very satisfied | 7 | 9,5 | 9,5 | 100 |
| Total | 74 | 100 | 100 | |

Source: authors´own calculation

The responses of the participants for the second question can be seen in Table 5. The average value for the family life satisfaction level of employees is 3,61 and standard deviation value is 0,791. From these values it can be concluded that family life satisfaction level is lowly above the average value.

**Table 5.** Employees' family life satisfaction

| To what extent are you satisfied with your family life? | | | | |
|---|---|---|---|---|
| | Frequency | Percent | Valid percent | Cumul. percent |
| Very unsatisfied | 1 | 1,4 | 1,4 | 1,4 |
| Unsatisfied | 3 | 4,1 | 4,1 | 5,4 |
| Neutral | 28 | 37,8 | 37,8 | 43,2 |
| Satisfied | 34 | 45,9 | 45,9 | 89,2 |
| Very satisfied | 8 | 10,8 | 10,8 | 100 |
| Total | 74 | 100 | 100 | |

Source: authors´own calculation

### 3.2 Employees' views about flexible working arrangements

In order to understand PTT employees' attitudes towards flexible working and their opinions about the effect of flexible working over performance, participants were asked to respond to an open-ended question. The question statement is as follows: "With regard to performance, flexible working should continue or not in your working unit, please explain briefly its reason". Below, positive and negative opinions of PTT employees about flexible working is listed in the Table 6 and Table 7.

According to results of the open-ended question, 4 of the 70 participants stated as indecisive, 5 participants responded negatively and 59 participants stated that flexible work should continue. Those who have similar views are expressed in a single item. Regarding the responses, it can be concluded that the majority of participants have very positive attitudes towards flexible working. Under different themes they stated that flexible working has lot of advantage in terms of health, performance, management, organization and work-life balance.

**Table 6.** Positive opinions about flexible working

| POSITIVE OPINIONS |
|---|
| ***Health*** |
| • With regard to health and performance, flexible working applications should continue. |
| • The catch disease ratio diminishes. |
| • Health is more important than the rest. |
| • Flexible working applications are very important with regard to physical and mental health. |
| • Employees feel safe with regard to health. |
| • Flexible working is necessary for the protection of family and coworkers. |
| ***Performance*** |
| • Flexible working has good effect over effectiveness and work focus. |
| • As flexible working hours are short, efficiency increased and this results in positive increase of performance. |
| • Flexible working is motivative for personnel and has positive influence over performance. |
| • Flexible working applications increased individual performance. |
| • Flexible working affects positively performance and protection from illness. |
| • Flexible working motivates. |
| • Flexible working has positive effect in terms of performance. |
| • Instead of working full time, working in different time intervals enables doing the work with the same quality. |
| • Flexible working is positive in terms of worker happiness and performance. |
| • Flexible working is beneficial with regard to worker efficiency. |
| • Flexible working has good influence over motivation and performance. |
| ***Work and Family*** |
| • Time to spend for my family and myself increased. |
| • Specially being a mother, short and flexible workers hours permit me to allocate more time to my family. |
| • More time is allocated to homework, and family and these results in increase in performance. |
| ***Working at Home*** |
| • Working at home is necessary for pandemic period. |
| • Business can be run from home. |
| • Flexible working at home can help producing more ideas that are creative. |
| ***Work-Life Balance*** |
| • With regard to work-life balance, flexible working is favourable. |
| ***Work Engagement*** |
| • Flexible working arrangements increase trust to institution and this increases corporate belongingness. |
| • Flexible working strengthens my work engagement and belongingness. |
| • I am satisfied with my job and my working hours. |
| ***Organization*** |
| • The same working procedures can be done by less personnel while protecting the same quality. |
| • Flexible working can provide the timeliness of work. |
| • As there is no much workload in my working unit, flexible working can continue. |
| ***Management*** |
| • Working with collegues is not disrupted and good communication is observed. |
| • Flexible working doesn't lead to a negative situation with regard to managers and personnel. |
| • Flexible working should continue, but in all units, it should have defined standards. |
| • Flexible working should be applied in all departments unless there is missing personnel. |

Source: authors´own calculation

**Table 7.** Negative opinions about flexible working

| NEGATIVE OPINIONS |
|---|
| • With regard to business follow up, there is rupture. |
| • Application of flexible working applications are impossible in our department. |
| • Personnel supervision becomes difficult. |
| • Flexible working applications make difficult the motivation and so performance is negatively affected. |
| • Flexible working may have negative effect over performance. |

Source: authors´own calculation

Negative responses are also important as they show the missing parts of the flexible working. Two mostly enounced negative properties of flexible working are low performance and difficulty in supervision. Some respondents stated that flexible working has negative effect on performance, as flexible working diminishes motivation. Difficulty in supervision and business follow-up come also with flexible working. In addition, some respondents stated flexible working is not suitable for their working unit.

## Conclusion

With an effective performance evaluation and management system, both personal and corporate success increase, and with positive ameliorations realized on behalf of employees, employees are focused on their personal and corporate objectives. According to results of our study, when we look at the responses of participants who work in units where flexible working was applied, it can be seen that performance evaluation PTT employees were quite high. In so called scale, the least mean value of answered questions is calculated as 3.60.

Results showed that, employees are satisfied with flexible working applications and they have positive impressions about flexible working applications. With flexible working, workers have oppportunity to rest, they became more engaged to work, they have advantage for child and house care, they have freedom to work, they are in a safe working environment at home away from covid-19, they take advantage of being away from stress.

Work-life balance, the possibility to change working hours according to job were seen as advantages of flexible working. Application of flexible working model is motivational for employees and this increases performance. Most of the participants said that working at home application has positive effect over performance.

In conclusion, the flexible working applications often applied in private sector, in pandemic era, were also used in some public organizations and in our research showed that employees had positive opinion about flexible working. So-called applications have an increasing effect on motivation, efficiency and performance. As a result of all these evaluations, flexible working models, after pandemic period, will have incerasing effect on performance in public sector organizations as well as in private sector organizations.

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**APPENDIX 1.**

Items related to the performance perceptions of ptt employees

1. Be patient
2. Keep your cool
3. Being honest
4. Being trustworthy
5. Representing the institution with care for its attire
6. Always wearing clean
7. Always be organized
8. Complying with instructions about work
9. Finishing the given work on time
10. Using resources effectively
11. Owning assigned tasks
12. Taking care of service delivery
13. Doing your job with the desired quality
14. Know your current responsibilities
15. Knowing the boundaries of the task area
16. Protecting the tools, equipment and materials used
17. Keeping your surroundings tidy while doing your work
18. Knowing the rules of hygiene
19. Applying hygiene rules
20. Being able to save on the materials used
21. To be able to finish their work by putting them in order according to their importance and urgency
22. To be able to follow the results of his work
23. Representing the organization with the quality of their behavior
24. Showing sensitivity in according with working hours
25. Behaviors to their superiors
26. Behaviors to co-workers
27. Behaviors to service receivers
28. Compliance with disciplinary rules
29. Tendency to team work
30. Completing the tasks that require teamwork on time
31. Working collaboratively with other employees
32. Sharing knowledge, skills and experiences with colleagues
33. Being able to communicate well with the environment
34. Willingness to participate in the trainings required to do their job better
35. Quickly adapt to changes
36. Reflecting what you have learned to your work
37. Ability to use information
38. Being creative
39. Ability to express thoughts clearly
40. Effective communication
41. Understanding people's wishes
42. Level of knowledge about their job
43. Knowing occupational health and safety rules
44. Implementing occupational health and safety rules
45. Ability to use all kinds of equipment related to the task

**APPENDIX 2.**

Items related to the flexible working perceptions of PTT employees

1. Flexible working hours create an occasion for resting.
2. Having flexible working hours at my workplace motivates me.
3. Changing the working hours in accordance with the job positively affects the commitment to the job.
4. Flexible working hours are positive for child and home care.
5. It is important that my working hours are flexible so that I can spare time for myself.
6. In the flexible working model, being away from the managers allows to work more freely.
7. Changing my working hours according to my wishes has a positive effect on my performance
8. The flexible working model has a positive effect on my performance as it gives me the opportunity to be protected from the pandemic (epidemic).
9. Being away from stress in the flexible working model positively affects my performance
10. The practices of the flexible working model to all personnel positively affects the performance
11. As flexible working model facilitates work life balance it affcets positively the performance of employees
12. Applying flexible working model to only a part of the staff creates inequality, it affects negatively performance of personnel.
13. In the flexible working model, inappropriate working conditions at home negatively affects performance
14. The flexible working model makes it difficult for me to achieve self-motivation.
15. It has become difficult to objectively evaluate the performance of employees during the flexible working period.
16. As the flexible working model will complicate the supervisory function of the managers, it affects the individual performance negatively.
17. In the flexible working model, the alienation of employees from the workplace negatively affects individual performance.
18. When I shifted to flexible working because of the pandemic, I saw that I can manage my work from home.

# INFORMATION ON SLOVAK CORPORATE RESEARCH AND DEVELOPMENT IN CONSOLIDATED ANNUAL REPORTS

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**Abstract**
Groups of enterprises forming a consolidated whole and developing consolidated financial statements and consolidated annual reports are among the ones that own the biggest share of private capital capable of a significant push towards innovation and research for sustainable development and reaching global goals. The research of such consolidated wholes' approaches and of using capital within the research and development in an entrepreneurial environment is important for assessing the effectiveness of incurred costs. This paper aims at the evaluation of a scale to which external users are informed about R&D carried out by entrepreneurs forming a consolidated whole in the Slovak Republic in 2015-2022, based on quantitative contextual analysis of consolidated annual reports of entrepreneurs applying a super-deduction of R&D costs. Since 2015, the super-deduction has been between 25% and 200% and is being applied on average by 3 consolidated wholes a year. The research of 18 consolidated annual reports shows that in the case of 7 mother companies the dependency of the amount of super-deduction and examined terms frequency as a factor identifying the scale of R&D information provision was not determined.

**Keywords**
Consolidated Annual Report, Research, Development, Super-deduction.

**JEL classification**
H20; E62; M10; O32; O38

## Introduction

R&D is one of the most significant driving forces of the modern world, ensuring the economic and social progress of our societies in times of ongoing crises measures. A competitive environment helps regulators in their efforts to set the entrepreneurial environment conditions so their supportive and restrictive mechanisms alike can ensure reaching the global sustainable development goals (European Commission, 2022). Current challenges of the ongoing energy crisis, COVID-19 and post-Covid conditions and measures as well as increasing inflation rate should be a sufficient memento to bring us to the more intensive development of society-wide research and development towards resolving global, mostly climate-related, issues as European and national strategic goals, and as local, more short-term goals as well, reflected on the societal unit level, of which entrepreneurs are a part too. Without an entrepreneurial sector holding sufficient capital and human resources and visions for innovation and effectiveness needed for reaching goals, modern society will be exposed to emerging challenges and worsening conditions. It is therefore important to ensure strong support of innovation that has as its primary feature the R&D on all levels. One of the currently used ways of support in the entrepreneurial sector is an application of a super-deduction for the R&D costs in the business tax. Without proper awareness about the R&D carried out throughout the whole society, the public and private resources that can be also used in other areas may be used ineffectively. The quantitative research in the form of a contextual analysis presented in this Paper dealing with the reporting of the R&D carried out within the groups of enterprises applying the super-deduction for R&D costs is the first one that focuses on examining published information in consolidated annual reports of groups of enterprises in the Slovak Republic in 2015-2020. Since 2015, the super-deduction rate in Slovakia has been increasing from 25% to 200%.

## 1 Literature review

Companies face many challenges when providing information on the scale and quality of their R&D (Grmelová, 2022), because very often the information is protected during the research from industrial espionage. This is observed also during the acquisition of companies carrying out the R&D (Masulis & Simsir, 2018) due to specific information needs of buyers. The lack of information in the published reports on companies is therefore a consequence of little information available about the existence of a company, its products and services, assets, potential profitability or innovation and technology viability, being developed in its active stage (Cuypers et al., 2016). Such information gaps can be overcome by the institutionalization of governance mechanisms through the Boards of Chairs (Cai & Sevilir, 2012), ensuring a good, qualified and functional governance structure of a company (Irwin et al., 2021), activation and protection of proprietary rights for tangible and intangible assets through patent ownership (Grimpe & Hussinger, 2014) and a higher level of support for drawing the venture capital (Ivanov & Xie, 2010) and a better legal framework (MacGregor Pelikánová & MacGregor, 2020; MacGregor Pelikánová et al., 2021; Grmelová, 2022).

In the case of some forms of R&D, e. g. in the field of information technologies (Turečková, 2018), the awareness is disadvantaged by the fast pace of their development and changes that hamper applying of some supportive information mechanisms. Bajaj et al. (2001) and Ko & McKelvie (2018) state that users often encounter informational gaps when evaluating the viability and potential sales of R&D results, probably mainly due to informational differences about life cycles, predominantly regarding information technologies. Another problem is a moral compass and readiness to adhere to the ethical rules including the ones related to intangible assets (MacGregor Pelikánová et al., 2021).

Informational gaps also include an uncertain assumption of subsequent profitability of achieved R&D results, which is one of the decision-making factors the company owners cannot control (Wuebker, 2015). From the perspective of the credibility of a company and the information provided, the Board of Directors and control bodies may signal to their potential users their willingness for adhering to the supervision principles and due care, i. e. mainly during managing the investor's investment (Li et al., 2021, Westphal & Park, 2020), and the very existence of the Board of Directors may influence the value signalled by the organization (Cai & Sevilir, 2012; Yitshaki et al., 2021) and represent a significant ethical impulse (MacGregor Pelikánová et al., 2021). Positive effects on the company's reputation may be brought upon mainly by elaborated governance structures, extended managerial capabilities and controls, and combining interests of interested parties. Codification of R&D results in the form of knowledge allows for better presentation of one's knowledge assets value For example, the Patent and Ownership Rights Agency (Gaule, 2018; Hsu & Ziedonis, 2008) ensures the verification of R&D completed stages with the identified results that can be implemented and financially quantified Similarly, the verification of information may be supported by means of using venture capital company financing by investors (Gaule, 2018; Ivanov & Xie, 2010), or by the length of time the company successfully exist (Lungeanu & Zajac, 2016). These can also be useful indicators of maturity of the company's management team that manages the primary technological development and sales team alike, as well as supporting activities such as sales, advertisement and staff and customer support (Lungeanu & Zajac, 2016; Ragozzino & Blevins, 2016; Wong et al.., 2009) and communicates the quality and stability of the company. Despite this, the introduction of R&D tax super-deduction is used by companies for financing their own R&D only very rarely (Bockova, 2015).

Companies that regularly use venture capital have specific features because venture capital investors expect a high level of return on their investments (Gompers et al., 2020). Research on companies supported by means of venture capital shows that such companies produce more knowledge and results (Jeong et al., 2020; Wadhwa & Kotha, 2006), have a higher level of innovation and generate more money (Rossi & Martini, 2019). Their innovative potential may also be reflected in their stronger resilience toward climate change which is a highly topical issue (European Union, Houska, 2019). Mostly it is seen in technological innovations and information technologies (Turečková, 2015), where venture capital investors play a more active role by enabling access to specialists like infrastructure suppliers and professionals and carefully monitoring the development

of financed companies (Dutta & Folta, 2016; Jeong et al., 2020) by non-financial performance indicators as well (Dokulil, et al., 2022).

Such aspects prevail mainly in the case of acquisitions and mergers of companies with the value representing not only the sum of appraisable assets. Due to the above, it is important to observe the awareness of the interested parties via individual and consolidated annual reports available to the wide group of information users about the groups of enterprises. The importance of such information is increased by globalization and international groups of enterprises. Currently, in times of increasing inflation, climate crisis and other societal and social national and global challenges, it can be the R&D that finds at least partial solutions to some of our problems. Therefore, the information on the R&D carried out by entrepreneurs, gradually being incorporated as requirements to the EU law (MacGregor Pelikánová & MacGregor, 2020), as well as by the groups of enterprises published in their consolidated annual report, is all the more important.

## 2 Methodology and data

The aim of the paper is to evaluate the extent of informing external users about research and development carried out by entrepreneurs forming a group in the Slovak Republic in 2015-2020 based on a quantitative contextual analysis of the consolidated annual reports of entrepreneurs applying the super-deduction of research and development costs.

The object of observation is information related to research and development stated in the consolidated annual reports of the parent accounting entities, or in individual annual reports if the consolidated annual report for the accounting periods corresponding to the years 2015-2020 has not been published. The chosen periods of research (years 2015-2020) result from the fact that the super-deduction of research and development costs when calculating paid income tax has been allowed by the tax legislation of the Slovak Republic since 2015. Observation on consolidated annual reports for 2020 is the last due to incomplete time-series information because the consolidated annual reports for the year 2021 at the time of processing this contribution do not have to be stored in the Register of Financial Statements due to the fact that the legal deadline for saving the consolidated annual report is until the end of the following year, for in which the annual report was prepared (Act on accounting, 2022).

Observation is focused on that parent accounting entities, i.e. accounting entities required to prepare consolidated financial statements according to Act no. 431/2002 Coll. on accounting in Slovakia (Act on accounting, 2022), which in the period under review, in the years 2015-2020, applied the super-deduction of costs and research and development according to Act no. 595/2003 of the Income Tax Act (Income Tax Act, 2022) when calculating the payable income tax. Specifically, the companies of the research sample were filtered based on the simultaneous fulfilment of the conditions for presentation of consolidated financial statements and applying the super-deduction at least one year of the monitored period of 2015-2020, while financial companies were excluded due to their specific business object. The data on the applied super-deduction for research and development costs were filtered based on the lists of subjects applying the super-deduction of research and development costs published by the Financial Administration of the Slovak Republic (Financial administration, 2022). Consolidated annual reports (CAR) or individual annual reports (IAR) were sourced from the Register of financial statements, which is freely available on the Internet (Register of financial statements, 2022). The research sample of the investigated companies represents parent accounting entities, entrepreneurs, except for financial institutions. The research sample includes 7 parent accounting entities (parents), entrepreneurs with different business objects stated in Table 1.

**Table 1**. Overview of selected parent accounting units

| Name of parents | Headquarters of parents | SK NACE |
|---|---|---|
| Asseco Central Europe, as | Bratislava | 58.29.0 Other software publishing |
| Bekaert Hlohovec, as | Hlohovec | 24.34.0 Cold-drawing of bars |
| Hornotrianske bane Prievidza, as | Prievidza | 05.20.0 Mining of lignite |
| Slovenské elektrárne, a. s | Bratislava | 35.11.0 Production of electricity |
| TATRAVAGÓNKA as | Poprad | 30.20.0 Production of railway locomotives and rolling stock |
| US Steel Košice, s r o | Košice | 24.10.0 Production of pig iron and ferroalloys |
| Železiarne Podbrezová a s., as ŽP as | Podbrezová | 24.20.0 Manufacture of pipes, hollow profile pipes and related accessories |

Source: Register of Financial Statements, 2022.

The object of the analysis was annual reports (ARs) in those years of the examined period, in which parents had a super-deduction of research and development costs. ARs in the other years during the examined period, in which parents did not have a super-deduction of research and development costs, were not the object of the analysis.

At the company Tatravagónka, a. s, only individual annual reports were stored in the Register of Financial Statements for two years (2015 and 2016), and also at the company US Steal Košice, only individual annual reports were stored for three years (2015, 2016 and 2017) therefore, for these companies, IARs were analyzed instead of CARs. In total, 18 annual reports in pdf format were analyzed, namely 13 CARs and 5 IARs.

We monitored the information provided in the annual reports of examined parents about R&D based on a quantitative contextual analysis of ARs by using detection of the occurrence frequency of certain terms (also in the relevant word forms) related to information about research and development, namely: science; research; development/ innovation; project(s); super-deduction, deduction and total word count in the CARs or IARs. At Tatravagónka, a. s. it was not possible to find out the total number of words in five years (2015, 2016, 2017, 2019 and 2020), due to not allowing pdf conversion of the AR files to the document in which the total number of words could be determined.

## 3 Empirical results

The obligation to present consolidated financial statements is regulated in the Slovak Republic by Act No. 431/2002 Coll. on accounting (§ 22) (Companies Act, 2022). The obligation to present consolidated financial statements rests with the parent accounting entities for the consolidated whole. A consolidated entity is a group of accounting units regardless of their headquarters. A group of accounting entities consists of the parent accounting entity and all of its subsidiary accounting entities. Under certain circumstances, the parent accounting unit may be exempted from this obligation if it meets the specified criteria (so-called exemption from the obligation to present consolidated financial statements), however, this does not apply to business entities that are the subject of research in this paper.

A parent accounting entity is an accounting entity that has the required legal form (commercial company, state enterprise, cooperative) and has a decisive influence on another accounting entity that is a commercial company. Decisive influence arises from the existence of one of the defined rights, most often the majority of voting rights. An accounting entity in which the parent accounting entity has decisive influence is a subsidiary accounting entity.

Consolidated financial statements provide information on the financial situation, financial performance, cash flows and changes in the financial situation of a group. The parent accounting entity that prepares the consolidated financial statements is also obliged to prepare a consolidated annual report, while it is possible to combine data from the individual annual report and the consolidated annual report into one annual report according to the applicable accounting legislation. The consolidated financial statements and the consolidated annual report are subject to auditor verification.

The basic criterion for the analysis of the relevant CAR (or IAR, if CAR was not available) was the year in which the parent accounting entity applied the super-deduction of research and development costs when calculating the income tax payable. An overview of the individual years in which the parent accounting entities reported a super-deduction of research and development costs with its amount and the type of annual report, from which we subsequently drew the necessary data and information, are presented in Table 2.

**Table 2.** Claimed super-deduction and type of annual report in the examined sample

| Name of parents | Year of super-deduction | Amount of super-deduction in euros | Type of annual report |
|---|---|---|---|
| Asseco Central Europe, a. s. | 2019 | 163,270.13 | CAR |
| Bekaert Hlohovec, a. s. | 2017 | 31,627.00 | CAR |
| | 2018 | 188,388.64 | CAR |
| | 2019 | 301,597.66 | CAR |
| | 2020 | 375,890.77 | CAR |
| Hornonitrianske bane Prievidza, a. s. | 2015 | 18,017.00 | CAR |
| Slovenské elektrárne, a. s. | 2020 | 2,403,268.48 | CAR |
| TATRAVAGÓNKA a. s. | 2015 | 400,521.00 | IAR |
| | 2016 | 1,228,827.00 | IAR |
| | 2017 | 2,211,799.00 | CAR |
| | 2018 | 3,684,712.00 | CAR |
| | 2019 | 1,366,561.00 | CAR |
| | 2020 | 3,383,763.00 | CAR |
| US Steel Košice, s. r. o. | 2015 | 1,128,855.69 | IAR |
| | 2016 | 2,687,063.11 | IAR |
| | 2017 | 18,472,254.59 | IAR |
| Železiarne Podbrezová a. s., | 2018 | 83,339.28 | CAR |
| abbreviated as ŽP a. s. | 2019 | 3,096,759.15 | CAR |
| **Total amount** | **x** | **41, 226, 514.50** | **x** |

Source: Own processing

In 2015-2020, the examined parent accounting entities used a super-deduction of research and development costs in the total amount of 41, 226, 514.50 euros. The largest amount of super-deduction was applied by US Steel Košice, s.r.o., which applied a super-deduction in the amount of 22,288,173.39 euros within the period under review (2015-2017). The smallest amount of super-deduction was claimed in the period under review (in 2015) by Hornonitrianske bane Prievidza, a.s. in the amount of 18,017.00 euros. From the point of view of regularity, the situation with the company TATRAVAGÓNKA as in Poprad is interesting, which claimed a super-deduction of research and development costs in the examined period in each year, in the total amount of 12,276,183.00 euros. Figure 1 shows the average amount of applied super-deduction of research and development costs from the total examined sample.

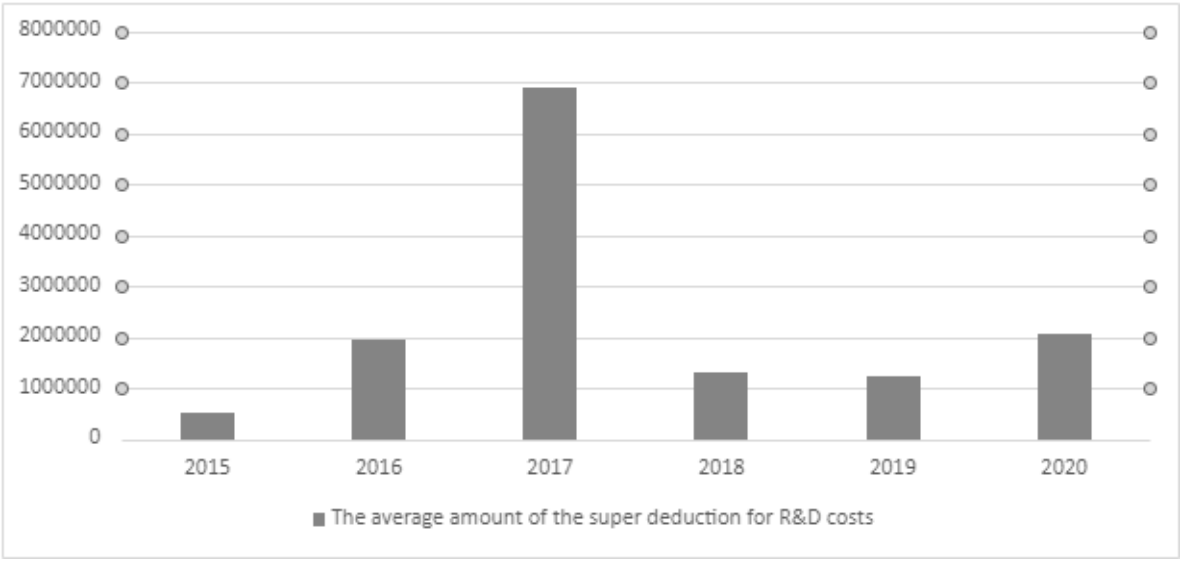


**Fig. 1.** Average values of applied super deduction (Source: Own processing)

As can be seen from figure 1, the lowest average value of the drawn super-deduction is in 2015, from 2015 to 2017 a gradual increase can be seen, and the highest value is in 2017, despite the fact that the super-deduction rate was only 25%. In 2018 and 2019 there was a significant decrease compared to 2017, even though the super-deduction rate was increasing to 100% (in 2018) and 150% (in 2019) and the increase occurs again in 2020. Despite the fact that the super-deduction had the highest rate in 2020, namely 200%, the rate of increase in the average amount of the super-deduction is not what we might expect.

**Table 3.** Absolute occurrence of the terms "science", "research" and "development"/"innovation" in the annual reports of the parent accounting entities

| Name of parents | Year | "Science" | "Research" | "Development"/ "Innovation" |
|---|---|---|---|---|
| Asseco Central Europe, a. s. | 2019 | 0 | 12 | 58/2 |
| Bekaert Hlohovec, a. s. | 2017 | 0 | 0 | 0/0 |
| | 2018 | 0 | 0 | 0/0 |
| | 2019 | 0 | 0 | 0/0 |
| | 2020 | 0 | 7 | 26/0 |
| Hornonitrianske bane Prievidza, a. s. | 2015 | 0 | 10 | 33/0 |
| Slovenské elektrárne, a. s. | 2020 | 3 | 29 | 46/0 |
| TATRAVAGÓNKA a. s. | 2015 | 0 | 0 | 0 |
| | 2016 | 0 | 0 | 0 |
| | 2017 | 0 | 0 | 0 |
| | 2018 | 0 | 0 | 0 |
| | 2019 | 0 | 1 | 11/0 |
| | 2020 | 0 | 0 | 0 |
| US Steel Košice, s. r. o. | 2015 | 0 | 9 | 10/0 |
| | 2016 | 0 | 12 | 9/0 |
| | 2017 | 0 | 17 | 13/0 |
| Železiarne Podbrezová a. s., | 2018 | 0 | 20 | 29/0 |
| abbreviated as ŽP a. s. | 2019 | 0 | 22 | 35/0 |
| **Total** | **x** | **3** | **139** | **270/2** |

Source: Own processing

Subsequently, on a selected sample of parent accounting entities in the years in which they applied the super-deduction, we analyzed the occurrence of terms associated with the presentation of information about research and development (science, research, development/innovation, project, deduction, super-deduction) in the annual reports. An overview of the occurrence of the searched terms "science", "research" and "development"/"innovation" in the examined periods in the respective annual reports is provided in Table 3.

The term "science" appeared in AR only 3 times, namely in CAR of the company Slovenské elektrárne, a. s. The term "research" (together in related forms of the word) appeared in AR a total of 139 times, 29 times again in the company Slovenské elektrárne, a. s. The terms "development/innovation" appeared the most (in related forms), namely the term "development" 270 times and the term innovation 2 times. The terms "development/innovation" was mentioned the most in the AR of Asseco Central Europe, a. s. (58/2). Table 4 shows the occurrence of the terms "project", "super-deduction" and "deduction" in ARs in the examined periods.

**Table 4.** The absolute occurrence of the terms "deduction" and "super-deduction" in the annual reports of the parent accounting entities

| Name of parent | Year | Project | Super-deduction | Deduction |
|---|---|---|---|---|
| Asseco Central Europe, a. s. | 2019 | 98 | 0 | 0 |
| Bekaert Hlohovec, a. s. | 2017 | 7 | 0 | 0 |
| | 2018 | 7 | 0 | 0 |
| | 2019 | 6 | 0 | 0 |
| | 2020 | 6 | 0 | 0 |
| Hornonitrianske bane Prievidza, a. s. | 2015 | 19 | 0 | 0 |
| Slovenské elektrárne, a. s. | 2020 | 105 | 0 | 0 |
| TATRAVAGÓNKA a. s. | 2015 | 0 | 0 | 0 |
| | 2016 | 0 | 0 | 0 |
| | 2017 | 0 | 0 | 0 |
| | 2018 | 13 | 0 | 0 |
| | 2019 | 14 | 0 | 0 |
| | 2020 | 0 | 0 | 0 |
| US Steel Košice, s. r. o. | 2015 | 23 | 0 | 0 |
| | 2016 | 34 | 0 | 0 |
| | 2017 | 30 | 0 | 0 |
| Železiarne Podbrezová a. s, | 2018 | 18 | 0 | 0 |
| abbreviated as ŽP a. s. | 2019 | 12 | 0 | 0 |
| **Total** | **x** | **392** | **0** | **0** |

Source**:** Own processing.

Among the terms "project", "super-deduction" and "deduction", only the term "project" (together with related forms of the word) appeared in the ARs of the selected parent accounting entities in the examined period, a total of 392 times. It occurred mostly in the CAR of the company Slovenské elektrárne, a. s., a total of 105 times. The terms "deduction" and "super-deduction" did not appear at all in the annual reports.

Figure 2 shows the absolute number and average number of occurrences (frequency) of monitored words in AR.

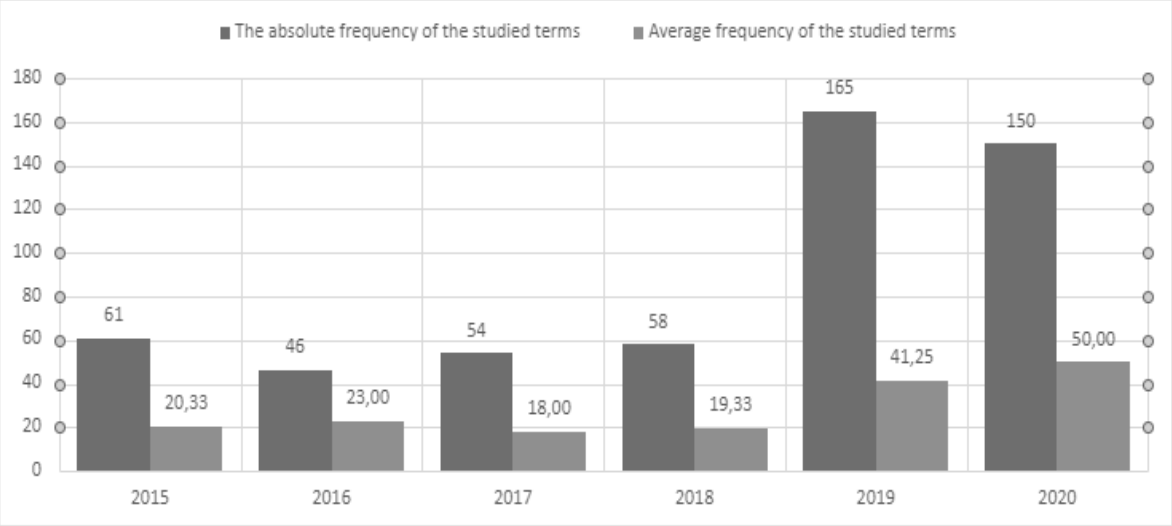


**Fig. 2.** The absolute and average frequency of the studied terms (SOURCE: Own processing)

The most monitored terms in absolute terms occurred in 2019, a total of 165 times. The monitored terms occurred the least in absolute terms in 2016, only 61 times. In average terms, the observed terms occurred most in 2020 and least in 2017.

We also monitored the total number of words in the particular ARs examined parent accounting entities. The total number of words could not be ascertained in all analyzed AR. The total number of words in the examined annual reports in which it could be found is presented in Table 5.

**Table 5.** Total number of words in the annual reports of parent accounting entities

| Name of parent | Year | Number of words in AR |
|---|---|---|
| Asseco Central Europe, a. s. | 2019 | 49,127 |
| Bekaert Hlohovec, a. s. | 2017 | 14,211 |
| | 2018 | 15,028 |
| | 2019 | 15,829 |
| | 2020 | 16,960 |
| Hornonitrianske bane Prievidza, a. s. | 2015 | 22,860 |
| Slovenské elektrárne, a. s. | 2020 | 95,510 |
| TATRAVAGÓNKA a. s. | 2015 | not detected |
| | 2016 | not detected |
| | 2017 | not detected |
| | 2018 | 10,592 |
| | 2019 | not detected |
| | 2020 | not detected |
| US Steel Košice, s. r. o. | 2015 | 6 186 |
| | 2016 | 8,962 |
| | 2017 | 9,818 |
| Železiarne Podbrezová a. s., | 2018 | 42,205 |
| abbreviated as ŽP a. s. | 2019 | 41,184 |
| **Total** | **x** | **x** |

Source: Own processing

The company Slovenské elektrárne, a. s. had the highest number of words in the AR among the AR where this data could be found. The total number of words in AR examined parent accounting entities cannot be ascertained, as in the case of the company TATRAVAGÓNKA, a. s. it was not possible to determine the number of words in some AR.

## Conclusion

The aim of the paper was to evaluate the extent of informing external users about research and development carried out by entrepreneurs forming a consolidated whole (group) in the Slovak Republic in 2015-2020 based on a quantitative contextual analysis of the consolidated annual reports of entrepreneurs applying the super-deduction of research and development costs. Under the conditions of the Slovak Republic, from 2015 to the present, the super-deduction is in the range of 25%-200%, and on average 3 consolidated units claimed it each year. The company U.S. Steal Košice, s. r. o. claimed the highest amount of super-deduction in the period under review (in the years 2015-2017). The company Hornonitrianske bane Prievidza claimed the smallest amount of super-deduction (in 2015). In the quantitative analysis of the frequency of occurrence of determining terms, as the chosen measure for evaluating the level of information provided in the annual reports, the terms "science", "research" and "project" appeared most frequently in the CAR of the company Slovenské elektrárne, a. s. Bratislava (in 2020). The terms "development/innovation" were most frequent in the CAR of Asseco Central Europe, a. s.

Although the company Slovenské elektrárne, a. s. (in the case of the terms "science", "research" and "project") and Asseco Central Europe, a. s. (the words development/innovation) did not belong to the subjects with the highest application of super-deduction, in their CAR the highest frequency of words occurred, which can be evaluated as a positive trend from the point of view of evaluating the quantitative analysis of the information provided. Although the company Slovenské elektrárne, a. s. (in the case of the terms "science", "research" and "project") and Asseco Central Europe, a. s. (the terms "development/innovation") did not belong to the subjects with the highest application of super-deduction, in their CAR the highest frequency of words occurred, which can be evaluated as a positive trend from the point of view of evaluating the quantitative analysis of the information provided.

The research of 18 consolidated annual reports shows that in the case of 7 mother companies the dependency of the amount of super-deduction and examined terms frequency as a factor identifying the scale of R&D information provision was not determined. In addition to extending the research to other companies, the researched issue of providing information on corporate research and development will also require research in the field of qualitative analysis of information, not only in relation to the amount of the super-deduction but also in relation to the form and method of ownership of companies and the focus of the object of research and development.

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# UKRAINE AS THE EU CANDIDATE STATE: OPPORTUNITIES AND CHALLENGES

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**Abstract**
Ukraine has been pushing for an enhanced strategic momentum for its integration with the European Union (EU) since the gaining the independency in the year 1991. In 2014, Ukraine signed its Association Agreement, including the Deep and Comprehensive Free Trade Area, with the EU. Eight years on, mutual relationship faces new and fundamental challenges. Russia's invasion of Ukraine in February 2022 poses to the EU and whole Europe the gravest security crisis since the World War II. The EU has demonstrated unity, solidarity and also, to a certain extent, resolve in its response. Nevertheless, Ukraine's application for membership found the EU almost unprepared, just as it was not prepared for the war itself. This paper provides the overview of the key milestones of EU-Ukrainian relations and discuss the Ukraine's candidate status and thus both opportunities and the risks associated with the entry to the EU. Ukraine's EU membership would bring both advantages and disadvantages. However, the current barriers to Ukraine's accession to the EU include war conflict, problems with corruption, level of economy, necessary reforms and the very attitude of some member states to future EU enlargement.

**Keywords**
EU, candidate country status, relations, Ukraine

**JEL classification**
F02, F51, 052

## Introduction

Since the foundation, the European integration has gone through prosperous development under the European or world historic events, such as the collapse of centrally planned economies and their transformation and subsequent accession to the EU, economic growth and rising the living standards but also many crises and challenges such financial and economic crisis followed by Eurozone debt crisis, migration crisis, security crisis (terrorism, regional conflicts), Brexit or Covid-19 crisis. One of the current hot challenge is Ukraine crisis related with other consequences as the security, including energy security, and stability of the European region with the question of the EU future enlargement, see e.g. Sucháček, 2014; Kaňa, Mynarzová, 2016; Melecký, Staníčková, Hančlová, 2019; Navrátil 2016.

Interest of the EU in the neighbouring countries is motivated among other efforts to eliminate the threat of economic, political and security nature that influence the development inside the EU. The second motive is to spread European values and to create around the EU a space of stable political, democratic systems and enhances the EU's presence on the global stage. The EU enlargement policy, together with European Neighbourhood Policy therefore belongs to those policies that should be intensively developed. (Navrátil, 2016)

There have been seven waves of the EU enlargement (1973–2013). Since Croatia became the 28th Member State of the EU, no other countries have joined the EU, but the UK left the EU on 31 January 2020. There are *five candidate countries*[1] – Montenegro, Serbia, Albania, the Republic of North Macedonia and Turkey, while Bosnia and Herzegovina and Kosovo are potential candidate countries.

With other six Eastern European and South Caucasus countries – Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and *Ukraine* the EU cooperates within the *Eastern Partnership*[2] (EaP). Security, stability and prosperity, democracy and rule of law are a priority for the EU. The EU

[1] Iceland applied for the EU membership in 2009 and was recognized as a candidate country in 2010, but accession negotiations have been on hold since 2013. In 2015, Iceland requested to no longer be regarded as a candidate country.
[2] Since 2019, EaP has been a specific Eastern dimension to the European Neighbourhood Policy. As of 28 June 2021, Belarus has suspended its participation in the EaP.

is committed to having strong, differentiated and mutually beneficial cooperation with all six EaP partners. EAP does not ensure the membership of the EU but it offers a solid framework for multilateral co-operation (strengthening institutions and good governance, including resilience to external changes; developing market opportunities through economic integration and trade agreements; ensuring energy security and improving interconnection for energy and transport; enhancing mobility and contacts between people with visa dialogue negotiations) and facilitates deepening of the bilateral cooperation (including new generation of association agreements**,** deep and comprehensive free trade area as part of the association agreements, visa liberalisation dialogues). (Council of the EU and the European Council, 2022a) Ukraine, Georgia and Moldova tried to establish cooperation with the EU most actively. It is no coincidence that these are three countries that have an unresolved conflict with Russia. These states therefore benefit by far the most from the initiative. For all three, the visa requirement for short-term trips to the Schengen area was gradually abolished and they signed an association agreement with the Union. This allows them access to the common EU market, but at the same time requires them to implement a number of EU standards. (Lebduška, 2019) With the Ursula von der Leyen's European Commission (since 2019), the Eastern Partnership as a political priority in the agenda receded into the background. However, the COVID-19 pandemic, and above all the crisis in Ukraine, fundamentally changed the importance of cooperation. Ukraine (on 28 February 2022), Moldova and Georgia (both on 3 March 2022) applied for the EU membership in the wake of the Russian attack against Ukraine on 24 February 2022.

In line with the previous text, the main aim of the paper is to provide the overview of the key milestones of EU-Ukrainian relations and discuss the Ukraine's candidate status and thus both opportunities and the risks associated with the entry to the EU. The paper does not seek to explain the whole background of EU-Ukrainian political and economic relations, but to present the current perception of the possibility and challenges of the potential of the EU enlargement.

## 1 EU Enlargement process

As the Article 49 of the TEU established, any European country[3] that respects the values referred to in Article 2[4] and is committed to promoting them may apply to become a member of the EU. Countries can join the EU after they have fulfilled a set of political and economic conditions. This accession process is complex and can take several years. (European Parliament, 2021). The decision on new EU membership is taken unanimously by the Council, after consulting the Commission and getting Parliament's consent. (European Parliament, 2022)

Successive enlargements led the EU to adapt its institutions and decision-making processes to the arrival of new members and ensure that enlargement would not come at the expense of efficient, accountable policymaking. The Treaty of Lisbon (2009) introduced profound changes to the composition and work of the main EU institutions. Some of these changes reflected the need for a sustainable set of rules that do not require new amendments with every new enlargement. (European Parliament, 2021) To invigorate and accelerate the accession process, the Council of the EU and the European Council endorsed a new enlargement methodology in March 2020. The new methodology allows candidate countries more opportunities for enhanced integration measures on the condition that countries have made sufficient reform progress. If countries make progress on reform priorities, it should lead to:

- closer integration of the country with the EU, work for accelerated integration and "phasing-in" to individual EU policies, the EU market and programmes, while ensuring a level playing field;

[3] Country must be located "geographically on the European continent", though there is no official definition for this.

[4] Article 2 of TEU says: The Union is founded on the values of respect for human dignity, freedom, democracy, equality, the rule of law and respect for human rights, including the rights of persons belonging to minorities. These values are common to the Member States in a society in which pluralism, non-discrimination, tolerance, justice, solidarity and equality between women and men prevail.

- increased funding and investment opportunities, including through a performance-based and reform-oriented instrument for pre-accession support and closer cooperation with international financial institutions to leverage support.

Should a candidate country stagnate or backslide on reforms, the methodology allows for the possibility of sanctions in response. (Council of the EU and the European Council, 2022b)

### 1.1 Accession process

A country that wishes to join the EU addresses its application to the Council, which asks the European Commission (EC) to submit an opinion. The European Parliament (EP) is notified of this application. If the EC's opinion is favourable (the EC can take months or years to consider a country's application), it is then confirmed by a vote in the EP (a majority of members of the EP have to be in favour). Finally, the European Council is required to decide (by unanimity) to grant the country. (Council of the EU and the European Council, 2022b; Institut Montaigne, 2022)

The opening of accession negotiations is decided on by the European Council (again by unanimity) upon a recommendation of the EC, once the candidate country sufficiently meets the *Copenhagen political criteria*[5], and possible other conditions (European Commission, 2015):

- *political criteria*: stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities,
- *economic criteria*: a functioning market economy and the capacity to cope with competition and market forces,
- *administrative and institutional capacity* to effectively implement the EU acquis (body of common rights) [6] and *ability to take on the obligations* of EU membership.

In order to start negotiations, the candidate country only needs to meet the political criterion. The other criteria can be met during the negotiation phase. There is also a *fourth consideration*: the EU must have the capacity to absorb a new member. (Institut Montaigne, 2022)

The European Commission is responsible for negotiating the accession of the candidate country. To facilitate the negotiations, the sum of EU legislation (the acquis communautaire) is divided into more than 30 policy chapters, each corresponding to a policy area. The first step in negotiations is called screening; its purpose is to explain the acquis to the candidate and to identify areas in need of alignment in its legislation, institutions or practices. As a basis for launching the negotiation process, the Commission delivers a screening report for each chapter. On the basis of the EC's recommendation, the Council decides by unanimity whether or not to open new negotiation chapters. Whenever progress is judged satisfactory, the EC may recommend "provisionally closing" a chapter. The Council again decides by unanimity. EU accession negotiations operate on the principle that "nothing is agreed until everything is agreed", so the definitive closure of chapters occurs only at the end of the entire negotiating process. The EC outlines the progress of candidate countries in yearly reports.

When negotiations on all the chapters are completed, the terms and conditions – including possible safeguard clauses and transitional arrangements – are incorporated into an accession treaty between the EU members and the acceding country. Only after EP's consent and the Council's unanimous approval can the accession treaty be signed. It is then submitted by all contracting states for ratification, in accordance with their constitutional requirements (i.e. ratification by parliament or referendum).

Once the accession treaty has been signed, the acceding state is entitled to certain provisional privileges. It acquires "active observer status" in most EU bodies and agencies, where it is entitled to

[5] Named after the 1993 Copenhagen European Council which defined them.

[6] The Madrid European Council in 1995 also added that the candidate states for are not only responsible for transposing the EU acquis into their internal law, but are also responsible for establishing the administrative and legal structures in charge of implementing the legislation they have harmonized and this was presented as a new condition for accession. This administrative capacity criteria are also called the Madrid Criteria. (Republic of Türkiye Ministry of Foreign Affairs, Directorate for EU Affairs, 2020)

speak, but not to vote; it can comment on draft EU proposals, communications, recommendations or initiatives. Once the ratification process is complete, the accession treaty enters into force on its scheduled date, and the acceding state becomes the EU member.

### 1.2 Current state

Five Western Balkan countries and Turkey are at different stages of the accession process. As it can be seen from table 1, from application for membership to starting the negotiations or to membership it takes years. At present, Montenegro and Serbia are farthest along in their accession negotiations. To date all 33 screened negotiating chapters with Montenegro have been opened, but only 3 have been provisionally closed. Serbia has opened 18 out of 35 negotiating chapters, of which 2 have been provisionally closed. Since December 2019, Serbia has not opened any new chapters. Although the EU approved opening accession talks with Albania and North Macedonia in March 2020, the two countries have encountered hurdles in advancing to the next step[7]. The situation changed on 19 July 2022 when the EC has started of the accession negotiations. Officially, the process was kicked off with the presentation of the negotiating frameworks, which will allow the EU head office to screen how well each nation is prepared to take on all the laws, rules and regulation of the bloc. EU decided to open accession talks with Turkey in 2005, but progress in the negotiations has been slow and negotiations with Turkey have been essentially frozen since 2018 amid heightened tensions with the EU about democratic backsliding in the country, disputes in the Eastern Mediterranean, and other issues. (Szucs, 2022; Brzozowski, 2022; European Parliament, 2021)

**Table 1.** Current state of accession process of EU candidate states

| | MNE | SRB | ALB | MKD | TUR | MDA | UKR |
|---|---|---|---|---|---|---|---|
| Application year for membership | 2008 | 2009 | 2009 | 2004 | 1987 | 2022 | 2022 |
| Year of candidate status | 2010 | 2012 | 2014 | 2005 | 1999 | 2022 | 2022 |
| Starting year of negotiations | 2012 | 2014 | 2022 | 2022 | 2005 | Not decided | Not decided |

Note: MNE – Montenegro, SRB – Serbia, ALB – Albania, MKD – North Macedonia, TUR – Turkey, MDA – Moldova, UKR – Ukraine

Source: Congressional Research Service, 2021; own processing, 2022

The EU also considers the remaining two Western Balkan states of Bosnia and Herzegovina (BiH) and Kosovo to be potential future EU candidates. In the case of BiH a shift of focus to economic governance allowed the entry into force of the Stabilisation and Association Agreement (SAA) with the EU in June 2015. In February 2016, BiH submitted its membership application. In May 2019, the Commission published its opinion, including a list of 14 key priorities, on the basis of BiH's replies to a comprehensive questionnaire. Five Central European countries (C5) – Hungary, Czechia, Slovakia, Austria and Slovenia have called on the EU to grant candidate status to BiH at the beginning of July 2022. According these countries, BiH should receive candidate status if possible during the Czech presidency of the EU, in the second half of year 2022. An SAA between the EU and Kosovo entered into force in April 2016. Kosovo has long been mired in an internal crisis that threatens to result in the dissolution of the Republic. (ČTK, 2022; European Parliament, 2021; Congressional Research Service, 2021)

[7] The opening of negotiations has been stalled since 2020 because of a dispute between Skopje and Sofia over linguistic and historical matters and France blocked the opening of accession negotiations with Skopje and Tirana until a new methodology for future enlargement was agreed at EU level.

## 2 Methodology and data

The paper is based on research investigation of description type. To achieve the goal of paper, the general logical methods of analysis and synthesis of secondary data are used. Literature review and analysis consider the European research studies, discussion papers and statements of European government or research institutions. The article uses also the SWOT analysis – methodology which enables to determine the main four directions: strengths, weaknesses, opportunities and threats.

## 3 Relations between the European Union and Ukraine

Ukraine has been pushing for an enhanced strategic momentum for its integration with the EU since the gaining the independency in the year 1991. Ukraine is a priority partner for the EU within Eastern Partnership. The EU supports Ukraine in ensuring a stable, prosperous democratic future for its citizens and is unwavering in its support for Ukraine's independence, territorial integrity and sovereignty. (EU Neighbours east, 2018). Russia's invasion of Ukraine in February 2022 poses to the EU and whole Europe the gravest security crisis since the World War II and opens new questions about security, defence and EU enlargement at the level of the EU and particular member states. (European Commission, 2022)

### 3.1 Key milestones of EU-Ukraine Relations

In 1994, Ukraine had already signed EU-Ukraine Partnership and Cooperation Agreement (into force in March 1998). The debate between the Russian and the European model of state-building unfolded especially since Ukraine's Orange Revolution in 2004. (Nehring, 2022) The Orange Revolution in 2004 against electoral fraud and corruption was also about the orientation towards the West and integration with the EU.

New legal basis and framework for EU-Ukraine relations is established by the EU-Ukraine Association Agreement (AA). It is the main tool for bringing Ukraine and the EU closer together, promoting deeper political ties, stronger economic links and respect for common values. An Association Agreement, including a Deep and Comprehensive Free Trade Area (DCFTA), was negotiated in 2007–2011 and initialled in 2012. In December 2012, the Council of the European Union adopted Conclusions on Ukraine that affirmed the EU's commitment to signing the Agreement as soon as Ukraine had taken determined action and made tangible progress towards achieving the benchmarks set out in the Conclusions. (Ministry of Foreign Affairs of Ukraine, 2021) The decision in late 2013, of the then-President (pro-Russian Viktor Yanukovych) not to sign, the AA, which symbolised for many Ukrainians a path towards the EU, led to large-scale protests against the authorities. Subsequently, the Russian Federation moved against Ukraine, not accepting the independent choice of the Ukrainian people. In the aftermath of so-called the Revolution of Dignity (Euromaidan), Russia illegally annexed Crimea and backed illegal armed groups in east Ukraine. The EU and the international community condemned these grave breaches of international law, and subsequently the EU imposed sanctions against the Russian Federation. (European Commission, 2022)

The EU and new Ukraine's government signed the political provisions of the AA in March 2014, underlining commitment to proceed with the signature and conclusion of the remaining parts of the AA. Following the completion of technical preparations, the EU and Ukraine signed the remaining provisions of the AA in Brussels in June 2014. Provisional application of important parts of the EU-Ukraine AA began in November 2014: on the respect for human rights, fundamental freedoms and rule of law; political dialogue and reform; justice, freedom and security; economic and financial cooperation. The AA could enter into force once all EU members and Ukraine have ratified it. The DCFTA has offered Ukraine a framework for modernising its trade relations and for economic development by the opening of markets via the progressive removal of customs tariffs and quotas, and by an extensive harmonisation of laws, norms and regulations in various trade-related sectors.

This will create the conditions for aligning key sectors of the Ukrainian economy to EU standards. (European Commission, 2022)

While losing control over part of its territory and suffering human and economic losses because of the conflict in the eastern part of the country (Donbas), Ukraine continued throughout the years as a resilient democracy moving closer to the EU and gradually aligning with the acquis. This process culminated in the coming into force of the AA in September 2017, visa-free travel to the Schengen area (June 2017) and the landslide victory of the former TV comedian Volodymyr Zelensky in the presidential elections in 2019. (Nehring, 2022)

On 28 February 2022, four days after Russia's unprovoked attack on his country, President Zelensky formally applied for EU membership. Four months later, 17th June 2022, the EC recommended to the Council that the country should be granted candidate status on the understanding that steps are taken in a number of areas. With 529 votes to 45 and 14 abstentions, EP adopted on 23 June 2022 a resolution calling on the heads of state and government to grant EU candidate status to Ukraine and the Republic of Moldova "without delay". They should do the same with Georgia "once its government has delivered" on the priorities indicated by the EC. As well as the EP insisted that there is no "fast-track" for EU membership and that accession remains a merit-based and structured process, which requires EU membership criteria to be fulfilled and is dependent on the effective implementation of reforms. The leaders invited the EC to report to the Council on the fulfilment of the conditions specified in the Commission's opinions on the respective membership applications. European Parliament demanded that the enlargement process be unblocked as regards the Western Balkans. (European Parliament, 2022)

Although the majority of the EU states support Ukraine in its war efforts, there is no longer such a consensus regarding membership in the EU. From the beginning of the war, only a small group of countries, mainly from Central and Eastern Europe, showed clear support for candidate status, other states were more reserved or proposed alternative methods of European integration. Austrian Foreign Minister declared in April 2022 that Ukraine should not be allowed full membership in the EU, as the Western Balkan states have been trying to join for a long time. Germany, Denmark, France and the Netherlands are also opposed to any accelerated accession process. The Netherlands was the last country to approve the AA with Ukraine. However, The Netherlands asked for guarantees that the ratification would not be a formal step on the way to Ukraine's EU membership and Union would not commit itself to military aid to Kyiv. These countries subsequently reassessed their positions and on 23 June 2022, the European Council decided the EU candidate status to Ukraine and Moldova. Both countries are now waiting on the Council and EP to give them the green light to begin talks.[8]

### 3.2 SWOT analysis of Ukraine's accession to the EU

Specific strengths, weaknesses, opportunities and threats of Ukraine's accession to the EU could be summarized by SWOT analysis that represents Table 2.

[8] The European Council is ready to grant candidate status to Georgia once the priorities specified in EC's opinion on Georgia's membership application have been addressed.

**Table 2.** SWOT analysis of the Ukraine's accession to the EU

| Strengths | Weaknesses |
|---|---|
| Citizens support accession to the EU.<br>EU candidate status – access to the EU funds.<br>International financial and political support.<br>Favourable geographical location and logistics opportunities.<br>Natural resource wealth.<br>Gradually approximation to substantial elements of the EU acquis.<br>Economic cooperation with the EU based on AA/DCFTA.<br>Large size of goods market.<br>Low government deficit and debt level.<br>High level of educated and skilled workers and low-cost labour force. | Conflict with Russia and needs of post-war reconstruction.<br>Low level of economic development, competitiveness and administrative capacity.<br>High level of corruption, oligarchy.<br>Lack of approximation to some areas of the EU acquis.<br>Managed float of the hryvnia, restrictions on capital movements.<br>Low efficiency of goods markets.<br>Low level of financial market development. |
| **Opportunities** | **Threats** |
| Stabilization of the political situation and democratic system, national and European security.<br>More weight for Ukraine and for the EU in global affairs.<br>Access to single market and customs union – economic growth leading to higher living standards, development of SMEs.<br>Additional investment inflow into economy, creation of new jobs, the development of innovative industries.<br>Potential for the development of tourism, energy industry, and agriculture. | Uncertainty about the relationship with Russia and position in international space.<br>Internal political instability. Populist pressure.<br>Competitive pressure from the EU market.<br>Loss of competitiveness, public deficit and debt growth.<br>Outflow of the highly skilled persons.<br>Requests within the EU for the stiffening of the membership criteria. |

Source: own processing, 2022

*Strengths* – Citizens support accession to the EU, when the number of Ukrainians who want to join the EU rose to a record high of 91% by the end of March 2022 (for the past three years support for EU membership mostly has hovered around 60%) (Reuters, 2022). EU candidate status allows to Ukraine uses the EU funds (and other international financial and political supports although conditional on reforms) supporting the reforms and transition processes. Ukraine is home to Europe's richest known uranium deposits, Europe's largest iron ore deposits, significant titanium deposits and fertile fields. There is also potential of large reserves of natural gas. Ukraine is a highly industrialized country – it is the first producer of ammonia in Europe and is an important producer of steel and gallium. Ukraine is an important exporter of wheat, barley, corn and sunflower oil. Besides of natural resource wealth Ukraine offers a large size of market (almost of 44 mil. inhabitants). As economic advantage is seen a low government deficit and debt level which is below the EU average level. Competitive benefits of the national economy of Ukraine are high-level education and, consequently, highly skilled workers. Since 2014, the EU has become Ukraine's main trading partner and so implementation of the EU-Ukraine AA/DCFTA has brought the positive progressed in economic integration. In total trade in goods and services in 2020, the share of the EU was 41%. Exports of goods and services from Ukraine to the EU amounted to 21.9 bln. USD, and imports from the EU amounted to 26.3 bln. USD, thus, the negative balance amounted to 4.4 bln USD. In 2020 the main trade partners of Ukraine in the EU were: Germany, Poland, Italy, the Netherlands, Hungary, France or the Czech Republic (Ministry of Foreign Affairs of Ukraine, 2021). As regards the capacity to

fulfil the obligations of membership, Ukraine has worked since 2016 on the implementation of the AA/DFCTA that already capture an unprecedented amount of the EU acquis. Ukraine has gradually approximated to substantial elements of the EU acquis across many chapters. It has an overall satisfactory track record of implementation.

*Weaknesses* – Conflict with Russia and subsequent post-war reconstruction (with economic and social impacts) slow down reforms and transition processes. Ukraine is well advanced in reaching the *political criteria* as the stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities, but there many procedures that need to be enhanced or reformed. For example, Constitutional Court of Ukraine (CCU) is still in urgent need of reform where main point is the introduction of a credible and transparent selection procedure for appointments of judges to the CCU, including an integrity check. Further the fight against corruption, in particular at high level, has to be strengthen, the selection process and appointment for a new Director of the National Anti-Corruption Bureau of Ukraine should be launched and completed, the Anti-Oligarch law to limit the excessive influence of oligarchs in economic, political, and public life should be implemented, anti-money laundering procedures need to be enhanced or the media law introducing the norms of the EU audiovisual media services directive into Ukrainian legislation must be accepted. (European Commission, 2022) According to the *economic criteria*, the macroeconomic situation in Ukraine should cope with parameters of the GDP growth, GDP per capita, foreign direct investment, corruption, support of business environment (high administrative burden on business) and overall competitiveness of economy (low economic diversification, sensitivity to weather and commodity prices), as indicators in Table 3 demonstrate. The weakest aspects of Ukraine's economy are also low efficiency of goods markets (the burden of customs procedures, low effectiveness of anti-monopoly policy, extent and effects of taxation), low level of financial market development or credit constrained by doubtful loans and high real interest rates. Despite planned massive investments in post-war reconstruction, it will take Ukraine many years (or rather decades) to catch up economically with even the poorest EU countries. To improve the functioning of market economy Ukraine needs to continue in structural reforms: remove corruption, reduce persistent influence of state (weak democratic institution, monopolies) and of oligarchs, strengthen private property rights, enhance labour market flexibility, improve educational outcomes and spur innovation. In some areas of AA/DCFTA the approximation to the EU acquis is still limited, for example, the area on intellectual property rights, social policy and employment, transport sector, agriculture and rural development, etc. (European Commission, 2022)

**Table 3.** Main macroeconomic indicators of EU candidate states and EU-27

| | MNE | SRB | ALB | MKD | TUR | MDA | *UKR* | EU-27 |
|---|---|---|---|---|---|---|---|---|
| Population (mil., 2021) | 0.6 | 6.8 | 2.8 | 2.1 | 85.1 | 2.6 | 43.8 | 447.0 |
| GDP (current USD, bln, 2021) | 5.8 | 63.1 | 18.3 | 13.9 | 815.3 | 13.7 | *200.1* | 17,088 |
| GDP per capita (current USD, 2021) | 9,367 | 9,215 | 6,494 | 6,720 | 9,586 | 5,314 | *4,835* | 38,234 |
| GDP growth (annual %, 2021) | 12.4 | 7.4 | 8.5 | 4.0 | 11.0 | 13.9 | *3.4* | 5.4 |
| General government deficit/surplus (% GDP, 2020) | -10.1 | -8.4 | -6.9 | -5.4 | -2.7 | -8.0 | *-3.4* | -6.8 |
| General government gross debt (% GDP, 2020) | 103 | 57 | 78 | 52 | 42 | 32 | *49* | 90 |
| Unemployment rate (% of total labour force, 2021) | 18.5 | 11.8 | 11.8 | 16.2 | 13.4 | 4.0 | *8.9* | 7.0 |
| Inflation, consumer prices (annual %, 2020) | 2.4 | 4.1 | 2.0 | 3.2 | 19.6 | 5.1 | *2.7* | 2.6 |
| Foreign direct investment, net inflows (% of GDP, 2020) | 11.0 | 6.5 | 7.1 | 0.1 | 1.1 | 1.3 | *0.2* | 2.1 |
| Corruption Perceptions Index 2021 (the rank from 180 countries) | 64 | 96 | 110 | 87 | 96 | 105 | *122* | 1* |
| Doing Business 2020 (the rank from 190 countries) | 50 | 44 | 82 | 17 | 33 | 48 | *64* | 4** |
| Global Competitiveness Index 4.0, 2019 (the rank from 141 countries) | 73 | 72 | 81 | 82 | 61 | 86 | *85* | 4 *** |

Note: *Denmark, Finland; ** Denmark; *** Netherlands

Source: World Bank Group, 2022; Trading Economics, 2022; Transparency International, 2022; World Bank Group, 2020; World Economic Forum, 2019; own processing, 2022

*Opportunities* – EU guarantee of the territorial integrity and independence of its members would make Ukraine and Europe safer, more stabilized and more prosperous place. Ukraine would become a member of the largest trade bloc in the world, the common market and the customs union, and would also gain access to the common EU budget and subsidy funds for its development. The benefits of the common market are considerable: economic growth leading to higher living standards, safer consumer goods, lower prices and greater choice in sectors such as telecommunications, banking and air travel, etc. It would bring also higher diversification of Ukrainian economy and potential for the development of tourism, energy industry, and agriculture.

*Threats* – Uncertainty about the relationship with Russia aggravates the Ukraine's position in international space (e.g. entry into NATO, new conflicts) and it could slow down reforms and transition processes. Also, internal political instability and populist pressure could slow down accession to the EU. Competitive pressure from producers from the EU market could lead to loss of competitiveness of some industries, public deficit and debt growth. High skilled workers together

with low salaries would led to outflow abroad. Partially Ukraine would lose sovereignty. A threat is also posed by the inconsistent position of member countries (caused by various political, economic and social reasons), their low willingness to accept new members, and potential demands for stricter accession criteria.

## Conclusion

Over the years the process of the EU enlargement has helped transform many European states into functioning democracies, market economies and more affluent countries. Ukrainian request to become EU candidate state was accepted after 4 months that represents the shortest time of acceptation in comparison with the Balkan states. This is only the first step of the long accession process that includes a series of phases that help prepare Ukraine for eventual membership and negotiations between the EU and the country. The EU membership would bring for Ukraine both opportunities and obligations. However, the current barriers to Ukraine’s accession to the EU include war conflict, problems with corruption, the level of economy, necessary reforms and the very attitude of some member states to future EU enlargement. It is highly unlikely that even after a long time since the end of the war and after war reconstruction, Ukraine would meet the criteria that would allow it to start negotiations. For a number of reasons, Ukraine is an even more complicated case than the Balkan countries those convergence with the EU has been going on for 20 years. Ukraine’s recognition as a candidate country does not guarantee its future EU membership. But it represents a significant breakthrough at a time when Ukrainians are defending their country against Russian invasion and together it can be seen as reaction on the current geopolitical situation. This EU symbolic decision is important, but at the same time, the Western Balkans should not be neglected, so that the accelerated process of European integration of Ukraine (and Moldova) does not frustrate and demotivate the Balkan countries to carry out further reforms and give the space to other power in this region, as can be seen in case of China in Montenegro and Russia in Serbia.

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# TECHNOPHOBIA AND TECHNOSTRESS IN OLDER ADULT EMPLOYEES AS A CHALLENGE FOR HUMAN RESOURCE MANAGEMENT

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**Abstract**
Technophobia, technostress, computer or techno anxiety, along with cyberphobia, techno-pessimism and technology-induced stress have been the subject of research in the last few decades. Technophobia (a fear of modern technology) is the dominant factor explaining digital divides between groups in terms of ICT access, use and knowledge. Our research has found that technophobia and technostress is more common among older adults. This study is related to older adult employees and the challenge they present for the management of human resources and describes strategies to reduce technophobia and technostress. The objective of this paper is to explore and describe strategies to reduce technophobia and technostress in older adult employees and suggest possible interventions by human resources management. The results showed three themes: 1) Human capital development through job training and education, 2) Be active in supporting ageing employees to facilitate the prevention of ageism, and 3) Incorporating diversity as sustainability. These results suggest that technophobia and technostress are key factors in explaining digital divides among older adults, and thus ought to be considered a threat to well-being in older adulthood.

**Keywords**
Human resources management, Older adults, Technophobia, Technostress, Thematic analysis

**JEL classification**
A00, P46, E24, E20

## Introduction

The workplace has experienced significant changes as a result of Information and Communication Technologies (ICTs) and the subsequent digital transformation. Gaudioso et al. (2017) emphasised that the introduction of ICTs can pose a threat to both a company and its employees through misuse, abuse, and overuse, resulting in technostress. Technophobia (a fear of modern technology) is the dominant factor explaining digital divides, namely, inequalities between groups in terms of ICT access, use and knowledge. Research has found that technophobia is more common among older adults. Brivio et al. (2018) stressed that the economic crisis has had two paradoxical effects that indirectly may have contributed to the raise of technostress. On the one hand, the crisis reduced the number of the total hours worked, reducing the resources needed; on the other hand, it increased the pressure on the workers. Corporations reduced available personnel - and thus tasks and activities increased for those remaining - and introduced new technologies to support their employees, requiring them to deal with a higher workload and with managing new and more complex flows of information. To achieve sustainable development in the economic, social, cultural and environmental dimensions, it is necessary to use the potential of the information society, while at the same time eliminating threats and dangers. ICT is understood as a diverse combination of software and hardware performing various functions together, including information creation, storing, processing, preservation and delivery, in a growing diversity of ways (Nord et al., 2017). The term 'ICT' covers computers, the internet and mobile technologies, in addition to applications that can be used to support the daily life

of household members. The transposition of face-to-face work activities into cyberspace creates a type of social exclusion since only part of society is able to maintain its employment and income (Medeiros et al., 2020).

Technophobia, technostress, generalised digitalisation anxiety, computer or techno anxiety, along with cyberphobia and technology-induced stress, are considered the dark side of using digital workplace technologies (Marsh et al., 2022; Pfaffinger et al., 2020; Agogo and Hess, 2018). According to Nestik et al. (2018) technophobia includes cognitive, emotional and behavioural components. As well as individual factors (self-efficacy, open-mindedness, anxiety level, user experience, emotional state, etc.), the formation of technophobia is influenced by interpersonal factors (communication with colleagues, friends and relatives on the subject of technologies), group and intergroup factors (clash of interests among different relevant groups in connection with the appearance of new technologies, group stereotypes – representations of typical users of the given technology, its developers, etc.), as well as societal factors (mass culture and mass media, the level of technological and economic development of a country, cross-cultural features).

In 1984, the concept of technostress appeared for the first time (Brod, 1984); Brod defined the term technostress as, "a modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner ". This definition has been modified by several researchers in the last decade (Wang et al., 2008, Chiappetta, 2017; La Torre et al., 2019). While technophobia refers to one's emotional reaction towards ICT use, technostress is a general construct that describes the direct and indirect impacts of ICT (Nimrod et al., 2022).

Technophobia and technostress are now affecting more and more individuals and the consequences are considered to be very serious. Technostress can be understood as the stress experienced when working with computers, which can worsen and lead to an outbreak of technophobia. At the other end of the scale is technosis, or over-identification with technology, in which the boundaries between man and machine are blurred and one loses one's own identity (Židková, 2004). Technophobia and technostress are growing phenomena resulting from the ubiquitous use of ICT in modern society. The terms refer to the consequences of their widespread application on people's physical and mental health. It is a broad and serious issue that has multiple components. Some of these are relatively easy to explain, while others are complex and hidden in people's subconscious mechanisms. It is important to uncover and investigate these mechanisms in order to more effectively prevent the risks of technophobia and technostress (Pertinant, 2022).

Thus, we will explore and describe strategies to reduce technophobia and technostress by older adult employees and suggest interventions for human resources management. Specifically, this study focussed on the question: "What kind of strategies can human resources management use to reduce technophobia and technostress in older adult employees?" The follow-up questions to the major research question are:

*RQ1: What novel approaches and interventions can potentially reduce the technophobia and technostress experienced by older adult employees?*

*RQ2: What are the documented possibilities of older adult employees who have experienced challenges with coping and adapting to demands to use digital technologies?'*

## 1 Theoretical background

Older adults are particularly vulnerable to internet-related social exclusion because they tend to use the internet less than younger adults. In addition, they very often need educational support in order to participate in the information society (Seifert et al., 2018).

Passarelli et al. (2016) defined digital exclusion as the exclusion that threatens individuals in terms of access to and use of digital technologies. Schejter et al. (2015) explained that digital exclusion includes unequal access to ICT and different abilities when using information and communication technologies that are considered essential for full participation in society. Van Dijk (2005) identifies a gradual embedding relationship between social inequalities and unequal access to digital

technologies. The definition of digital exclusion has changed in recent years, as authors' positions based on a simple understanding of 'user/non-user' of modern technology and 'having/not having' the internet have shifted to examining degrees of use and the 'skills divide' (Van Dijk, 2012). There is a relationship between digital exclusion and technostress, with technostress being both a cause and a consequence of digital exclusion. Older workers have adequate intellectual capacity but are apprehensive about using ICTs due to various prior events (e.g. previous failure when learning to operate new software); these can inhibit them and prevent them from engaging in lifelong learning. On the other hand, technical stress can be a natural element in learning when using new hardware and software. It is therefore considered both a consequence and a cause of digital exclusion.

As Nimrod et al. (2020) suggests, there is extensive diversity in the ways older ICT users experience digital technologies and the internet, but the potential for technostress, in particular the sense of being left behind in a rapidly changing media landscape, has an important relationship to the digital divide among ICT users. She explains that as digital immigrants, older adults face different challenges. She continues: “There isn’t only one cause of the digital divide; experience, knowledge, accessibility, and not having a person to consult with are some of the many reasons older adults don’t use technology as well as younger people”. This, of course, is not inevitable and Nimrod calls for scholars and practitioners to give attention to interventions that will increase digital literacy and simultaneously ease technostress among older adults. She advocates for a learning component on technostress in computer and internet training; this would lessen the possibility of maladaptive use, as well as offering online surveys or quizzes where people could assess their level of technostress and then have access to practical steps to modify their behaviours and relationship to ICTs. Nimrod (2022) suggests that older adults can also struggle with technophobia that in turn both reinforces the digital divide and augments feelings of technostress. “Many older adults don’t know how to use new technologies; they were not born into an environment where everything is digital, and it takes some time to get used to it. This can manifest as technophobia where they are scared to try something new”, says Nimrod. She also suggests that media traditionalism plays a role in the digital divide, but this can be understood in different ways. “We can’t underestimate the power of habit. For example, I love books, I love the paper, the smell, the touch, and I can’t imagine sliding across a screen instead of turning pages when I read. You can call me old and traditionalist, or you could acknowledge it as a habit. It is the same for older adults. Some people feel that there is no need for something else. Their needs for information, entertainment, and so forth are satisfied with familiar technologies, and they do not feel a need for new technology” she explains (Nimrod et al. 2022).

The problems associated with the digital divide have become one type of social exclusion, leading to new social divisions and stratification, economic diversification, loss of privacy, and information and cybercrime (Ziemba, 2019). Harris et al. (2021) explained that ICT users experience stress associated with ICT use, for which the name "technostress" has been coined. When examining technostress, the most common stress-inducers are considered to be the very technologies and applications that we work with, sometimes referred to in the literature as technostress creators. Technostress is defined as the psychological stress that employees experience when using ICT in their work, thought to be "caused by the inability of individuals to cope with the demands of using computers in an organisation" (Tarafdar et al., 2010). Technology is now a necessity in the performance of many jobs and is being introduced primarily to increase efficiency, but it has also become one of the primary stressors that people face in the work environment. Whereas in the 1980s and 1990s technostress was mainly manifested by the fear of using computers or technology in general, as well as learning how to use it, in recent years the consequences associated with excessive use of technology, such as multitasking, the urge to be constantly connected to others, physical pain in the back, eyes, etc., are becoming more apparent.

## 2 Methodology and data

The review was conducted as an overview of the current literature (Grant and Booth, 2009). References were identified by searching Web of Science and Scopus for the terms: "technophobia, "technostress", "digital anxiety", "young seniors", "older adult employees", "employment and workplace", "older adult workers", "access information technology", "information communication technology", "ability to use digital device", "digital infrastructure", "digital exclusion", "telework", "digital work", "digital gap", "strategies", and "human resources management". The inclusion criteria for references were that they were peer-reviewed journal articles listed in these two databases that contained the terms above, contained original data, and were written in English. Chapters, books, dissertations theses, master theses and professional articles were excluded. The authors read the titles and abstracts of all the articles identified through the Web of Sciences and Scopus search to identify those meeting the inclusion and exclusion criteria. Final selections for inclusion were made based on a more detailed review and examination of full-length articles. The period searched was from January 2017 until December 2021. A total of 11 references were identified that met inclusion criteria and were selected for data collection.

### 2.1 Data collection

The present study adopts document analysis as a research method. The analysis consists of a qualitative approach to secondary sources. Document analysis is a systematic research technique that uses both printed and electronic materials as its source, analysing them in-depth to extract information and indications related to the study objective (Bowen, 2009). It is important to note that document analysis is a process involving skimming (superficial examination), reading (thorough examination), and interpretation of content to provide answers to research questions. The creation of the sample for the document analysis was based on background research of the topic and the identification of relevant published original articles and international reports. A selection process led to delimiting the analysis only to documentation concerning technophobia and technostress by older adult employees. Furthermore, the study explores the use of strategies for human resources management related to the topic as a search to contextualise and code concepts, as well as understand possible challenges faced in the different implementation processes.

Whereas the first stage of the research dealt with establishing the meaning of the document and its contribution to the issues being explored, the second focusses on coding and contextualising the concepts found in these documents. For that purpose, the research will be guided by the means of qualitative exploratory study, using the triangulation method. By examining different styles of documents, the study will be able to find similarities, differences and possible constraints related to strategies for reducing technophobia and technostress by older adult employees and can therefore suggest novel interventions for human resources management. These patterns will be analysed by reviewing lines, sentences, and paragraph segments from the documents to code the data. This process of triangulation of different documents seeks to 'corroborate findings across data sets and thus reduce the impact of potential biases that can exist in a single study.' (Bowen, 2009, p. 28).

The documents will be analysed in their individual roles as well as in association with each other, aiming to understand and gain deeper knowledge about our research topic. Finally, the analysis of the published original articles and international reports will clarify ideas, identify conceptual boundaries, and recognise the fit and relevance of categories such as technophobia, technostress and strategies for reducing these phenomena. The focus of this process is, therefore, to explore elemental code and concepts related to novel interventions of human resources management.

### 2.2 Data Analysis

Inductive thematic analysis - a method for identifying, analysing and reporting patterns (themes) within data without trying to fit it into a pre-existing coding frame (Braun and Clarke, 2006) - was

employed. This is an established qualitative technique that allows in-depth exploration across a data set to find repeated patterns of meaning. This flexible approach enabled the integration of qualitative and quantitative studies. The key steps of thematic analysis include extensive familiarisation with the data, the generation of initial codes, and then the search for overarching themes. A theme is defined as representing *'... some level of patterned response or meaning within the data set...'* gathered as part of the research (Braun and Clarke, 2006, p. 10). These are then reviewed for coherence and distinctiveness, before being closely defined and named (Braun and Clarke, 2006). This process consisted of six steps; firstly, the entire data set was read through three times and initial ideas for codes were recorded. Secondly, all items were systematically reviewed and manually coded - additionally, codes were matched up with extracts that were deemed important examples. The third step, having coded and collated all the data, was to sort this information into potential themes; this involved analysing the relationships between various codes and organising them according to preliminary themes. The next step involved reviewing and refining the themes; For the fifth step the themes were defined and named and, lastly, all codes were tabulated under the finalised themes along with corresponding extracts that typified the themes.

The primary sources of the inductive thematic analysis were 11 original published articles found on Scopus and Web of Science. After the collection of the original published articles, the data were analysed by phenomenological analysis (Wilson, 2015) by two of the authors (MT and AS). The secondary data can provide important information about the real state of the challenges in connection with older adult employees and technology-induced stressor strategies reducing technophobia and technostress. These data can fulfil the function of indicators. The study deals with the inductive thematic analysis of published original articles that faces our research question in more detail, additionally focussing on the analysis and description of strategies / novel approaches and the improvement of human resources management. Considering the methodological advantages and limitations of document analysis (Bowen, 2009), data analysis was determined by both the research objectives (deductive) and multiple readings and interpretations of the data from the documents (inductive). Given the multitude and variety of documents, thorough reviews were the first step in the analysis. Some documents, although originally selected given their content, title, or possible link, were not deemed appropriate to the inquiry. Figure 1 presents a flowchart of our research process.

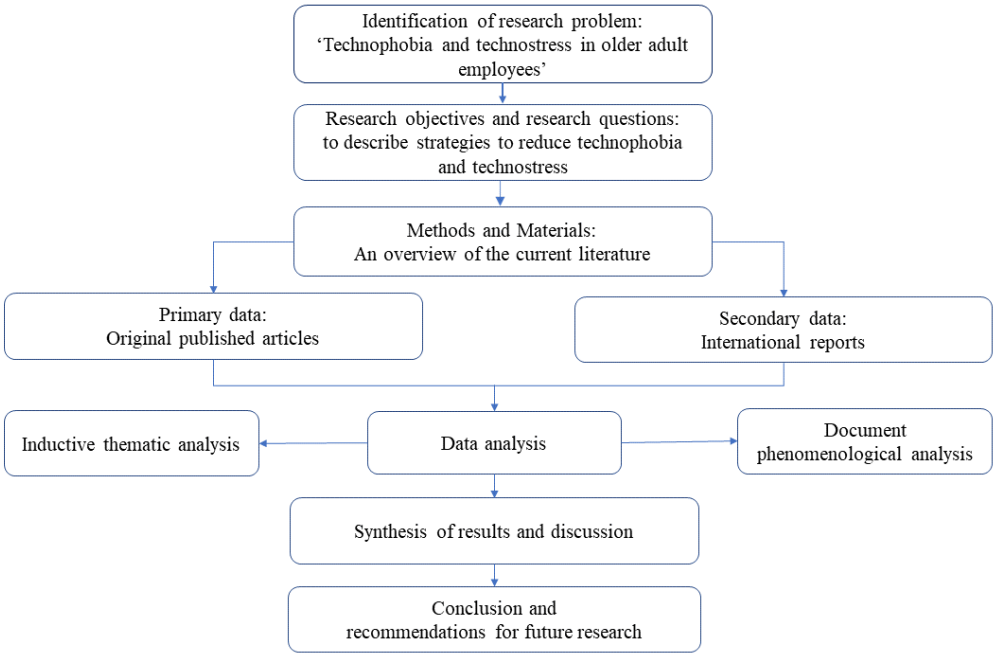


**Fig. 1**. A flowchart of the research process (Source: Own elaboration)

## 3 Empirical results

We abstracted three main categories of strategies that human resources management can use to reduce technophobia and technostress in older adult employees. The themes were labelled as follows: 1) Develop human capital through job training and education, 2) Be active in supporting ageing employees to facilitate the prevention of ageism, and 3) Incorporating diversity as sustainability. These themes are described in detail in the text below.

**AD1) Develop human capital through job training and education**

Human resource (HR) managers have become central to the way that organisations respond to ICT challenges around the world. Training has been one of the core activities of HRM since its conception, and it is therefore natural that ICT training also remains within the remit of HRM. Staff faced many challenges during the pandemic and HR managers, in collaboration with line managers, made decisions and devised strategies to manage their workforce. The pandemic revealed deep inequalities in the labour market and workplaces, linked to the widespread commodification of work. The policies causing these inequalities were often implemented by HR professionals, and in some cases guided by theories and concepts developed and taught by HR academics (Butterick and Charlwood, 2021). Employers need to carefully manage the trade-offs between external conditions, such as the constraints of the COVID-19 pandemic, and internal conditions, such as flexibility and other employee capabilities.

According to Choudrie et al. (2021), there are three types of resources capable of reducing technostress and technophobia. These resources are:

a) digital (materials made available online),
b) human resources (especially literacy and education),
c) social resources (community, institutional and social structures that support access to IT).

ICT education and training came under the spotlight during the COVID-19 pandemic due to the increased demand for it. Based on existing studies, the attainment of ICT skills has a positive impact on the wages of older workers aged 50-64 with higher levels of education, or in skill-intensive occupations (Lee et al., 2021). In addition, Esteban-Navarro et al. (2020) pointed out that there were barriers to technology adoption and use resulting from the existence of lower-than-average levels of education and computer skills in rural areas, although this was not the case in urban areas. The HR services need to take this into account and focus their assistance on providing technological equipment, particularly to staff living in rural areas. Job training also has a significant positive impact on the wages of older workers (Lee et al., 2021; Rolandi et al., 2020). Compared to younger workers, older and educated workers may be more productive due to higher levels of ICT skill attainment and participation in work-based learning. Experience suggests that the decline in productivity in line with the ageing process can be mitigated by training ageing employees to equip and retain ICT skills. Nimrod (2020) stressed that managers, including HR managers, should consider interventions that would mitigate technostress in older adults in particular, and help them to distinguish between adaptive and maladaptive use of technology.

As studies conducted by Butterick and Charlwood (2021), Lee et al. (2021), Esteban-Navarro et al. (2020), Rolandi et al. (2020) and Nimrod (2020) have shown, employer interventions that focussed on learning activities, influencing individual attitudes and skills, as well as peer learning and transfer of experience within the HRD, are the key. It is essential to explore the distributional and social implications of evolving approaches to people management and employment organisation at multiple levels of inquiry.

In the context of HRM, it should be emphasised that the pandemic crisis was, and is, ultimately the main accelerator of trends and transformations at the digital level. Teleworking, e-learning, videoconferencing, etc. have enabled behaviour and mindsets to be modified. It appears that they have also outlined new contours of HRM that will continue to be at the frontline in organisations. It

will focus above all on the necessary orientation of behaviour according to the mission of the individual organisations, and will adapt training activities accordingly, including those that help to reduce technostress and the digital divide for specific individuals or groups of employees.

Fischl et al. (2020)), pointed out that they used a collaborative approach when discussing goals and alternative solutions to support older adults, enabling them to make informed decisions relevant to their desired occupations. This approach also meant that the interventions implemented were individualised to meet the needs of the participants and the context. Digital skills are essential for sustainable competitiveness and economic resilience, but also for ensuring social justice. Businesses need employees with the skills necessary to cope with the green and digital transitions, and people need to be able to get the right education and training to thrive in this regard. Skills enable businesses to remain competitive while ensuring social justice in their internal environment. Accordingly, we argue that mutual learning programmes for managers and employees, as well as tailored support and training for individuals, are crucial for fruitful social dialogue as a form of lifelong learning. As the studies analysed show, the coronavirus crisis has highlighted the importance of the skills needed for the competent performance of strategic sectors and for people to navigate life and achieve professional change.

Our study highlights the need for digital skills in several aspects of individuals' daily lives, as well as for business sustainability. While teleworking and distance learning have become a reality for millions of people in the EU, they have also shown that there are a number of limitations in the area of digital readiness in general. The increase in the number of older workers may hamper the development of businesses, and thus the economic growth of a country, if these workers are less productive than younger workers due to both their physical and cognitive abilities and their lack of willingness to adapt to new technologies. Although maintaining the productivity of older workers is not an easy task, the more educated they become and the longer they continue to improve their human capital through on-the-job training, work experience, and the acquisition of new skills after completing formal education, the longer they will remain productive (Lee et al., 2021). The above authors believe that in terms of participation in work-based learning activities, they may be conditioned primarily by factors such as distance to the training centre and availability of training facilities. Furthermore, Nimrod (2020) reports that health rather than age plays a significant role in the ability of older adults to cope with the stress of ICT use in adverse circumstances.

Building digital skills and capabilities is also possible through social dialogue with peer support. Halvorsen and Yulikova (2020) described their peers using the Senior Community Service Employment Programme (SCSEP) to help them learn how to use Zoom and other technologies to stay connected. To support labour market inclusion and retention, older adult employees should have the opportunity to (re)train and acquire digital skills and abilities to help them manage any uncertainty in their transition to technological competence.

**AD2) Be active in supporting ageing employees to facilitate the prevention of ageism**

As noted by Monahan et al. (2020), the COVID-19 pandemic has entrenched ageism, which in turn necessitates the need for rapid policy action to address its roots and to remedy or address its consequences. Raising the public awareness of institutionalised discrimination against older people in, for example, healthcare, workplaces and other settings is a key starting point in the fight against such ageism. This can be achieved through two interrelated factors:

(a) providing education on ageing

(b) highlighting the positive experiences of intergenerational contacts.

According to Lelarge (2006, p. 187), it has become imperative to apply non-age differentiated policies to the labour market and to continue to motivate older workers until their retirement. In addition to public employment policy facilitators themselves, enterprises should also participate. It is also necessary to offer these employees a sufficiently interesting perspective, particularly in terms of the evolution of wages and jobs. The application of standard criteria in terms of mobility, training and remuneration, i.e., objective competences and performance, to all age groups is a fundamental tool

for recognising and valuing the work of seniors. Only by radically modifying working conditions for the second part of a person’s career can it be ensured that all jobs are accessible to all ages, thus reversing the tendency of older workers to leave the labour market prematurely in the long term. As an example, the author cites PSA's 2001 agreement to improve working conditions on its assembly lines, where the introduction of new modern technologies has made it possible to significantly reduce the so-called 'heavy jobs' that were no longer suitable for older workers.

Although some industries and others have successfully adapted their work environment to embrace the internet, millions of workers have lost their livelihoods, and many more - especially women, who are concentrated in the more exposed industries - remain at risk. Employment policies need to address potential age discrimination in the application of time off work, pay cuts, layoffs, reemployment and retirement, as the pandemic has already led to huge job losses (Coibion et al., 2020).

Public authorities are called upon to design policies, take decisions, reduce public panic and implement urgent and swiftly effective measures that minimise digital gaps of all kinds, including those of territorial origin, especially in rural areas. Failure to do so would lead to widening inequalities among citizens and territories in their participation in the information and knowledge society (Esteban-Navarro et al., 2020; Sun et al., 2020).

Employment policies developed during the COVID-19 pandemic will also need to address continuity of employment for all workers in the post-COVID era; potential barriers for older adults will also need to be addressed, such as their ability to work remotely due to the nature of their work, and the enforcement of safety measures in the physical workplace to meet health or hygiene guidelines, such as erecting necessary barriers, providing protective equipment, and implementing adequate cleaning of the work environment (Monahan et al., 2020). Attention towards the SDGs has become more urgent, and these goals will need to intensively guide the research that is being conducted in various fields. As our findings show, ageing is not a one-step concept; there are many theories about successful ageing but no clear-cut answer. The most important point from an individual's point of view is to remain active in the labour market, if possible, without falling victim to technostress or the digital divide.

**AD3) Incorporating diversity as sustainability**

The results of the research so far show that working conditions are related to the creation and implementation of a working environment that facilitates the attraction, integration and retention of employees in the labour market. This is related to building inclusive workplaces where older adults do not feel 'technostressed' and can keep their jobs in any crisis.

As Mannheim et al. (2019) note, there appears to be a disconnect between the digital technologies developed and the wants and needs of older adults. Recognising the needs of older adults in the context of ICT, then designing appropriate programmes and training, is a priority. Despite the potential of technology to improve many areas of older adults' lives, this population is not yet making full use of ICT, or more precisely, is making less use of it than younger population. In fact, some older adults are more likely to adopt and use technology than others, but there are factors that are not well understood that contribute to the emergence and persistence of individual differences in technology use. Teleworking may lead to what the European Commission's technical report in May 2020 characterised as a “new digital divide depending on the type of settlement”. Only 29% of workers living in rural areas had access to teleworking, compared to 44% of workers living in large cities and 35% of workers living in suburbs during the pandemic (Esteban-Navarro et al., 2020). It is unknown how the pandemic will affect our future lifestyles and when, if ever, we will be able to return to our normal lives. This pervasive uncertainty makes planning difficult, and thus creates additional psychosocial stress (Vinkers, 2020). Building inclusive workplaces as another strategy to overcome technostress and the digital divide must include the continuous flexible implementation of changes in human resource management as a basic prerequisite for coping with modifications caused by external conditions.

As part of the strategy to build inclusive workplaces, the creation of special programmes for older workers is seen as an important element. Such temporary or short-term programmes help, for example, to reintegrate their participants back into the workforce, whether it is a return to the physical workplace or a return to teleworking (Halvorsen and Yulikova, 2020). Another of the prerequisites for building and implementing inclusive workplaces is a targeted facilitation, support and collaboration process. Esteban-Navarro et al. (2020) emphasised the importance of close collaboration between older adults and occupational therapists as part of human resource management to achieve changes in occupational performance. They also stated that goal setting takes time, and that older adult should be given ample time to comment on the goals set and, if necessary, to modify them. However, Nimrod (2020) pointed out that external pressure to adopt technology or use it more intensively can increase employees' levels of technostress. The management of HR departments should remember that it is important to trust the competence of occupational therapists to enable older adults, in particular, to increase their skill levels and reduce the stress of learning.

As we have shown, technostress and technophobia can be reduced mainly through four interrelated or complementary strategies, such as ICT education, social dialogue, implementation of successful ageing in public policies, and building inclusive workplaces. Technology is placing greater demands on all ages, as well as on the necessary changes in the way HR is managed during the crisis. In reducing technophobia and technostress among older adult workers, the efforts and approach of HR managers, as well as the continuous development of ICT and the implementation of policies to promote the involvement of the older generation in its use, will be crucial for the period ahead. As technology continues to evolve and people continue to age, it is necessary to keep the digital divide to a minimum and ensure the continued integration of individuals into the labour market and, thus, its sustainable development.

## Conclusion

According to the findings of this study, education and training is one possible means of achieving a reduction in technophobia and technostress among older adult employees, along with actively supporting ageing employees to facilitate the prevention of ageism. We consider healthy ageing in the elderly could be greatly improved by a concerted effort by policymakers, educators, physicians, mental health professionals, and other health professionals if these recommendations are implemented. We consider these as effective strategies to reduce technophobia and technostress as well as the digital divide, and thus find ways to promote the inclusion and retention of the category of employees in question in the labour market.

Post-pandemic digital realities are reshaping the debate about overcoming ability and belief in the successful adoption of digital technologies in later life, as well as the barriers and challenges associated with the sustained use of technology - including those associated with technophobia and technostress.

For older adults in particular, the new digital spectrum raises issues related to attitudes and awareness of technology, issues of confidence, and ways of bridging the gap between online and offline activities.

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# RISKS, CHALLENGES AND OPPORTUNITIES - CYBERSECURITY IN SMES. A CASE STUDY ABOUT POLAND

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**Abstract**
In paper a desk research about the situation of cybersecurity in Polish SME's will be shown. The collected data will be based on the actual situation in Poland. Basing on some available data and challenges related to the Path to Digital Decade in Europe it will be shown that the overall situation with constantly increasing level of digitalisation requires more focus on the problems with security of IT systems in SME's. The most challenging problem is how to increase the awareness of the whole problem among employees and managers. Taking into account the existing possibilities of international collaboration one example of Erasmus+ Interdisciplinary Cyber Training (InCyT) will be shown – this project is the active answer to existing challenges.

**Keywords**
Cybersecurity, Small and medium enterprises, Digitalization, Decision making.

**JEL classification**
K22, D81, C83, C88

## Introduction

In this paper, we focus on selected risks, challenges, and opportunities related to cybersecurity topics in SMEs. We will pay special attention to the Polish labour market, however, we are aware that in the case of other UE countries situation can be very similar. Having in mind that the problem of cybersecurity refers not only to technical (hardware and software) challenges but also is a big social and organizational problem, it is commonly expected that members of organizations (here, SME employees) will be aware of the whole situation and will have some extra knowledge and practical skills. The whole problem is more complicated because on the one hand labour market consists of many people with different IT skills but on the other hand we are a part of it and we expect different processes and services digitalization assuming that they will significantly support our economic activity. Digitalization is a process that is necessary and is inevitably influencing decision-making and requiring appropriate frameworks in order to guarantee that it will be done with the necessary security level.

The whole paper is organized as follows. After the introduction, in Section 1 we show the literature review of the competency frameworks. Then, Section 2 focuses on the analysis of Polish labour market and cybersecurity risks and needs in SMEs. Section 3 focuses on the challenges related to cybersecurity. In Section 4 we propose an example of activities that make attempt to solve proposed problems. Paper is concluded in Section 5.

## 1 Literature review – competence frameworks

The competence frameworks are used by different companies to recognize and understand the skills of employees, requirements, necessary competencies, and existing company gaps (Ali et al., 2021; Gowie et al., 2020; Mills et al., 2020). A well-prepared competency framework improves company performance and clarifies employees' roles. In recent years we are forced to focus on a new challenge related to employees' competencies due to many cyber-attacks (Mannebäck and Padyab, 2021). This is a consequence of the increasing role of IT systems in companies and a big acceleration of these solutions during and after COVID-19 spread.

The awareness that a successful cyber-attack can cause significant damage to a company's business rises, however, this is rather observed in big companies. Among small, medium, and micro enterprises (SME) we still can indicate major gaps and space for important activity in order to increase the company security even if the term 'company' means self-employment (Bråthen and Lie, 2021). Usually, cyber-attacks or breaches result in three categories: financial, reputational, and legal. But the most painful are financial losses from stealing information related to company issues, financial details, money transfers, and contract details. We can observe that many of these losses could be avoided if businesses would spend some amount of money in order to introduce some organizational, technical, and social means to increase the level of (cyber)security. After the breach, these costs are much higher and are spent to repair affected systems, networks, and devices.

The protection of data and privacy should be considered as a part of risk management (Silva et al., 2019) and after an attack happens, there should be recovery procedures to:

- report the incident to the relevant authorities,
- to clean up the affected systems,
- reduce the impact of another attack,
- get company business up and return to normal work in the shortest time possible.

In order to achieve these issues among the traditional security policy, a cybersecurity framework should be also included in company behaviour with constantly increasing awareness of existing and new threads. At the same time, a guide (or more generally, a security policy) for employees and stakeholders with the best security practices in cyber company culture and hygiene consulted with IT specialists (sometimes external because SMEs do not always have IT departments) should be constantly developed. And this causes a major problem. According to ISC(2) (2019) it is estimated that there are 2.8 million cybersecurity professionals globally, but the gap is more than 4 million and in the case of the EU the gap is more than 290,000 employees.

Taking into account the work frame EU program A Path to Digital Decade (APDD, 2021), it should be remembered that in a quite short time, before 2030, the EU community should be ready not only to commonly use IT technologies having necessary theoretical and practical skills but also significantly increase the social awareness of cyber security risks. As executive Vice-President for A Europe Fit for the Digital Age, Margrethe Vestager, said: "*The Digital Decade is about making digital technology work for people and businesses. It is about enabling everyone to have the skills to participate in the digital society. To be empowered. It is about empowering businesses. It is about the infrastructure that keeps us connected. It is about bringing government services closer to citizens. Europe's digital transformation will give opportunities for everyone*."

It seems to be a trivial statement, but for more than 300 years we build regulations and good practices in order to guarantee that physical and mental work will be safe. We have mandatory courses and training, exams, and certificates related to occupational and safety work, but only some of them refer to cyber world. We are witnesses of new paradigm emergence, where cyber-hygiene will appear and becomes as much important as classical occupational and safety work is.

## 2 The analysis of Polish labour market

As we wrote in the Section 1 and is confirmed by many authors, the competence frameworks are good practices used in companies. In the case of existing cybersecurity competences frameworks one can indicate the following examples:

- Payment Card Industry Data Security Standards (PCI DSS) related to the payment card industry, e-commerce business, and financial sector - https://www.pcisecuritystandards.org/about_us/.
- Center for Internet Security Critical Security Controls (CIS) related to data breaches and attacks, in a hierarchy of priorities - https://www.cisecurity.org/controls.

- International Standards Organization (ISO) with ISO/IEC 27001 and 27002 standards - https://www.iso.org/isoiec-27001-information-security.html and https://www.iso.org/standard/75652.html.
- US National Institute of Standards and Technology (NIST) Framework for Improving Critical Infrastructure Cybersecurity (NIST CSF) related to the security of IT critical infrastructure - https://nvlpubs.nist.gov/nistpubs/cswp/nist.cswp.04162018.pdf.
- The National Initiative for Cybersecurity Education Cybersecurity Workforce Framework (NICE Framework) related to skill requirements and duties of cybersecurity workers - https://niccs.cisa.gov/workforce-development/nice-framework.
- Control Objectives for Information and Related Technologies (COBIT) issued by non-profit organization Information Systems Audit and Control Association (ISACA) related to bridging the gaps between government and business in cybersecurity standards - https://www.isaca.org/resources/cobit.
- SPARTA Cybersecurity Skills Framework (SPARTA CSF) based on the NICE Framework, and related to cybersecurity applicability, adaptability by industry and academia - https://www.sparta.eu/training/.

Any details related to the above mentioned examples can be found on appropriate webpages and as a summary they address the shortage of: "*people with the knowledge, skills and abilities to perform the tasks required for cybersecurity work*". This includes: "*technical and non-technical functions that are occupied by knowledgeable and experienced employees*". All of these cybersecurity frameworks can be seen in terms of opportunities for any companies, however in order to see how big is the problem of cybersecurity awareness lack, let's focus on some general overview related to Polish economy and cybersecurity problems in Poland. This study is based on data from Skowrońska and Tarnawa (2021), NASK (2020), CSIRT GOV (2020), PARP (2021).

### 2.1 General Overview on the SMEs in Poland

According to the data collected and presented by Skowrońska and Tarnawa (2021) the general overview data related to Polish labour market and SME enterprises in Poland is presented in Table 1.

**Table 1**. Polish labour market

| | |
|---|---|
| Total number of enterprises | 2.2M |
| The structure of enterprises | |
| According to the number of employees | 99,8% – SME<br>97.0% – micro<br>2.2% – small<br>0.7% – medium<br>0.2% – large |
| According to the industry[1] | 52.5% – service activities<br>22.4% – commercial activities<br>14.9% – construction/building activity<br>10.1% – industrial activity |
| According to the legal form | 87.0% – individual persons running a business (98.9% of them are micro-enterprises)<br>13.0% – legal persons and entities without legal personality |
| Contribution to GDP | |

[1] Because 99.8% of companies are SMEs, in practice the industry structure of SMEs corresponds to the structure of the entire sector (including large ones).

| | |
|---|---|
| Contribution to GDP (data form 2018) | 72.7% – contribution of enterprises in generating GDP<br>49.1% – contribution of SMEs in generating GDP<br>The structure of GDP contribution<br>29.0% – micro<br>9.1% – small<br>11.1% – medium<br>23.6% – large |
| Labour market | |
| Working people | 10.01 M – the number of working people in enterprises<br>6.75 M – the number of people working in SMEs<br>4.12 M – micro<br>1.05 M – small<br>1.58 M – medium<br>3.26 M – big<br>4.53 – the average number of working people per enterprise |
| Employed people (basing on agreement) | 7.01 M – the number of working people in enterprises<br>56.0% – the share of the SME sector in the structure of the whole average employment<br>3.17 – the average number of employees per enterprise |

Source: Skowrońska and Tarnawa (2021).

It is easy to see that around 67% of working people work in SMEs, but around 61% of them work in micro companies, which usually means self-employment or small family companies with up to 5 employees. Such enterprises do not have the necessary funds to ensure the necessary level of cyber security but their activity, even if is not related to any IT branch, requires to use of IT solutions and technologies at least on the financial and accounting level. So, even if they only use e-mail service, own webpage, online banking access, and mandatory reporting to national/government agencies, they are potentially exposed to cyber risks, as we show below.

### 2.2 Analysis of the cybersecurity risk situation in Polish SMEs

The general overview about the situation and structure of SMEs in Poland together with essential risks and cybersecurity problems according to data presented in Computerworld (2021) shows that:

- 33% of all and 42% of big enterprises have struggled with cybersecurity breaches in 2021,
- 6% of large companies have experienced multiple attacks,
- 45% of cybersecurity threats were related to malware,
- 43% of companies reported attempts to break into IT systems,
- 29% of all companies noticed phishing attempts.

These data are further supported by the major risks in the SMSs (Computerworld, 2021; NASK, 2020) presented in Table 2.

**Table 2**. Major cybersecurity risks

| Risk | Total | SME | Big |
|---|---|---|---|
| breaking into the company's IT systems | 43% | 37% | 47% |
| the operation of malware, including ransomware | 45% | 37% | 50% |
| identity theft | 8% | 16% | 3% |
| theft or disclosure of data | 18% | 11% | 23% |
| phishing | 29% | 26% | 30% |
| other | 8% | 11% | 7% |

Source: Computerworld (2021), NASK (2020).

There are no major differences in risks types between SMEs and big companies (Computerworld, 2021) except Power engineering, Banking, Financial market infrastructure, Public administration, Education as it is shown in Table 3, however big companies have bigger possibilities to avoid, mitigate and react cybersecurity risk mostly due to bigger financial resources.

**Table 3**. The number of attacks on different companies; ✓ stands for SMEs companies in Poland

| Economy sector | SME | Number | % of all |
|---|---|---|---|
| Power engineering | | 101 | 0,97% |
| Transport | ✓ | 29 | 0,28% |
| Banking | | 1008 | 9,67% |
| Financial market infrastructure | | 1283 | 12,31% |
| Health Services | ✓ | 112 | 1,07% |
| Waterworks | ✓ | 9 | 0,09% |
| Digital infrastructure | ✓ | 1016 | 9,75% |
| Public administration | | 388 | 3,72% |
| Construction and real estate management | ✓ | 29 | 0,28% |
| Culture and national heritage protection | | 7 | 0,07% |
| Sport | ✓ | 9 | 0,09% |
| Education | | 71 | 0,68% |
| Agriculture | ✓ | 4 | 0,04% |
| Fishing | ✓ | 1 | 0,01% |
| Religious denominations and national minorities | | 8 | 0,08% |
| Insurance services | ✓ | 2 | 0,02% |
| Chambers of commerce | ✓ | 3 | 0,03% |
| Retail trade | ✓ | 1437 | 13,79% |
| Production | ✓ | 57 | 0,55% |
| Logistics and distribution | ✓ | 27 | 0,26% |
| Post and courier services | ✓ | 500 | 4,80% |
| Tourism | ✓ | 9 | 0,09% |
| Waste management | ✓ | 1 | 0,01% |
| Hotels | ✓ | 19 | 0,18% |
| Media | ✓ | 2568 | 24,64% |
| Other services | ✓ | 384 | 3,69% |
| Persons | | 959 | 9,20% |
| Others | | 379 | 3,64% |
| Total | | 10420 | 100% |

Source: Computerworld (2021), NASK (2020).

According to CERT (2021) the following types of incidences in Polish SME companies can be shown – see Table 4.

**Table 4**. Types of incidences in Polish SME companies

| Incident | Number |
|---|---|
| Breaking | 8 |
| Publication | 11 |
| Substitution | 13 |
| Botnet | 36 |
| Discredit | 66 |
| Incorrect configuration | 69 |
| Impersonation | 72 |
| Attack | 96 |
| Leak | 230 |
| Unavailability | 254 |
| Spam | 311 |
| Susceptibility | 1366 |
| Phishing | 1396 |
| Scanning | 2604 |
| Virus | 16777 |

Source: Cert (2021).

As one can see the scope of risks and threads is very wide and the numbers of recognized and recorded attacks is very high. Obviously, there are no data about all these incidents that were not recognized or reported to any official institution. Depending on the source (CSIRT GOV, 2020), it is even assumed that official records show less than 10% of threads.

## 3 Cybersecurity in Poland –actions, needs, and challenges

In previous section we showed how big could be the problem of cyber security attacks in SMEs, but it can be also shown that some of them take different actions to protect themselves. Such actions could be: the development of used software and hardware solutions, the development of people, introduction of cyber-security culture into the organization. Depending on the company activity fields and available resources data collected by Skowrońska and Tarnawa (2021) show major areas of activities – see Table 5.

**Table 5**. Actions used by different companies in order to increase the level of security

| Actions | % |
|---|---|
| we use anti-virus software | 85% |
| we secure mobile devices and the Internet of Things, including those connected to the network in the BYOD model | 67% |
| encryption, including mobile devices, laptops and documents | 51% |
| we use security at the edge of the network | 88% |
| we use typical security procedures such as software updates, regular backups | 72% |
| we secure and monitor employees' workstations | 68% |

Source: Skowrońska and Tarnawa (2021).

As one can see, during many years of common computer use and omnipotent access to the Internet network we know that we should use anti-virus software and security solutions (for example firewalls) at the edge of the network. But on the other hand, the necessity to encrypt mails, memory sticks, laptops, and documents is still very low.

### 3.1 Analysis of the cybersecurity needs in Polish SMEs

Companies are also aware, that not only technical means are important, but also the employees with appropriate skills. When we are looking for a typical work offer for IT specialist in cybersecurity we can indicate the following needed skills (Praca, 2020) also confirmed by report available done by Marszycki (2021):

- identifying security gaps, risk analysis and detection of hacker attacks or other incidents,
- evaluation of the level of safety, in terms of technical, legal and ethical aspects,
- design, configuration and diagnosis of ICT networks,
- taking care of the technical efficiency of the system - removing failures and defects,
- administration of the system and devices for detecting incidents of IT security breaches,
- planning and implementing cybersecurity solutions,
- developing emergency procedures, attack response scenarios,
- cooperation with programmers,
- support for employees of other departments in the field of safe use of the Internet or devices,
- conducting security tests of applications and websites,
- preparing reports.

In the case of official report published in 2021 by Polish Agency of Entrepreneurship Development (PARP, 2021) we can see that the increase in the number of work offers in the case of cybersecurity equals 750% (!!!).

Another question is how to gain the overall level of awareness among employees. Companies use different approaches. Firstly they try to recognize their current state. Example of such recognition (Kurek, 2018) is given in Table 6 and it shows that still there is a lot of job to be done in this field.

**Table 6**. How do the companies evaluate the employees' maturity and awareness of different security areas in their organizations

| | Score | | | |
|---|---|---|---|---|
| Employees' maturity and awareness | 5 | 4-3 | 2-1 | 0 |
| Malware protection | 26% | 72% | 2% | |
| Safety of the contact with the Internet | 34% | 61% | 3% | 2% |
| Identity and access management | 32% | 64% | 4% | |
| Security incident response | 31% | 63% | 6% | |
| Internal network security (segmentation, access control) | 43% | 45% | 12% | |
| Business continuity plans | 29% | 61% | 9% | 1% |
| Security monitoring | 22% | 70% | 7% | 1% |
| Protection against data leaks (Data Leakage Prevention - DLP) | 14% | 69% | 16% | 1% |
| Vulnerability management | 11% | 66% | 21% | 2% |
| Safety awareness programs for employees | 12% | 58% | 25% | 5% |
| Asset classification and control | 10% | 62% | 19% | 9% |
| Mobile device security management (MDM technologies) | 15% | 50% | 25% | 10% |
| Business partners' security management | 11% | 57% | 21% | 11% |
| Security in software development processes | 16% | 54% | 9% | 21% |

Source: Kurek (2018).

### 3.2 Challenges related to cybersecurity in Polish SMEs

Depending on the scope of SME activity we can indicate different levels of awareness and readiness to challenges related to cybersecurity. Because of common knowledge related to GDPR regulations, companies that focus their activity on accounting outsourcing, data processing and IT are quite good prepared for challenges related to cyber security, but a huge number of different companies that work in other fields of economy are not prepared to attacks.

According to data given in the PWC Report (2018) for Polish SMEs we can indicate that:

- 44% of companies have suffered financial losses as a result of attacks,
- 62% of companies experienced disruptions and downtime,
- 21% were victims of disk encryption (ransomware),
- 20% of medium and large companies have no cybersecurity,
- 46% of companies do not have operational incident response procedures,
- on average, 3% of the IT budget is spent on security - that's at least three times too little,
- 20% of the respondents have not started preparations yet,
- 50% of companies rate their readiness at 30% or less,
- 3% of the companies are fully operational in cyber security,
- 8% of the surveyed companies are matured in terms of information and cyber security.

The general outlook for this data suggests that we are still at the beginning of the road to being prepared for security solutions, procedures, general awareness, and cyber hygiene in our work activity. The above-given data were collected before COVID-19 pandemic time, but some recent data indicates that this situation still is not much better. According to milestones proposed in the EU program A Path to Digital Decade (APDD, 2021), at least 80% of society should have IT competencies that allow not only use but also be aware of IT solutions and existing risks related to digital solutions. So, the challenge is how to fulfil this ambitious task?

## 4 Development of cybersecurity competence frameworks

The question stated at the end of the previous section hasn't got a straightforward answer and thus it seems that any efforts done in this challenge can be very helpful and worth to be considered. If we refer back to the '90s of the XX-th century we can remind that when the concept of the Internet started to be civil technology and computers became more and more popular, many people were engaged in the process of development and dissemination of these new devices – computers. At that time, many people were aware of this technology, didn't understand how useful it could be and how helpful it is not only in specialized tasks but in normal life. After the spread of mobile phones at the beginning of the 00' years of the XXI-th century and then the development of smartphones, now many, especially young people, cannot imagine how they can work, live, and do their activities without IT solutions. And it is easy to be observed that also older people can quickly learn and use it. Thus it seems to be obvious that we, as humankind, accepted this invention and now we have fully understood not only how it works, but what risks and dangers it can cause. The best, so far tested approaches, were based on the development of human competencies. As it was written in Section 1, competence frameworks are well-known, tested, and working solutions used by companies to recognize and understand existing company gaps. This time these gaps are related to the skills of employees because the level of technical solutions is significantly high and allows using sophisticated interfaces and hardware facilities that are not fully utilized.

The development of competences usually is done via trainings, seminars, and through out the mentoring. According to the study presented by HRM Partners (2016) in the case of Poland we can indicate that:

- A mentoring is highly effective for management's talent development as well as succession planning and management.
- 53% of companies use or plan to use tools to manage and monitor progress of the mentoring process.
- Mentoring offers a practice of measuring the effects of achieved results.
- In companies without used mentoring, respondents indicate the need to increase the level of its use and needs to implement and use working experts.
- Mentoring strengths for development both employees (59.2%) and managerial staff (40.8%) and all employees in new roles.
- In companies where there are no formal mentoring processes, as many as 63% of respondents see the need to implement such activities.

- The respondents also see the need to build a culture of sharing knowledge, especially for succession and ensuring the development of the best and most committed employees.

Companies need complex ways of thinking, and the ability to understand and integrate knowledge from different sectors (Hamburg, 2020), which requires interdisciplinary learning. This increases cognitive abilities and critical thinking (Peterman and Kennedy, 2003). Vocational and Educational Training (VET) are members of education systems that encourage the development of companies by giving them new employees, but they should be more flexible in the methods they use. Companies for employees' development can organize interdisciplinary learning and some studies have demonstrated that this gives very positive results (Kafetzopoulos and Gotzamani, 2013). New, interdisciplinary, experiential teaching and learning models imply that learning is a process where knowledge and practical skills are created through the transformation of experiences. Together with mentoring they generate innovative and complex solutions to existing challenges.

Taking into account this consideration the Erasmus+ Interdisciplinary Cyber Training (InCyT) project was proposed by the consortium consisting of: IAT/Westfälische Hochschule Gelsenkirchen, Germany – as a coordinator, and partners: Paydas Egitim Kultur VE Sanat Dernegi, Zonguldak, Turkey, SC IPA SA CIFATT Craiova, Bucharest / Craiova, Romania, European Training Center Copenhagen, Copenhagen, Denmark, MAG – UNINETTUNO S.R.L., Rome, Italy, Politechnika Rzeszowska (PRz), Rzeszów, Poland and Fachhochschule St. Pölten, Pölten, Austria. It's topic is related to increase the awareness of cyber security among small and medium-sized enterprises (SMEs). It proposes:

- a cybersecurity competency framework,
- digitally supported interdisciplinary learning programs and mentoring for SME managers and employees,
- an adapted version for vocational training (VET) and a European transferability model.

The details related to this project can be found on: https://www.incytproject.eu/home – see Fig. 1.


**Fig. 1.** The official webpage of InCyT project. Source: https://www.incytproject.eu/home

Taking into account the advantages of interdisciplinary training and mentoring programs, project develops, and tests digitally supported interdisciplinary training programs and a collaborative e-learning platform. The outcomes of the project will be:

- methodology of a cybersecurity framework for implementation,
- training (courses, exercises, webinars),

- opportunities for improvements of these by using interdisciplinarity and mentoring,
- learning and mentoring methodology for the training,
- proposals for VET and a European approach.

## Conclusion

A quick look back into modern history shows that 30 years ago humankind was in front of a big technological revolution, where computers started to be not only "magical", "mystic" and enigmatic machines used by engineers in laboratories or military forces, but devices that soon would change our world. Like a spinning wheel that made a full 360 degrees turnaround and after 30 years history repeats and goes back from the starting point once again but this time we have to focus on cybersecurity. A framework Path to Digital Decade assumes a significant development in IT solutions usage by EU citizens till 2030. This brings a new big challenge for SMEs. Thanks to the collaboration of 6 different EU institutions and Erasmus+ call for proposals, KA220-VET - Cooperation partnerships in vocational education and training, an Interdisciplinary Cyber Training (InCyT) – ID KA220-VET-E0B193D – the project was started (Hamburg, 2022). In line with its scope, it is one of the possible answers to existing problems and challenges that SMEs and VET have to deal with.

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# EMPLOYMENT AND WAGES OF GRADUATES OF VSB TECHNICAL UNIVERSITY OF OSTRAVA

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**Abstract**
The paper presents the results of a survey on the employment and wages of graduates from the VSB Technical University of Ostrava in the labour market conducted in the autumn of 2020. Its aim was to obtain information on employability and wages of graduates according to certain criteria (occupation, field of education, industry, region). Employees who had completed their education at the VSB Technical University of Ostrava in the period 2014-2019 were considered as graduates. The survey was conducted on weighted ISPV data (Average Earnings Information System) for the wage sector for the year 2019. Graduates of the VSB Technical University of Ostrava were identified in the database according to the OBORVZD code (field of education). The survey included a total of 7540 graduates. The results showed that graduates of the university were well employable in the labour market in the period under review. The university will carry out a follow-up survey in 2022.

**Keywords**
university graduate, wage, employment, employer

**JEL classification**
J21, J31, J44

## Introduction

In developed economies, education is a very important prerequisite for a successful professional life. Most employers choose employees according to the specialisation of the graduate. When selecting a suitable candidate, the employer defines the conditions of admission, which are linked to the job requirements of the specific position. These include the level of education, length of experience, language skills, soft skills, etc. (Novák, 2016).

Due to the education attained, a university graduate is considered more capable of generating a better product. Through more educated people, technology and innovation are also developed. Because of this, there is also an increase in productivity. This results in higher labour product earnings for firms. Individuals are rewarded with higher wages for their higher productivity (Brožová, 2003).

The transition of university graduates to employment and their employment in the labour market after graduation is a topical issue, both for the graduates themselves and for universities. There are barriers of various kinds in this transition.

As Koucký et al. (2008) state, there are barriers that affect graduates' entry into the labour market. In order to make the transition for graduates into the workforce as easy and successful as possible, a well-functioning economy is an important prerequisite. This factor is considered to be the most important one. If the economic situation of a country is not very favourable, it is considered a significant barrier for graduates entering the labour market. However, there are other influences such as the education system, the structure of the labour market, etc., that are also very important but are considered as secondary factors compared to the overall state of the economy.

Buchtová et al. (2013) state that university graduates are at a significant disadvantage compared to other job seekers. A significant barrier is insufficient or zero work experience. Individuals who have not used their acquired knowledge during their studies in practice often lack basic work habits. In the period following graduation from college, individuals also often lack the job contacts that could help them in their job search. Often they do not have sufficient information about the labour market, cannot write a proper CV or are not sufficiently prepared for a job interview (Sirovátka, 1997).

Blahovec (2013) states that many universities around the world regularly conduct employer needs surveys which, in addition to declaring their needs, also assess the knowledge and skills of graduates of these universities.

The VSB Technical University of Ostrava monitors the employability of graduates in the labour market on a long-term basis. In order to improve the quality of teaching, it tries to modernize teaching methods and implement a more effective cooperation between students and potential employers during their studies.

The paper presents the results of a survey on the employment and wages of graduates of the VSB Technical University of Ostrava in the labour market, which was conducted in the autumn of 2020. Its aim was to obtain information on the employability and wages of graduates with employers according to certain criteria (occupation, field of education, industry and region).

## 1 Literature review

The first research on the employability of university graduates was carried out in the second half of the 1990s (Harvey, 2001). In this context, key skills were defined, also called generic skills. For example, knowledge skills, thinking skills, personal skills, personal attributes and practical skills were identified as key indicators (Weligamage, 2009).

Gradually, there has been a move towards more comprehensive approaches to assessing the employability of university graduates.

For example, Curtis at al. (2002) define in their study Employability Indicators for Australian industry. According to the results of this study, employers place the following emphasis on students´ characteristics and students´ skills. The study defines loyalty, commitment, honesty and integrity, enthusiasm, reliability, self-presentation, common sense, positive self-esteem, sense of humour, balanced approach to work and family life, ability to work under pressure, motivation and adaptability as the core qualities. The study then identified communication, teamwork, problem-solving, organisational skills, self-education, self-discipline, initiative and entrepreneurial skills as further skills needed by employers. The study also includes recommendations for universities in Australia to adjust their curricula and change their teaching methodologies to support the development of these skills and attributes (Blahovec, 2013).

Frye (2011) characterises some of the issues that arise in the process of graduate employment that need more research. These are a mismatch between the curricula offered by the college and the expectations and needs of students, a mismatch between the requirements of graduates for future employment and the actual requirements of employers and a mismatch between what the college teach and what employers demand.

Matsouka and Mihail (2016) identify differences between the views of the graduates and the employers. The results are discussed in relation to the changes needed in higher education institutions and the importance of appropriate interaction and collaboration between employers and universities.

Salas-Velasco (2007) examines the labour market employability of graduates in selected European countries. In 1999, the first major survey concerning the labour market situation of university graduates was conducted in Europe. This research covered eleven European countries, namely Austria, the Czech Republic, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden and the United Kingdom.

Gottvald et al. (2008) analyse the employability of graduates of the VSB Technical University of Ostrava. Both employers and graduates have participated in the questionnaire survey. The total number of graduates surveyed was 295. Employers evaluated a total of 361 graduates employed in their companies.

In the Czech Republic, 1,115 employers were contacted in the pilot phase as part of the REFLEX 2013 survey to assess the employability and graduate quality of university graduates from different perspectives (Koucký, Bartušek and Zelenka, 2014).

The labour market employability of graduates in the Czech Republic is the subject of the study Wealth in Diversity (Koucký and Bartušek, 2016). The term graduate employability refers to the degree of employability and successful finding of employment in the labour market through university education. The labour market employability of graduates has been more intensively studied after the economic crisis of 2008-2009. During this period, there was a significant downturn in national economies that had had a significant impact on overall employment and therefore on the labour market employability of university graduates. The employability of graduates has also been included in the quality assessment of universities.

Koucký and Bartušek (2016) provide two ways of tracking the employability of graduates in the labour market. The first option is graduate employability indicators obtained from administrative sources. These sources help determine how likely graduates are to be immediately employed after graduating from university and how long they last in a given job. The second option is then to monitor certain characteristics of the labour market employment of university graduates. The characteristics of graduates are related to specific areas of labour market employment, such as graduates' gross wages, the use of their knowledge and skills, graduates' job satisfaction, whether graduates are employed in their field of expertise, etc. This information is obtained using indicators from national surveys at the tertiary level or at the level of individual schools.

Employers' views of university graduates were also the subject of a supplementary survey by the Centre for the Study of Higher Education Graduate 2018. In this supplementary survey, 447 respondents completed the employer´s questionnaire. The results show that the actual level of skills and abilities of graduates is more important to employers than a diploma from university, that employers are more or less satisfied with the quality of graduates already enrolled in two-thirds of cases, and that there is no clear trend in assessing the quality of graduates. In relation to the labour market situation, more than half of employers faced difficulties in trying to recruit qualified graduates, graduates from master's degree programmes (including engineers) work in an adequate position in more than three-quarters of cases, while graduates of bachelor's degree programmes are noticeably more likely to work in positions where they would need a higher or lower level of education, and are more likely to work outside their field of study. The need for stronger links between teaching at universities and practice was also an important theme (CSVŠ, 2021).

The study Applicability of VSB- TUO graduates (Trexima, 2018) presents the results of a survey of employers who evaluated university graduates. 872 employers were approached as part of the questionnaire survey. The survey among employers was carried out in the form of a structured electronic questionnaire. A graduate was defined as an employee who graduated in 2013, 2014, 2015, 2016, 2017. The questionnaire assessed the professional skills of graduates as well as their level of soft skills.

## 2 Methodology and data

For the university the data of the graduates´ jobs and their remuneration are of high importance. This information can be obtained in wage-earning databases (in the Czech Republic this is, for example, the Average Earnings Information System). The statistical survey must identify the specific university and faculty the students graduated from, the year of graduation, and the study programme completed. It is also a prerequisite enabling an access the database. All personal data must be strictly anonymised.

In 2020, a survey of this type had been carried out at VSB-TUO. Its aim was to obtain information on the employability of graduates according to certain criteria (occupation, field of education, faculty, region). The indicator monitored was the gross monthly salary. The employees who had completed their education at the VSB-TUO in the period 2014-2019 were considered as graduates. The survey was conducted on weighted ISPV data for the wage sector for the year 2019. The survey included a total of 7541 graduates.

The calculation file was created based on the following sequence of activities:

- identification of VSB-TUO graduates with employers,

- assigning weights to individual employers,
- creation of a calculation file with data representative for the whole Czech Republic.

VSB-TUO graduates were identified in the ISPV data by the code OBORVZD (field of education). The field of education code is composed of the year of graduation, the school code and the field of education code. The school code for universities is the RID (departmental identifier), which is unique for each university and faculty. The computation file is based on harmonized (imputed data) ISPV survey data on the entire employee population and includes 2019 payroll data excluding entities with less than 10 employees (micro-entities).

The weighted number of employees, representing the structure of graduates, represents the weighted number of employment relationships by the record time (the record time includes absences for which the employee was not paid). Maternity and parental leave are not included in the ISVP survey.

The weighting used to calculate the gross monthly wage was based on full-time employment, excluding unpaid absences.

Publication criteria were used for correct interpretation and usability of the estimates. A system of basic publishability of the estimates was established for each category under study. The basic publication criteria are set so that each estimate meets the following requirements:
- At least 3 economic agents (employers),
- at least 31 observations (i.e. employment relationships),
- the estimation is not unduly influenced by one firm (a firm must not influence the estimation by more than 20%, inclusive, with its weight above 1, which represents the weight for the panel selection),
- the estimation was not affected by the undue influence of two firms (firms must not, by their weight be above the value of 1, which represents the weight for the selection bias and affect the estimation from more than 30% inclusive).

Setting these criteria ensured that each combination of output matrices was not affected by an insufficient number of observations or by the unnatural influence of one or two firms.

Interval estimates of the reliability of the results were calculated for the categories that passed the baseline publication criteria. Each estimate is calculated with its interval and is labeled with the appropriate category. To calculate the estimates, it was necessary to follow the design of the ISPV and to proceed correctly to calculate the standard deviations of the estimates and the confidence intervals of the estimates.

By analogy with the standard ISPV publications, the quality of the estimate is divided into 4 publication categories:
Category A characterizes the best estimates of the median gross monthly wage with an average estimation error of ± 1.5 % (max. 3.5 %).
Category B characterizes the estimates of the median gross monthly wage with an average error of ± 5.0 % (maximum 7 %).
Category C characterizes the estimates of the median gross monthly wage with an average error of ± 12.0 % (maximum 21 %).
Category D characterizes median estimates of gross monthly wages with an average error of > 21 %, where the estimate is assessed as unreliable.

## 3 Empirical results

The results of the survey are presented from two perspectives. These are the weighted number of VSB-TUO graduates and gross monthly wages. The graduates were analysed in terms of their job performance in the regions, the field of education completed (CZ-ISCED classification), employment in industries (CZ-NACE classification of economic activities) and occupation performance (CZ-ISCO occupational classification).

All outputs are presented in aggregated form and meet data anonymity requirements. Data for graduates for whom publication criteria are not met are marked with *.

Table 1 shows number of surveyed and gross monthly salary of VSB-TUO graduates by the faculty.

**Table 1.** Number of surveyed and gross monthly salary of VSB-TUO graduates by the faculty

| Faculty | Total | Gross monthly salary in CZK | | | |
|---|---|---|---|---|---|
| | | Median | 1st decile | 9th decile | Estimate quality |
| Faculty of Civil Engineering | 608 | 33185 | 21752 | 51347 | C |
| Faculty of Safety Engineering | 379 | 39702 | 29057 | 60916 | B |
| Faculty of Mechanical Enginneering | 1080 | 38688 | 27995 | 57137 | A |
| Faculty of Electrical Engineering and Computer Science | 1404 | 44019 | 31858 | 69730 | A |
| Faculty of Mining and Geology | 1065 | 39199 | 24613 | 62857 | B |
| Faculty of Material Science and Technology | 843 | 39170 | 27479 | 58448 | A |
| Faculty of Economics | 2091 | 34601 | 23410 | 57019 | A |
| University study programs | 70 | 37071 | 26542 | 65711 | A |

Source: Trexima, (2020).

Table 1 shows that the highest earnings are achieved by graduates of the Faculty of Electrical Engineering and Informatics. The median monthly earnings of CZK 39000 are exceeded by graduates of the Faculty of Safety Engineering, the Faculty of Mining and Geology and the Faculty of Metallurgy and Materials Engineering. A lower wage was recorded for graduates of the Faculty of Economics and the Faculty of Civil Engineering.

Table 2 provides an overall view of the employability and remuneration of graduates of VSB-TUO in each region. Most graduates were employed in the Moravian-Silesian region (4587 persons). This value is related to the regional character of the university, where the majority of students are local. After graduating from the university, a large number of them remain working in their region of residence. 721 graduates work in Prague. These numbers is in line with the trend of some young qualified workers leaving the region, often for Prague. One of the reasons for this may be, as mentioned below, higher remuneration in other regions of the Czech Republic. The Olomouc region also has a more significant representation of graduates. This situation may to some extent be related to the neighbouring location of the two regions and the impossibility of obtaining technical and university education in this region. The smallest number of graduates (106 persons) for whom the publication criteria are met work in the Kralovehradecky and Pardubice regions.

**Table 2.** Structure and gross monthly salary of VSB-TUO graduates by the region (weighted data)

| Region | Total | Gross monthly salary in CZK | | | |
|---|---|---|---|---|---|
| | | Median | 1st decile | 9th decile | Estimate quality |
| Prague | 721 | 41146 | 29778 | 72643 | B |
| Central Bohemian Region | 207 | 46218 | 20952 | 74883 | C |
| South Bohemian Region | * | * | * | * | * |
| Pilsen Region | * | * | * | * | * |
| Karlovy Vary Region | * | * | * | * | * |
| Usti Region | 281 | 48772 | 32775 | 72403 | C |
| Liberec Region | * | * | * | * | * |
| Hradec Kralove Region | 106 | 37478 | 29118 | 57149 | B |
| Pardubice region | 106 | 36 351 | 28559 | 50831 | C |
| South Moravian Region | 437 | 36 630 | 28178 | 62806 | C |
| Vysocina Region | * | * | * | * | * |
| Olomouc Region | 674 | 34 870 | 26473 | 52912 | B |
| Moravian-Silesian Region | 4587 | 35 427 | 24900 | 57516 | A |
| Zlín Region | 436 | 32 856 | 25582 | 56924 | C |

*values that do not meet the publication criteria

Source: Trexima, (2020).

Table 2 also shows the level of remuneration of university graduates. The highest median gross salary is achieved in the Ústí nad Labem region (CZK 48772), which is related to the nature of the professions that are performed by graduates in this region. Higher wage levels are also achieved in the Central Bohemia region and Prague. These three regions also show a higher wage differentiation, as expressed by the relationship between average gross wages in the ninth decile and average gross wages in the first decile, than the other regions for which publishable data are available. The lowest median average gross wage for graduates of the VSB-TUO was recorded in the Zlín Region.

Table 3 provides an overview of the structure and remuneration of graduates according to the CZ-ISCED fields of education. It presents the weighted numbers of graduates in aggregate by CZ-ISCED education field (level 3). The largest number of graduates (1118) graduated in CZ-ISCED 0715 Mechanics and metal trades. The other more significantly represented fields are CZ-ISCED 0788 Inter-disciplinary programmes: engineering, manufacturing and construction (756 persons), CZ ISCED Management and administration (680 persons), CZ-ISCED 0732 Building and civil engineering (570 persons), CZ-ISCED 0714 Electronics and automation (549 persons) and CZ ISCED 0724 Mining and extraction (544 persons). The lowest number of graduates was recorded in CZ-ISCED 0588 Inter-disciplinary programmes: natural sciences, mathematics and statistics (40 persons), CZ-ISCED 0719 Engineering and engineering trades not elsewhere classified (45 persons) and CZ-ISCED 0541 Mathematics (47 persons).

The highest salaries are paid to graduates of CZ-ISCED 0613 Software and applications development and analysis (42843 CZK) and CZ-ISCED 0713 Electricity and energy (42578 CZK). Graduates of CZ-ISCED 0724 Mining and extraction (41166 CZK), CZ-ISCED 0714 Electronics and automation (41156 CZK) and CZ-ISCED 0541 Mathematics (40127 CZK) are also well paid. Lower valuations were recorded for graduates of CZ-ISCED 0588 Inter-disciplinary programmes: natural sciences, mathematics and statistics (27455 CZK) and CZ-ISCED 0411 Accounting and taxation (30964 CZK

**Table 3**. Structure and gross monthly salary of VSB-TUO graduates by field of education CZ- ISCED (weighted data)

| Code | Field of education | Total | Gross monthly salary in CZK | | | |
|---|---|---|---|---|---|---|
| | | | Median | 1st decile | 9th decile | Estimate quality |
| 0214 | Handicrafts | * | * | * | * | * |
| 0311 | Economics | * | * | * | * | * |
| 0312 | Political sciences and civics | 150 | 34726 | 26095 | 53212 | B |
| 0321 | Journalism and reporting | * | * | | | * |
| 0388 | Inter-disciplinary programmes: social sciences, journalism and information | * | * | * | * | * |
| 0411 | Accounting and taxation | 295 | 30964 | 21006 | 48935 | C |
| 0412 | Finance, banking and insurance | 211 | 34710 | 23170 | 54721 | B |
| 0413 | Management and administration | 680 | 37074 | 26356 | 58987 | B |
| 0414 | Marketing and advertising | 201 | 31365 | 24183 | 58361 | C |
| 0488 | Inter-disciplinary programmes: business, administration and law | 500 | 31262 | 23804 | 54520 | C |
| 0533 | Physics | * | * | * | * | * |
| 0541 | Mathematics | 47 | 40127 | 27526 | 65642 | C |
| 0588 | Inter-disciplinary programmes: natural sciences, mathematics and statistics | 40 | 27455 | 21787 | 55967 | C |
| 0613 | Software and applications development and analysis | 218 | 42843 | 34707 | 66685 | C |
| 0688 | Inter-disciplinary programmes: information and communicat. technologies (ICTs) | * | * | * | * | * |
| 0711 | Chemical engineering and processes | * | * | | | * |
| 0712 | Environmental protection tech. | * | * | * | * | * |
| 0713 | Electricity and energy | 255 | 42578 | 31694 | 67466 | B |
| 0714 | Electronics and automation | 549 | 41156 | 29501 | 58860 | A |
| 0715 | Mechanics and metal trades | 1118 | 38745 | 28078 | 56993 | A |
| 0716 | Motor vehic., ships and aircraft. | 98 | 37080 | 26575 | 59899 | A |
| 0719 | Engineering and engineering trades not elsewhere classified | 45 | 34925 | 26044 | 65711 | A |
| 0724 | Mining and extraction | 544 | 41166 | 26945 | 74430 | C |
| 0731 | Architecture and town planning | * | * | * | * | * |
| 0732 | Building and civil engineering | 570 | 33590 | 25920 | 51665 | C |
| 0788 | Inter-disciplinary programmes: engineering, manufacturing and construction | 756 | 38925 | 27095 | 53736 | B |
| 1032 | Protection of persons and property. | 379 | 39702 | 29057 | 60916 | B |

*values that do not meet the publication criteria

Source: Trexima (2020).

The overall view of the structure of graduates and the remuneration of VSB-TUO graduates by sections of the sectoral classification of economic activities of the employer is expressed in Table 4.

Only one main sector of the employer's economic activity according to the register of economic entities was worked with. Other sectors for the same employer were not considered.

The largest number of graduates in the sample (758 persons) was employed in the Information and communication (CZ-NACE J) sector, CZ-NACE M Professional, scientific and technical activities (711 persons) and CZ-NACE G Wholesale and retail trade (697 persons), CZ-NACE CH Manufacturing of basic metals and fabricated metal products, except machinery and equipment (665 persons). The lowest number of graduates (48) for whom the publication criteria were met was in CZ-NACE Q Human health and social work activities.

**Table 4.** Structure and gross monthly salary of VSB-TUO graduates by industry CZ-NACE (weighted data)

| Code | Industry | Total | Gross monthly salary in CZK | | | |
|---|---|---|---|---|---|---|
| | | | Median | 1st decile | 9th decile | Estimate quality |
| A | Agriculture, forestry and fishing | * | * | * | * | * |
| B | Mining and quarrying | 194 | 48513 | 32871 | 69321 | A |
| CA | Manufacturing.of food product... | 92 | 37040 | 26365 | 50473 | C |
| CB | Manufacturing of textiles … | * | * | * | * | * |
| CC | Manufacturing of of wood … | 72 | 41306 | 27253 | 58161 | C |
| CD | Manufacturing of coke… | * | * | * | * | * |
| CE | Manufacturing of chemicals… | 88 | 44245 | 31075 | 72712 | C |
| CF | Manufact. of pharmaceuticals… | 42 | 34580 | 26293 | 52884 | C |
| CG | Manufacturing of rubber… | 195 | 49294 | 26737 | 74910 | D |
| CH | Manufacturing of basic metals… | 665 | 38235 | 28139 | 57137 | B |
| CI | Manufacturing of computer… | * | * | * | * | * |
| CJ | Manufact. of electrical equip… | 581 | 39046 | 29070 | 58942 | A |
| CK | Manufacturing of machinery… | 331 | 34253 | 26214 | 49674 | C |
| CL | Manufact. of transport equip… | 459 | 39318 | 28760 | 60520 | A |
| CM | Other manufacturing and repair | 198 | 39762 | 27921 | 51114 | C |
| D | Electricity, gas, steam… | 161 | 45586 | 33948 | 72886 | B |
| E | Water supply, sewerage… | * | * | * | * | * |
| F | Construction | 344 | 36042 | 28104 | 54120 | C |
| G | Wholesale and retail trade… | 697 | 34399 | 21006 | 58987 | C |
| H | Transportation and storage… | 214 | 37653 | 27064 | 56381 | B |
| I | Accomodation and food service | * | * | * | * | * |
| J | Information and communication | 758 | 43784 | 31105 | 77202 | C |
| K | Financial and insurance activit. | 295 | 34053 | 24184 | 60799 | C |
| L | Real estate activities | * | * | * | * | * |
| M | Professional, scientific and technical activities | 711 | 36654 | 21752 | 60828 | C |
| N | Administrative and support … | 192 | 31325 | 21831 | 45217 | C |
| O | Public administrat. and defence | * | * | * | * | * |
| P | Education | 598 | 36688 | 20788 | 57950 | B |
| Q | Human health and social work activities | 48 | 32604 | 23096 | 46496 | B |
| R | Arts, entertaiment and recreation | * | * | * | * | * |
| S | Other services | * | * | * | * | * |

*values that do not meet the publication criteria

Source: Trexima (2020).

**Table 5.** Structure and gross monthly salary of VSB-TUO graduates by occupation (weighted data)

| Code | Title | Total | Gross monthly salary in CZK | | | |
|---|---|---|---|---|---|---|
| | | | Median | 1st decile | 9th decile | Estimate quality |
| 12 | Corporate managers | 81 | 57727 | 39700 | 119619 | C |
| 121 | Manager of business administr... | 48 | 61989 | 40029 | 107248 | D |
| 13 | General managers | 259 | 60116 | 34683 | 97958 | C |
| 132 | Managers in the industry | 215 | 60143 | 39614 | 99750 | C |
| 21 | Physical, mathemath. prof. | 1466 | 39289 | 26647 | 59765 | B |
| 211 | Physicists, chemists | 49 | 36654 | 22214 | 58121 | A |
| 214 | Professionals in manufacturing, construction and related fields | 953 | 38748 | 27064 | 58035 | B |
| 23 | Teaching professionals | 454 | 38705 | 22956 | 61175 | C |
| 231 | College, university teachers | 439 | 39261 | 22784 | 61330 | C |
| 24 | Business professionals | 432 | 39416 | 28510 | 64344 | C |
| 241 | Finance professionals | 206 | 38097 | 28155 | 62353 | B |
| 242 | Strategy a HR professionals | 85 | 39061 | 29962 | 61688 | C |
| 243 | Sales professionals | 141 | 41734 | 28510 | 72886 | D |
| 25 | ICT professionals | 807 | 44286 | 31336 | 76398 | A |
| 252 | Database professionals | 157 | 39185 | 27095 | 58860 | D |
| 26 | Legal and social professionals | 37 | 35696 | 26682 | 55980 | B |
| 31 | Physical and engineering prof. | 1444 | 39247 | 29192 | 54465 | A |
| 311 | Physical and engineering tech. | 1247 | 38017 | 28833 | 51681 | A |
| 312 | Manufacturing technicians | 177 | 47954 | 37546 | 74910 | B |
| 33 | Professional workers in business | 1295 | 33625 | 24184 | 53770 | B |
| 331 | Workers in economic fields | 481 | 32265 | 25008 | 48442 | C |
| 332 | Sales representatives | 324 | 40860 | 25970 | 58987 | C |
| 333 | Service providers | 276 | 29440 | 21006 | 41816 | C |
| 334 | Professional administrative staff | 214 | 34687 | 20603 | 50182 | C |
| 35 | IT technicians | 115 | 41145 | 30014 | 69955 | B |
| 351 | IT technicians of operation | 111 | 41147 | 30635 | 69955 | B |
| 41 | General admin. staff, secretaries | 262 | 26582 | 21400 | 38924 | C |
| 411 | General administrative staff | 226 | 27279 | 21400 | 38624 | D |
| 42 | Information service workers, at the counters | 81 | 27229 | 20956 | 42045 | B |
| 422 | Information service workers | 67 | 26634 | 20423 | 40190 | A |
| 43 | Officials for information processing and in logistics | 182 | 34548 | 24399 | 48491 | B |
| 431 | Officials for the processing of numerical data | 87 | 33842 | 22422 | 51534 | C |
| 432 | Officials in logistics | 95 | 34879 | 28539 | 47632 | C |
| 52 | Sales staff | 115 | 30943 | 22688 | 46635 | C |
| 522 | Leaders of work teams in stores, salespeople. | 102 | 30143 | 22405 | 46635 | C |
| 75 | Food, wood, textile processors | 54 | 33407 | 27379 | 44887 | C |
| 754 | Other craft workers | 44 | 34281 | 27379 | 47337 | A |
| 81 | Oper. of stationary machines | 88 | 35681 | 28131 | 47114 | B |

* values that do not meet the publication criteria

Source: Trexima (2020).

High median gross monthly wages were achieved by graduates who were employed in CZ-NACE CG Manufacture of rubber and plastic products, and other non-metallic mineral products (CZK 49 294), CZ-NACE B Mining and quarrying (CZK 48513), CZ-NACE D Electricity, gas, steam and air-conditioning supply (CZK 45586). Conversely, low wages were paid to graduates working in CZ-NACE N Administrative and support services activities (CZK 31325), CZ-NACE Q Human health and social work activities (CZK 32604).

Table 5 shows the structure of graduates and their wages by CZ-ISCO occupational classification. Only those occupations where the publication criteria are met are listed. It contains the weighted numbers of employees aggregated by two more general levels of classification (levels 2 and 3 - CZ-ISCO grade and group).

The largest number of graduates (1 247 persons) worked in occupations falling under CZ-ISCO group 311 Technicians in physical and industrial fields (construction technicians, electrical technicians, mechanical technicians, mining and metallurgical technicians and other technicians). More significantly represented in the sample were the occupational groups CZ-ISCO 214 Specialists in manufacturing, construction and related fields (953 persons), CZ-ISCO 331 Professional workers in economic and related fields (481 persons), CZ-ISCO 231 College and university teachers (439 persons). Some graduates were employed in blue-collar occupations classified in the 7th, 8th and 9th main occupational classes. 102 graduates performed the occupation Salesman and store manager, which is classified in CZ-ISCO 522 Leaders of work teams in stores, salespeople.

High median gross monthly wages are achieved by graduates working in occupations CZ-ISCO 121 Managers of business administration, administrative and support activities (61989 CZK), CZ-ISCO 132 Managers in the industry (60143 CZK), CZ-ISCO 312 Manufacturing technicians (47954 CZK), CZ-ISCO 243 Specialists in sales, purchasing, marketing and public relations (41734 CZK), CZ-ISCO 351 Information and communication technology operation and user support technicians and related workers (41147 CZK). Graduates of CZ-ISCO 422 Information service workers (26634 CZK) had the lowest median gross wages

## Conclusion

The results of the survey of employers' employability of VSB-TUO graduates showed that most of them were employed in the Moravian-Silesian Region (4587 persons). This value is related to the regional character of the university, where the majority of students are local, and after graduation a large part of them remain working in the region of their residence. This number is in line with the trend of young skilled workers leaving the region, often for Prague. The highest median gross wage is achieved in the Ústí nad Labem Region (CZK 48772), which is related to the nature of the professions that are performed by graduates in this region. Higher wage levels are also achieved in the Central Bohemia Region and Prague. The lowest median gross wage of VŠB-TUO graduates was recorded in the Zlín Region.

In terms of the structure and remuneration of graduates according to the CZ-ISCED fields of education studied, the largest number of graduates (1118) studied the CZ-ISCED 0715 Mechanics and metal trades. The smallest number of graduates were enrolled in CZ-ISCED 0588 Inter-disciplinary programmes: natural sciences, mathematics and statistics (40 persons), CZ-ISCED 0719 Engineering and engineering trades not elsewhere classified (45 persons) and CZ-ISCED 0541 Mathematics (47 persons).

A large number of graduates from the sample were employed in CZ-NACE J Information and communication (758 persons), CZ-NACE M Professional, scientific and technical activities (711 persons). The smallest number of graduates (48 persons) who fulfilled the publication criteria were employed in CZ-NACE Q Human health and social work activities.

High median gross monthly wages were achieved by graduates who were employed in CZ-NACE CG Manufacture of rubber and plastic products, and other non-metallic mineral products (49 294 CZK), CZ NACE B Mining and quarrying (48513 CZK), CZ-NACE D Electricity, gas, steam and

air- conditioning supply (45586 CZK). On the contrary, low wages were obtained by graduates working in CZ-NACE N Administrative and support services activities (CZK 31325), CZ-NACE Q Human health and social work activities (CZK 32604).

The largest number of graduates (1,247 persons) held jobs falling into CZ-ISCO 311 Technicians in physical and industrial fields (construction technicians, electrical technicians, mechanical technicians, mining and metallurgical technicians and other technicians. The occupational group CZ-ISCO 214 Specialists in manufacturing, construction and related fields was more significantly represented in the sample (953 persons). High median gross monthly wages are achieved by graduates in occupations CZ-ISCO 121 Managers of business administration, administrative and support activities (61989 CZK), CZ-ISCO 132 Managers in the industry (60143 CZK), CZ-ISCO 312 Manufacturing technicians (47954 CZK). The lowest median gross wages are achieved by graduates in CZ-ISCO 422 Information service workers (26634 CZK).

The VSB-TUO monitors the employability of graduates in the labour market on a long-term basis. In 2022, another survey on the employability of graduates with employers is being implemented in an extended form. The new survey examines the employment and remuneration of graduates of individual faculties, the position of the university in the area of graduate remuneration in relation to the national average, which includes graduates of universities with a similar profile. In order to improve the quality of teaching, VSB-TUO tries to modernize teaching methods and implement a more effective cooperation between students and potential employers during their studies. Also, through the services of the Career Centre, it helps the students with the choice of employment for its graduates.

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# LEAN MANAGEMENT IN HEALTHCARE FACILITIES

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**Abstract**
This paper does not focus on the use of one of the quality management methods applicable in healthcare. The aim of the paper is to introduce the Lean and Six Sigma method in healthcare in the context of professional studies dealing with this issue. The paper also presents the practical applications of the method used in various hospital facilities around the world. It is important to note that this is a method that is new in the field of healthcare, specifically in hospitals, and it brings a new perspective on how it is possible to slim down the method of management in hospitals and their departments. Based on the given studies presented in the paper, the author of the paper focuses primarily on its applicability in practice in healthcare. This article is intended to provide a basic understanding of the given method applicable in the management of health care and various hospital departments.

**Keywords**
Management, Lean, Six Sigma, Healthcare

**JEL classification**
M12, I11, I19

## Introduction

Quality is becoming an increasingly prevalent part of our lives. People are constantly looking for high quality products and services. The existence of this desire for quality has caused companies and organizations around the world to consider it an essential part of any service and production process. Quality is a strategic differentiating tool for maintaining a competitive advantage. Improving quality through the improvement of structures and processes leads to a reduction in waste, rework and delays, lower costs, higher market share and a positive image of the company (Langrosen and Lagrosen, 2005; Rahman, 2001). The result is improved productivity and profitability (Alexander, Weiner and Griffith, 2006). Therefore, it is very important to define, measure and improve the quality of health services (Mosadeghrad, 2014).

Quality is generally defined as "value" (Feigenbaum, 1951); "*perfection*" (Gilmore, 1974); "*conformity with specifications*" (Gilmore, 1974); "*compliance*" (Crosby, 1992); "*fitness for use*" (Juran, 1988); "*meeting and/or exceeding customer expectations*" (Parasuraman, Zeithaml and Berry, 1985) and "continuous customer pleasure by providing products and services to the latest functional specifications that meet and exceed the explicit and implicit needs of the customer and satisfy the manufacturer/provider" (Mosadeghrad, 2013).

Defining and measuring the quality of health services is even more difficult than in other sectors. Different characteristics of the healthcare industry, such as non-materiality, heterogeneity and simultaneity, burden the definition and measurement of quality. A health service is an intangible product and cannot be physically touched, felt, viewed, counted or measured as a manufactured commodity. The production of tangible goods allows quantitative quality measurement because it is possible to take samples and test quality during the production process and in later use. However, the quality of health services depends on the service process and the interaction between the customer and the service provider (McLaughlin, 2006; Mosadeghrad, 2012).

The quality management system can be perceived as a set of interacting activities, methods and procedures used to monitor, control and improve the quality of care (Wagner et al. 2013; Wagner et al. 2014). Components of the quality management system at the hospital level include, for example, quality monitoring by the Board of Directors, implementation of quality policy documents, formal protocols and analyses and improvement of processes and output measures (Vogus, Sutcliffe and Weick, 2010; Singer and Vogus, 2013; Wagner et al. 2014). Strong management support – from top

management to department management to unit-level clinical leaders – is a key factor in the successful implementation of a quality management system (Abdallah, 2014). The introduction of a quality management system changes previously established mechanisms and procedures, induces structural changes and supports effective organizational processes that support communication, coordination and the continuity of patient journeys (van Harten, Casparie and Fisscher, 2000).

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Lean Six Sigma is a method of strategic process improvement that aims to improve operational consistency and quality and reduce deviations and waste. Lean thinking and Six Sigma are traditionally used in production (Chiariniova and Bracci, 2013). Six Sigma and Lean Management focus on improving system efficiency. Six Sigma optimizes output quality, while Lean management allows users to identify waste and work process improvements. The Lean Six Sigma (“LSS") approach is the best choice in a healthcare setting for dealing with a critical patient. The LSS methodology optimizes the average reduction of the required process. Expected results may include shortening several aspects of the medical peak, such as patient waiting time in emergency departments, lost billing fees in patient service finances, delinquent medical records, processing time of diagnostic results, days of claims, length of stay of patients or medication (Ahmed, Manaf and Islam, 2014).

The aim of the paper is to introduce the Lean and Lean Six Sigma method in healthcare in the context of professional studies dealing with this issue. This contribution is conceived following the Introduction, followed by the second chapter, which focuses on the literary research of professional studies in the context of the given issue. The third chapter in this case the empirical part pays attention to the use of new methods of quality management in practical application. At the end there is a drafted Conclusion, where a summary of the findings so far and the further direction of research of the author of the contribution is given.

## 1 Literature review

Over the past few decades, there has been a sharp increase in interest among healthcare organizations and scientists about the role of organizational culture in improving hospital performance (Lee et al., 2021). The idea is that organizational culture unites its members around a common set of values, norms, and attitudes, thereby developing a highly motivated and well-coordinated workforce (Lim, 1995). Organizational culture plays a critical role in process improvement (Schein, 1996) and has been identified as one of the most important factors in the successful implementation of quality management practices such as Lean and Six Sigma (Patyal and Koilakuntla, 2018) and improving healthcare performance (Scott et al., 2003). According to Someer and Blumenthal (2019), Lean management is a set of principles aimed at improving processes by identifying and eliminating steps that do not add value to consumers. Such actions lead to the wasting of time, resources and expenses and lead to dissatisfaction of customers and employees. Although it was originally invented and perfected for factory assembly lines in the automotive industry, it has since expanded considerably and has repeatedly proven itself as a powerful "engine" for improving quality and quantity in healthcare. The benefits of lean implementation include improved security, reduced waiting times, increased patient satisfaction, and reduced costs. The lean manufacturing method is very suitable for

implementation by healthcare providers within existing processes and routines without the need for complex reorganization. This change could allow employees to constantly explore and improve processes, each in their area of work (Patterson et al. 2017; Taylor and Benger, 2004; Xie and Or, 2017). The medical literature highlights numerous examples of Lean techniques that have been successfully implemented in medical practice and have been associated with a reduction in postoperative complications, improved patient outcomes, increased satisfaction and improved safety, as well as cost reduction (Sethi et al. 2017).

Lean research in health care has developed into a major research direction since the beginning of the 21st century (e.g., Thompson, Wolf and Spear, 2003; Young et al. 2004; Spear, 2005). One of the first papers published on Lean in healthcare is a study by Young et al. (2004). The study addresses the use of industrial processes to improve patient care. Essentially, the authors describe three established industry approaches, i.e., lean thinking, constraint theory, and Six Sigma, and examine how the concepts on which each is based relate to healthcare. The authors concluded in the study that the three methodologies have common features because each emphasizes the concept of manufacturing as a complex interaction of individual activities, and each recognizes that it is essential for efficient and effective production to identify weak links or bottlenecks and take appropriate corrective action. However, in order for them to work, all approaches require strong leadership, the adoption of algorithmic methods to solve problems based on interactive improvement, and employee participation in all components of the system (D'Arrematteo et al., 2015). The following authors of the study, Kim et al. (2006), note that readiness for action by hospital staff who use the new Lean principles within hospitals can provide patients with high-quality and effective care. The authors also highlighted the cultural and practical obstacles that need to be overcome in order to expand the use of Lean techniques. These obstacles include distrust of management tools imported from a context other than healthcare, a misunderstanding of what Lean wants to achieve through cuts and layoffs, and the difficulty of acting as a whole by units that are accustomed to functioning as an autonomous "force" (D'Arrematteo et al., 2015).

In the case of the heyday of the given area of study, D'Ardamatteo et al. (2015) note that there are several literary overviews in this regard. De Souza (2009) sought to shed light on general new trends and approaches to lean healthcare and to evaluate the status quo of research by proposing a taxonomy primarily based on distinguishing between theoretical and case studies. Another study by Mazzocato et al. (2010) created a "realistic overview" that emphasizes the general mechanisms included in the Lean application. Conversely, Holden (2011) created a critical review that deployed an analytical framework focused on setting up emergency care. According to D'Arrematteo et al. (2015), another literature review evaluates Lean applications in specific conditions or compares different approaches to process improvement, analyzes academic, professional and gray literature. Radnor et al. (2006) highlighted some features of Lean in the public sector that remain under-researched (i.e., how it works, its outcomes, barriers to change and success factors for sustainability), emphasizing that Lean principles have been adapted for its application. Boaden et al. (2008) demonstrated a growing emphasis on Lean in healthcare, with Lean sometimes being integrated into a Six Sigma framework. The study also notes that there are some difficulties in identifying guidelines for Lean implementation and in identifying other studies with findings that are more comparative, independent or critical.

Based on a study by Lighter (2014), Lean and Six Sigma are usually combined in healthcare because they address two related but separate problems. Lean's focus on cost reduction and efficiency is a perfect complement to Six Sigma's pursuit of accuracy and precision. Many healthcare organizations have embarked on the LSS journey, and some have already achieved significant business results. As the LSS framework is applied in healthcare, its use in improving clinical processes of care will soon follow. The application of Six Sigma and Lean management to improve operational efficiency through process improvement and standardization has clearly documented success (Sultan and Charalambous, 2012; Joosten, Bongers and Janssen, 2009; Tagge et al. 2017; Cima et al. 2011; Cerfolio et al. 2016).

## 2 Methodology

The second chapter is focused is focused on the contribution's methodology. Contributions that had open access were selected. The aim of the paper is to introduce the Lean and Six Sigma method in healthcare in the context of professional studies dealing with this issue.

In the case of the areas that were searched for among the articles, the following can be included: the definition of Lean Management in healthcare; Lean implementation in healthcare; areas and sub-areas of research focused on the implementation of Lean in healthcare; Lean procedures and performance measures implemented in healthcare facilities; the application of Six Sigma in healthcare and what measures and improvements it has brought. Below are studies focusing on the above-mentioned issue.

## 3 Empirical results Use of Lean and Six Sigma Methods in Healthcare Facilities

The next chapter is devoted to professional studies that focused on the use of the Lean and Six Sigma methods in healthcare facilities. As mentioned above, this is primarily an overview of literary studies that focus on this area.

The table below (Table 1.) focuses on the common definitions of Lean Management in the healthcare sector following various studies that were discussed in the paper by Rotter et al. (2019). As can be read from the given table, most definitions of Lean Management focus primarily on the efficiency of the process in healthcare facilities, the elimination and detection of errors and the recognition of the patient as the primary client and as a critical factor to be considered when designing processes and providing care.

**Table 1.** Common definitions of Lean Management in healthcare

| Studies | Characteristics/Definitions | Definition type |
|---|---|---|
| Black and Miller (2008) | Patient-centered approach to managing and delivering care that continuously improves how work is done. All parts of the production system are focused to eliminate waste while continuously increasing the percentage of value-added work. Based on the premise that we can continuously improve health care without adding more money, staff, space, or inventory. | Theoretic |
| D´Andreammatteo al. (2015) | Basic principles: Specify value, identify the value stream, avoid interruption in value flow, let customers pull value, and start pursuing perfection again. Other principles: Committed management, respect for people, and the involvement of supply chain management. Prioritizing flow efficiency over resource efficiency | Theoretic |
| Glasqow, Scott-Caziewell and Kaboli (2010) | Articles that self-identify as reporting on a Lean, Six Sigma, or Lean Sigma projects | Operational |
| Mazzocato et al. (2010) | Understand processes to identify and analyze problems. Organize more effective and/or efficient processes Improve error detection, relay information to problem solvers, and prevent errors from causing harm. Manage change and solve problems with a scientific approach. | Theoretic |
| Poksinska (2010) | Understanding what adds value and how to eliminate waste. Often emphasizes that current health-care systems consist of fragmented processes that require a shift in how the flow of patient care delivery is perceived and organized. Recognizes the patient as the primary customer and as a critical factor to be taken into consideration when designing processes and delivering care. Sees the processes as they are performed with all problems and shortcomings. | Theoretic |

| | | |
|---|---|---|
| Radnor, Holwg, and Waring (2012) | The philosophy of continuously improving processes by increasing customer value or reducing nonvalue adding activities (muda), process variation (mura), and poor work conditions (muri) Assessing activities that include reviewing the performance of existing organizational processes to look at waste, flow, or capacity to add value Improvement activities that support and improve processes Performance monitoring to measure the processes and any improvements made | Theoretic |

Source: Rotter et al. (2019), own adjustment

Table 2. shows the application of the Six Sigma method in healthcare in the context of the given purpose. The mentioned table shows the destination, service, or process, improvement and studies that have dealt with this issue. It is evident that the mentioned studies, which are presented in the table below, clearly prove that the approach of the Six Sigma method is a suitable benefit for the medical facility and its effective management, which seeks to improve process approaches, cost reduction and error reduction.

**Table 2**: Where has Six Sigma been applied and for what purpose? Actions and improvements Some actions carried out to achieve the main efficiency objectives

| Objective | Service/Process | Actions/Improvements | Studies |
|---|---|---|---|
| Time reduction | Hospitalization | Improve evaluation processes | Johnson et al. 2005 |
| | | Decrease patient´s length of hospital stay | Improta et al. 2017; Niemeijer et al. 2013; Niemeijer et al. 2010; Arcidiacono and Pieroni, 2017. |
| | | Minimize infections derived from long stays | Hina-Syeda et al. 2013 |
| | Waiting list | Improve collaboration between different doctors and specialists | Paccagnella, Mauri and Spinella, 2012; Patton et al. 2015 |
| | Medical consultation | Improve patient flow (Reorganization) | Aakre, Valley and O´Connor, 2010 |
| | Medical tests | Reduce length of notification process and delivery of results | Cavagna et al. 2003; Kim, Song and Lee, 2009 |
| | Surgery | Avoid underutilization of spaces | Adams et al. 2004 |
| | | Reduce steps' duration | Kelly et al. 2010; Rai et al. 2016 |
| | Emergency | Differentiate urgent from non-urgent queries | Johnson et al. 2017 |
| | | Improve coordination between different hospital areas or different centers during transfers | Silich et al. 2012 |
| | Laboratory | Improve management of samples (avoid extra costs-errors) | Elbireer, le Chasseur and Jackson, 2013 |
| | Surgery | Improve the programming of interventions to reduce extra hours of the staff | Adams et al. 2004 |
| | | Reorganize operating rooms processes | van den Heuvel et al. 2006 |
| Cost reduction | | Improve procedures to avoid incidences or infections | Kles et al. 2015 |
| | Unnecessary process or test Management | Improve the programming of interventions to reduce extra hours of the staff | Cima et al. 2011 |
| | | Decrease orders of excessive daily laboratory tests and X-rays | Ko et al. 2016 |
| | | Improve the use of resources | Sunyog, 2004 |
| | | Reduce falls rates | Kuwaiti and Subbarayalu, 2017 |

| | | | |
|---|---|---|---|
| Error reduction | Laboratory | Improve protocols that avoid erroneous values | Shaikh and Moiz, 2016 |
| | | Improve workflow, sample handling | Berte, 2004 |
| | | Improve the billing process (avoid unbilled tests) | Levtzow and Willis, 2013 |
| | Surgery | Reduce complications arising from the administration of anesthesia or other aspects of interventions | Taner, 2013; Bertolaccini, Viti and Terzi, 2015; Akifuddin and Khatoon, 2015 |
| | Medication administration | Improve medical prescriptions | Leaphart et al. 2012 |
| | | Guarantee the correct administration of medications | Ramirez et al. 2017; Yamamoto, et al. 2010; Drenckpohl, Bowers and Cooper, 2007; Long and Liu, 2017 |
| | Measure | Use digital measurement systems | Bertolaccini et al. 2011 |
| | Hygiene | Improve protocols to avoid infections | Chassin, Mayer and Nether, 2015 |
| | Information system | Improve information system in favor of the effectiveness of the processes | Ratnaningtyas and Surendro, 2013 |

Source: Ninerola, Sánchez-Rebull and Hernández-Lara (2020); own adjustment

## Conclusion

Quality in health care is a fundamental goal of health policy, and policy makers around the world put quality improvement at the top of their agendas (Busse et al. 2019; Øvretveit et al. 2002; Gadolin and Andersson, 2017). While definitions of quality have traditionally been the remit of clinicians and health services researchers and focused mainly on clinical effectiveness and safety, the importance of other stakeholders such as patients and healthcare managers is increasingly recognized (Busse et al. 2019; Brook, McGlynn and Cleary, 1996; Shaw and Kalo, 2002; Madsen, Mainz and Jensen, 2019). Thus, quality improvement now also includes dimensions such as patient-centeredness, equity, and efficiency, and relies on different governance management principles (Madsen, Mainz and Jensen, 2019; Committee on Quality of Health Care in America, 2001). Quality improvement in healthcare is currently focused on creating value across the healthcare system, including quality of care and health system performance, governance and sustainability (Busse et al. 2019). A study by Spear (2005) discusses how health professionals can ensure that the quality of their services matches their knowledge and aspirations. The above author claims that learning how to improve the work one does, while actually doing it, can result in extraordinary savings in life and money. D'Andreamatteo et al. (2015) report that, in the case of the study by Spear (2005), some hospitals make enormous short-term improvements that are not based on legislative or market reorganization and with little or no capital investment. Rather than waiting for sweeping changes in market mechanisms, these institutions take an operational approach to patient care.

Current challenges and pressures have shown the importance of establishing quality in health as a priority that is central to the planning of health systems worldwide, not as a general or intangible discourse, but as a tool for systematic and consistent assessment. In a world tending towards universal health coverage (Ghebreyesus et al. 2018), many factors influence the quality of health care, and the way patients seek it and are treated (Rortveit, Shcei and Strnad, 2004; Mulder, 2018; Serra, 2014). Perfect health systems do not exist but achieving the stated goals in a responsible manner is crucial and requires the efforts of those involved (Declaration of Alma-Ata, 1978; Donabedian, 1988). Primary health care (PHC) is a cornerstone for promoting health and improving access to health care providers, which can lead to better health outcomes, cost savings, and greater equity. Therefore, it is paramount to establish primary health care and its professionals as the main target when it comes to efforts to improve quality and reorganize health systems (Ramalho et al. 2021).

Health care systems that are able to provide equitable and efficient services are necessary for general and sustained improvement in the health status of the population. Over time, healthcare efficiency has become synonymous with healthcare spending. Moreover, for both high and medium development index economies, increasing spending efficiency appears to be the only option that would allow public systems to overcome the spending pressures associated with age and tax increases (Heller and Hauner, 2006). The results of a study by Potrafke (2010) show how for a 1% increase in GDP per person, health spending increases by 0.4%. Another study by Schoenberg et al. (2007) and Thompson et al. (2009) show in their studies that the costs of diseases increase exponentially for citizens over 60 years of age, mainly because these people suffer from an average of 2.2 chronic diseases per person. Furthermore, studies have shown how health care spending is affected not by the age of patients, but by the fact that patients are approaching death. So, it turned out that the 5% of patients aged 65 and over who were in their last year of life (2012) accounted for more than 50% of the hospital's expenditure. Studies by Payne, Youngcourt and Beaubien (2007) highlight the impact of increased life expectancy on health care spending. The study points out that increased life expectancy may be a pressure factor on health spending if morbidity does not decrease or remain constant. In other words, prolonging the life of keeping patients in a state of illness leads to an increase in aggregate health expenditures, because periods of illness are more expensive than periods of health (Atkinson, Foster-Powell and Brand-Miller, 2008; Mathers and Loncar, 2006).

The aim of the paper was to introduce the Lean and Six Sigma method in healthcare in the context of professional studies dealing with this issue. Based on the given contribution, which focused on a list of studies that were focused on the applicability of the Lean and Six Sigma methods in healthcare facilities, it can be said that this method brings improvements to healthcare facilities primarily in the organizational process, reducing costs and waste. The mentioned method can be applied for new processes that focus on the length of patient care and the time spent in the doctor's office. The author of the paper believes that the introduction of lean management in hospital facilities is important for the 21st century, as it saves money and time.

There are limitations that must be taken in this post. The studies that were published in the given post are from open access. There are other studies that did not have open access and were therefore not presented here. Another limitation in the case of using the Lean method in healthcare facilities is that the mentioned method is new for hospital facilities and is gradually being applied in the world and their positive and negative effects on healthcare facilities are being determined. Therefore, for the further direction of the research, it is necessary, above all, to conduct an in-depth search of the professional literature as well as to find out the practical effects on the implementation of this method, where it is mainly about the size of the cost reduction after the introduction of the given method and other economic indicators that can help to apply the Lean method more effectively in healthcare facilities.

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# BEHAVIORAL ASPECTS OF INNOVATION ECOSYSTEM: RESEARCH DESIGN FOR ASSESSING THE ROLE EXTERNAL MOTIVATORS PLAY IN INNOVATIVE BEHAVIOR

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**Abstract**

This theoretical paper offers a research design to explore the interaction between organizations and individuals, aiming to uncover individual external motivators a firm can produce to foster collective innovative behavior. This behavior then turns into ideas, ideas form technology which then, in turn, becomes progress through interaction between organizations and the market. Individual propensity to produce new ideas represents the focal point of future work of the author. Firstly, important steps taken towards locating the topic and a path that led to the viewfinder being focused are described step by step. A point of interaction between organization and its workers is located within the entrepreneurial ecosystem. What follows is a design of quantitative research aimed at assessing the external individual drivers of collective innovative behavior. The literature review offers a detailed look at how economic growth is formed within an interaction between entrepreneurial and innovation ecosystems. The design then offers methodology aimed to inspect workplace organization and employee traits in order to assess team innovative behavior.

**Keywords**
Innovative behaviour, Innovation ecosystem, External motivation, Technology.

**JEL classification**
O31, O47, L26.

## Introduction

Economic growth as a process powering the progress of humanity, uplifting our levels of knowledge, material abundance and well-being is a thoroughly studied phenomenon. A conventional view of it, the one taught at universities, is rather vague. Firstly, progress is being explained by increases in dexterity: people getting better at tasks with increased experience, also known as learning-by-doing. Secondly, as people specialize and focus on the task they improve performing in, they save time and with those hoarded manhours, free themselves from labour and hence have time to think about making their work even more easy e.g. by improving the machines that work for them. Finally, when such approach is taken by many people thinking alike, there are returns from new ideas (or technology). When more people think about an activity in cooperation, there is a greater chance that they will come up with a way of doing it better – increasing their productivity.

There has been a great contribution to modelling growth and speaking about it since the 1950's pioneered by Solow (1956). The early view offered was that of productivity growth which was seen as uninfluenceable by anything in the other parts of the economy – a result of external factors. Those were the times when growth was described as exogenous. A contemporary understanding of economic growth has its roots in a paper by Romer (1990). While seeing technological change at the core of progress, similarly to the exogenous theory, Romer developed the theory of endogenous growth. In this view, upgraded technology results from the efforts of entrepreneurs and researchers who act on behalf of economic incentives. By occupation, entrepreneurs are dependent on ideas to make a living and by doing so and igniting growth (offering new possibilities), they contribute to increasing everyone's standards of living. These actors produce new ideas based upon their understanding of reality and the opportunities it brings and it is the goal of the work hereby presented to look closer at the circumstances of idea creation and dissemination.

## 1 Literature review

Defining technology has been a challenging goal and while the early growth-literature authors avoided the term or left it unexplained, Rosenberg and Nathan (1994) coined the term black box, pointing out a tendency to leave technology unexplained when discussing economic growth. Kumar et al. (1999) regard technology as having two components: 1) a physical component consisting of products, tools, equipment, techniques, blueprints and processes; and 2) the communication (information spread) component which comprises of managerial know-how, marketing, quality control, reliability, production, functional space and skilled labour. Lan and Young (1996) see technology as 1) knowledge or technique; and 2) doing things. The concept is connected with the knowledge or an information on how to use it (Bozeman, 2000). After all, Romer (1993) prefers to use the term *ideas* rather than the traditional technology, emphasizing that we apply this concept to all segments of the economy[1] rather than to industry, machinery or ITC etc. This paper will use the two terms – ideas and technology – interchangeably.

Another branch of research deals with technology transfer. In this case, similarly, authors tend to treat the terms technology transfer and knowledge transfer as interchangeable (Hayden and Stephenson, 1992; Hill, 1995). There are also works that draw a line between technology transfer and the transfer of knowledge while, however, pointing out that those two processes cannot occur separately. Bozeman (2000) argues that when a technological product is delivered, the knowledge which composes it is being transferred alongside it. Li-Hua (2006), studying the transfer of technology in China, stresses that technology will not happen without knowledge transfer as the later serves as a key component of driving technology. The transfer of knowledge that underlies technology represents an advantage of a firm providing it with an edge in production, processes, marketing etc. Although knowledge transfer and technology transfer are oftentimes used as synonyms, they serve different purposes. As Gopalakrishnan and Santoro (2004) write, the knowledge transfer component addresses the question of why make change happen, whereas technology transfer tends to be more focused and targets certain toolbox for changing the economic habitat.

This work taking into account that layering ideas leads to the transfer of knowledge which leads to innovation, as the process of innovation always owes a little something to the ideas that came before it, aims to further uncover and explore the parts of human behavior where innovation is most likely to happen. In order to dig deeper into the matter, the following subchapter deals with two coexisting parts of catallaxy[2] which are central to idea creation and dissemination: the entrepreneurial and the innovation ecosystems.

### 1.1 Where fresh ideas come from: the concept of the two ecosystems

The entrepreneurial and the innovation ecosystems are responsible for a large part of the dynamics within an economy. Considering the North American setting – where worthy and consistent data is available – as an example, and, noting that Decker et al. (2017) document the slowdown in the average pace of business dynamism during the recent decades, Ignaszak and Sedlacek (2021) still report that since 1980, the U.S. economy annually conceived or devoured about 1/3 of all its jobs. The authors also observe that more than 50 % of all new firms die out within five years of existence while the survivors almost double their size. Such pattern is consistent with the growth theory seen as endogenous innovation resulting from entry, growth and exit of businesses within the ecosystem (Acemoglu et al., 2018). The space in which this process takes place can be seen as a habitat in which new firms emerge, fade away and grow not only due to being created and developed by individual entrepreneurs but also because of operating within this environment which nurtures them, making their 'life' easier. The entrepreneurship ecosystem (referred to as EE from here on) is dynamic by definition with interdependent actors and institutions (public and private) functioning within it, influencing each other reciprocally (Acs et al., 2017; Spigel, 2017). Within this system, people lose

[1] Aggregated human behavior.
[2] *A Marketplace for ideas* as described in the works of F. A. Hayek. Explained in brief in Horwitz & Hall (2003).

and find jobs, are provided with self-fulfilment opportunities, supply others with the value they create and in the end of the day, make a living while fuelling change.

Surely no single formula to creating an ecosystem is to be found. In case of the EE, Isenberg (2010) suggests that its creation depends on conductive culture, enabling policies and leadership, quality human capital, accessible financing and the support of institutions, markets and infrastructure. Stam and Spigel (2016), taking the innovation systems perspective within the EE, propose a taxonomy which grasps the key elements that propel the dynamics of the EE: connectors, culture, resource providers, interactions, and mindsets. Another work (Spigel and Harrison, 2017) highlights the importance of community in the mediation of an EE. Variety of works then focus on the importance of networks that act as vehicles for the flow of knowledge and skills (Dubini, 1989; Malecki, 1997; Neck et al., 2004) while others highlight the role of mentorship in the process of uplifting an EE (Feld, 2012; Kenney and Patton, 2005; World Economic Forum, 2013) with their effort matched by works focusing on organizational support laying in providing auxiliary services such as incubators or law/accounting expertise (Kenney and Patton, 2005; Startup Genome Project, 2020; Charles University, 2022).

At this point, the focus of this paper allows to switch full attention to the processes of the mind[3]. If one is set on a quest to researching what propels single actors of EE to commit to creating change, demasking the vague constant change phrase, one has to explore the more secretive chambers of this sphere, targeting the process of knowledge conception which then leads to the process of innovation as described in the previous chapter. The selected space hence is the innovation ecosystem (IE henceforth). Vibrancy of an EE is the innovation springing from ideas created within the IE and – similarly to the inseparability of knowledge and technology transfer –, the IE and EE are intertwined.

With the reader inching closer to the very gist of the project proposal, conceptualization calls. Granstrand and Holgersson (2020) define innovation as outcome of a process, rest on two defining characteristics, a degree of newness of a change and a degree of usefulness or success in application of something new. The concept of 'new' could mean new to world, new to a nation, new to a firm, etc. There is a reminiscence to the early parts of this paper as the need to make one's work easier, to increase our dexterity is a common trait in human conduct. The deliberate process of innovation was famously described by Schumpeter (1934) as creation or implementation of a new combination of products, service, work processes and markets. Innovation, as defined currently by OECD did not move too far from the earlier work: An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organization or external relations. (OECD, 2005)

The concept of an innovation system can be summarized as a set of components and the causal relations influencing the generation and utilization of innovations and the innovative performance. (Granstrand and Holgersson 2020). Further definitions can be found in a rather broader set of works (Edquist, 1997; Asheim and Gertler, 2005).

The concept of an ecosystem can be traced back to having been coined by Tansley (1935) as the author described organisms and their special environment. Having originated in the science of ecology, a more recent work by Shaw and Allen (2018) defines the term as ecycling flows of nutrients along pathways made up of living subsystems which are organised into process-orientated roles; connects living and non-living subsystems. Here an analogy with the previous chapters can be seen with recycling being the omnipresent rise and fall of firms while nutrients (ideas, resources and capital, be it human or physical, while all of those are scarce and – with the exception of ideas – rival goods) get transferred to those surviving and growing. The EE and its supporting services then enable the flows of knowledge, finance and factors of production while the IE interacts as a cradle of technology and a nest for knowledge. Those components then engrain their finer roots into separate organizations/firms acting as subsystems that form the process-oriented roles, spreading the notional

[3] Echoing the term animal spirit, oftentimes attributed to the Roman Empire physician Galen (2-3rd century AD), later scripted as *spiritus animalis* i.e. spirit or vital force that originated in the brain i.e. the affairs of the mind.

capillaries into business units, teams and individual minds powering human behavior and being wired into the system from the ground up.

Formally, the concept of innovation ecosystem is described by Adner (2006) as the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution. This definition is problematic as it overlooks e.g. the public sector or culture – crucial social components that are being constantly forged anew by new idea implementation powered by social behavior which they also in turn underline in forms of public governance (taxis) and the evolution of culture and human cooperation (logos)[4].

Granstrand and Holgersson (2020) point out that although the concept of IE has become very much present in literature since around 2005, its definition lacks clarity. For this reason, they offer an overarching definition which will be acknowledged for the purpose of this paper: An innovation ecosystem is the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors (Granstrand and Holgersson, 2020). In this view, artifacts entail tangible and intangible products, services, and technology. The research proposed in this work will focus on the interaction between actors and activities with ideas being the result of their cooperation, propelling progress. Innovation i.e. creating change is synonymous to value creation. This process however also destroys value and ideas as described in Schumpeter (1942) by the concept of creative destruction (or self-liquidation) of capitalism, which destroys its own success. This work focuses solely on value creation.

To conclude this part, the following discussion is offered: as Burke (2012) postulates that as the increase in connections and interactions between humans intensifies over time, the rate of innovation accelerates. But what happens when change turns out to be too much for the average person to handle? To this, Hayek (1992) offers a view in which progress brings new possibilities which create new disciplines. Therefore, we are being civilized contrary to our wishes while culture5 is inseparable from progress. The author further argues that the same forces which sustain culture propel humans towards economic growth, enhancement of organizations and their ways of getting things done because if all those movements were to become stagnant, they would start to decline.

Progress is oftentimes faster than we would like it to be and it would be more digestible, were it to be slower. It however cannot be dosed, nor controlled. We can create the best conditions for it to happen and hope for the best. (Hayek, 1992).

### 1.2 Actors performing activities to create ideas: which personality traits precede work-related innovative behavior of individuals and what role do organizations play?

What is the nature of the persons who initiate innovation? The current section aims to explore the link between personality of an individual and innovative behavior in order to study the extent to which personality traits of an individual can influence her innovative outcomes at the workplace. To keep the research afloat, the literature reporting on the connection of the work process (workplace organization) and work progress (innovative output) to the topic of personality psychology is to be explored. The work of Wu et al. (2014) brings an individual's need for cognition to the foreground – connecting individual innovation behavior with her tendency to engage in and experience joy while thinking. The authors postulate that low job autonomy and increased time pressure stimulate thinking. Conversely, as these two factors diminish, the need for cognition kicks in, creating a situation with a trade-off between somewhat of a time-imposed need to innovate while not being too autonomous and enjoying thinking, being pushed to it by own personality when not facing a time constraint, producing innovation as a result of experiencing a heightened job autonomy. The authors, however, do not go as far as to explore whether persons with a high need for cognition perceive complexity more

[4] As described in the works of F.A. Hayek where *taxis* is the made, exogenous order that is constructed (a form of an organization) and *logos* which is the grown, endogenous, *spontaneous order.*

[5] Including tradition, organizational processes.

positively and whether such individuals are more capable of combining knowledge and information as opposed to individuals who express lower levels of need for cognition. The authors also acknowledge the limitation of the study as the research was conducted on a sample gathered mainly from a pool of researchers and consultants, pointing towards a research gap that offers an interesting opportunity.

A paper by Yesil and Sozbilir (2013) set on a research journey to explore the factors that affect personal ability to innovate. The authors tested the impact of five-factor personality dimensions against an individual's innovation behavior at work. Testing conscientiousness, agreeableness, openness to experience, extraversion and neuroticism, the authors conclude that in their study, openness to experience has a positive effect on individual innovation behavior while the other factors do not play a significant role. As stated in the seminal work by Barrick et al. (2001), although the Big Five traits do not predict overall work performance, they serve as good predictors for success in specific occupations. The work of Yesil and Sozbilir (2013) proves just that and while providing a view of a possible linkage, notes the shortcomings of employing information from respondents coming solely from the hospitality sector. This points towards a possible limitation of their study.

Petterson et al. (2009) describe the personality characteristics of an individual who is likely to produce innovation as imaginative, inquisitive, highly energetic, expressing a high desire for autonomy and social rule independence, and high self-confidence. Then again, these authors explore the ability of the Five Factor Model to understand which part of the personality structure serves best when linking personality and innovation. Authors target openness to experience (ideas, aesthetics) to be positively associated with the characteristics commonly associated with innovation (imaginative, original, unconventional, flexible – a list of more specific traits taken up from Feist, 2003).

To move further in on the topic, the motivational factor is at question. The amount of studies linking intrinsic motivation to innovative behavior (Chen et al., 2021; Jnaneswar and Ranjit, 2022; Karimi et al., 2021; Huang, 2021) greatly surpasses that of works assessing extrinsic motivational factors (a phenomenon which some authors e.g. Byron and Khazanchi, 2012; Cerasoli et al., 2014 emphasize as worth studying). The aim of the current paper points towards inspecting the interaction of individuals with their organizations, leading towards uncovering the extrinsic motivation provided by the lesser. The work by Fischer et al. (2019) aims to explore this very area by focusing on the channels though whose extrinsic motivation stemming from organizations percolates into intrinsic motivation of individuals who then are more inclined to behave in an innovative way. The study depicts that those extrinsic motivators – be it in the form of relations or transactional rewards – can have a significant positive impact on innovative outcomes. The authors also postulate that the relationship between extrinsic and intrinsic motivation in this sphere is rather complementary than substitutional. In other words, extrinsic motivators do not crowd out the intrinsic ones and rather serve as multipliers. Contrary to this claim, Cerasoli et al. (2014) perform a rather monumental meta-analysis, noting that extrinsic incentives crowd out intrinsic motivators when linked directly to performance. When being tied indirectly, incentives do not distract the inner motivators, according to the study, bringing about a conflict in literature.

Byron and Khazanchi (2012) conclude that creativity is uplifted by providing feedback and rising job autonomy. This shows a way of extrinsically motivating actors to be more creative. In literature, the difference between creativity and innovation is grasped as such that while creativity represents a cognitive activity of idea creation, innovation is an ability to create newness as mentioned earlier. It is therefore the act of converting creativity into action (applying it) or an output. Therefore, a creative actor can be non-innovative while having new ideas, lacking the ability to materialize them[6]. As noted by Fadaee and Abd Alzahrh (2014), creative individuals often innovate but not all creative actors are innovators.

[6] Rather in a metaphorical sense, as a large part of output is intangible.

## 2 Methodology, data, participants and procedure

Organizations undoubtedly need to generate and apply new ideas in order to survive. This process induces change and sublimes through ecosystems, creating progress of humanity as ideas layer up. It will be the aim of the work of the author of this paper to delve into the area depicted in the previous sections. The current review uncovers a missing component in the contemporary knowledge surrounding the way knowledge is 'grown', namely in the area of the interaction between organizations and workers (actors) and innovative behavior (activities). Based on the knowledge gathered, the following research question is formulated to guide the research design:

*What are good ways for organizations to extrinsically motivate actors towards innovative behavior?*

In order to fit the quantitative design, this can be simplified as:

*What individual external motivators correlate with collective innovative behavior?*

To measure the innovational might, two approaches will be taken:

1) Self-reported scale provided by the leaders of innovation teams will be developed. Based on the gathered answers, targeting both the initiation of innovations and the ratio of innovation realization. A 22-item questionnaire by Axtell et al. (2000) will be used with a model item "To what extent do you and other members of your team get involved in allocating jobs amongst yourselves?" while answers are recorded on a 7-point scale.
2) To insure against the research being dependent on the subjective reporting of leaders only, objective organizational performance based upon a method provided by Houten and Russon (2020) will be measured. The dataset includes information concerning managerial methods as well as the rate of new product and service introduction. Firms which are included in the sample will be compared against their respective national benchmarks reported in the International Innovation Scorecard (2019).

The sample will be chosen from within organizations that perform applied research in a chosen segment of the economy e.g. energy, transportation etc. This will be documented by their success in being granted a (inter)national research agency grant or receiving an innovation prize in the respective field. Every organization that qualifies will then be contacted with the aim of having 20 % of the total organizations included and performing a research which then can be generalized on an acceptable level of validity.

Proposed tools for the development of the following predictors:

a) Contemporary work climate.
b) Leader-member exchange.
c) Organizational support for creativity
d) Baseline personality traits.
e) External and internal motivation index.
f) Gamification measures.
g) Measures of behavioral management.

The Work Climate Questionnaire (Baard et al., 2004) having its roots in Self-determination theory, will be disseminated to measure the perception regarding autonomy support of actor's interactions. Crafted to contain a 10-item scale with responses on a 7-point scale (strongly agree/disagree), the questionnaire will contain a sample item: "My manager expresses trust in my ability to perform work-related tasks well."

The Leader-Member Exchange introduced by Graen and Uhl-Bien (1995) will be employed in the work to allow for the superior-subordinate relationship. Using the LMX-7 scale type survey, an item example follows: "My supervisor understands my job problems and needs". Team leaders will be

asked to fill the modified SLMX-7 questionnaires which are designed to fit the point of view stemming from their role.

Elements of Dynamic componential model of creativity and innovation in organizations (KEYS) unearthed by Amabile and Pratt (2016) combined with parts of Self-determination theory provided in Ryan and Deci (2000) will further enrich the survey. This tool will add a predictor for creativity support within a workgroup, creativity support directed from a leader and organizational creativity support.

The cornerstone of the baseline questionnaire containing basic demographic and personality traits will be the NEO: BFI-2-S. This shortened version of the classic Big five is reported to having satisfying properties compared to the full questionnaire which tends to be time consuming (Soto and John, 2017).

Work external and internal motivation scale (WEIMS) by Tremblay et al. (2019) rooted in self-determination theory will be employed, measuring basic six traits of work-related motivation. The questionnaire will also contain additional 6 items aiming to grasp the extent of usage of gamification and behavioral management methods in the workplace.

The usage of the 5H-INN survey recently developed by Canestrino et al. (2022) will also be considered. This method claims to offer a framework for identifying the drivers of innovation independently from time and space, focusing on innovative dynamics. This work has, however been published in April 2022 and there has not been a sufficient timeframe for its inspection between the date of its publication and the submission of the current work (9/2022).

## 3 Expected results

The results are expected to support the claim that both transactional and transformational rewards positively correlate with innovation behavior. It is expected to find that external motivators are in a complementary relation to internal ones.

By confirming that these elements serve as drivers of extrinsic motivation leading to innovation behavior increase while autonomy, responsibility, character of tasks, usage of behavioral management and some gamification moderate the relationship between the actors and the actions positively and significantly. Employees open to change are expected to be better performers when it comes to innovation.

## Conclusion

The main goal of the proposed research is to offer guidelines concerning adjustment of organization processes in order to enable actors to accelerate 'bringing change about'. The work will identify important elements of organizational environment which can be shaped to promote innovation development, tend to innovation maturation and ensure innovation realization within the market as such ongoing is key to company success and survival. Alongside leadership and organizational psychology implications, policy recommendations targeting market interventions enacted by governments will be issued. Future work will also target the character of public innovation hubs.

Further research directions will be developed and offered for colleagues to focus on in future work, particularly in the area of actors and actions – the first represented by innovation teams, the lesser by innovation output.

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# DEVELOPMENT OF FOREIGN TRADE OF THE CZECH REPUBLIC

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**Abstract**
The aim of this paper is to evaluate the development of Czech foreign trade, which should then serve as the basis for a detailed analysis to determine the impact of this trade on the Czech economy. Given the required scope and according to the title of the paper, the content of the paper is limited to this analysis. Within the framework of this analysis, we have concluded that Czech foreign trade is quite important for the Czech economy and may contribute to its growth as well as to its economic decline in the future. We have also concluded that the Czech economy is closely linked through foreign trade not only to the economy of the European Union but also to the German economy, which may also cause economic problems in the future, as the connection is quite strong. Last but not least, we have also noted that the fourth and final risk factor that can affect the stability of the growing Czech economy is the long-term share of machinery and transport equipment, both in total turnover and in imports and exports from the Czech economy. The conclusions reached in this document can be used to assess the impact of foreign trade on the Czech economy.

**Keywords**
Development, Export, Foreign Trade, Import.

**JEL classification**
F40, F41, F49, O11.

## Introduction

The Czech Republic is a small open economy country, which is also confirmed by the data presented in Figure 1. As the figure presents, the ratio of foreign trade turnover to gross domestic product, which is an indicator of the degree of openness of the economy (Pastucha, 2021), increased by 57.21 percentage points between the years 2000 and 2021 in the Czech Republic, from the initial 99.03% to the final 156.24%. The growth of this ratio can be interpreted as an increase of the openness of the Czech economy towards its foreign trading partners, which may subsequently be reflected in the growing dependence of this small economy on economic developments abroad. This increasing dependence is then likely to have an impact on its internal stability, affecting mainly the domestic labor market and economic growth. If we are to determine how significantly the demand and supply of foreign economic agents affect the development of the Czech economy, it is necessary to first assess the development of Czech foreign trade and only on the basis of this analysis to determine the impact that foreign trade has on the development of the Czech economy. Due to the required length, however, we are limited to evaluate only the development of Czech foreign trade, both in terms of its commodity structure and its territorial composition, or to indicate the possible effects of this trade on the performance of the Czech economy.

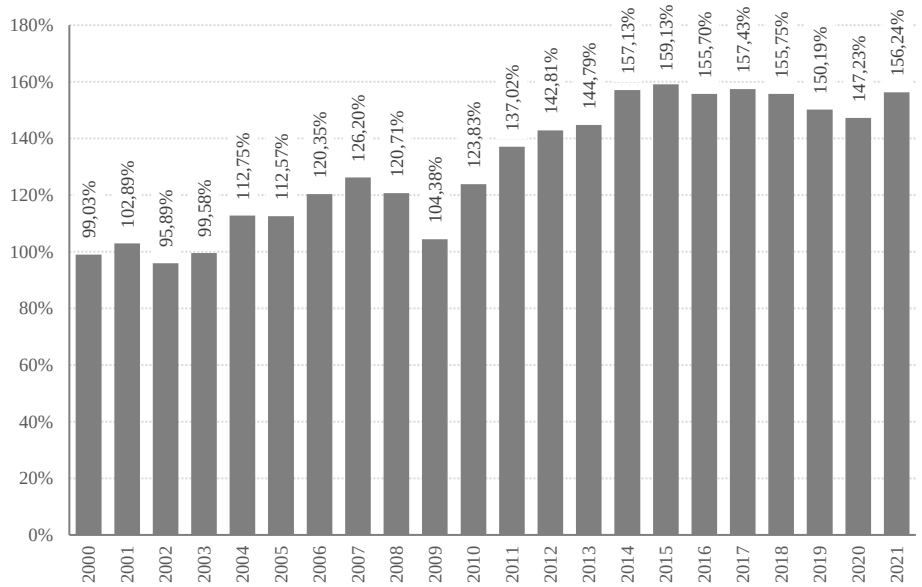


**Fig. 1.** Foreign trade turnover per GDP of Czech Republic (thousand CZK) (Source: Own calculation)

## 1 Foreign Trade of the Czech Republic and its Commodity Structure

In terms of commodity structure, goods, and services, they have played a decisive role in Czech foreign trade over the last 21 years and can be classified in four standard international trade classification (SITC) classes, namely classes 5 to 8. The available data show that the aggregate share of these four classes in the total foreign trade turnover of the Czech Republic reached an average value of 87.50% between the years 2000 and 2021, with the value of this share increasing by 2.49 percentage points over the period, i.e., from the initial 85.72% to the final 88.21%. This growth was mainly driven by the demand for foreign goods by domestic economic agents, whose share of the four classes mentioned above in total imports increased by 3.80 percentage points, while the increase in this share on the export side did not exceed one percentage point, reaching 0.68 percentage points.

Foreign trade in goods and services, which falls into classes 5 to 8 had a positive effect not only on the Czech foreign trade turnover, but also on its balance between the years 2000 and 2021. From the data we have analyzed, it is clear that while in the year 2000 these four classes accounted for -15.18% of the Czech Republic's trade balance, in the year 2021 this share was already 165.11%, which means that its value increased by more than 180 percentage points. The most significant contribution to this growth was made by class 7 - Machinery and transport equipment, where the demand for domestic goods exceeded the demand for domestic entities for foreign goods by a total of CZK 608.94 billion. The share of this class in the total trade balance of the Czech Republic therefore increased by 191.71 percentage points in real terms during the period in question, reaching a final value of 193.12%. Between the years 2004 and 2011, this share even fluctuated between 216 and 682%, owing to which the Czech trade balance subsequently shifted from a passive balance to an active balance. This conclusion is also confirmed by our calculations, which show that while in 2004 the Czech trade balance was still at a deficit of CZK 26.44 billion, in the year 2005 this deficit was replaced for the first time by a surplus of CZK 38.62 billion, which increased to CZK 191.13 billion by 2011 to reach a final value of CZK 316.21 billion in 2021.

If we proceed from the above, it is probably not surprising that class 7 - Machinery and transport equipment also had the largest share in the total exports of goods and services from the Czech Republic. As can also be seen from the data shown in Figure 2, while in the year 2000 this share was 44.46%, 21 years later this value had already exceeded the fifty-five percent mark, reaching 55.81%. Thus, the average value of this share between the years 2000 and 2021 was 54.96%. The class with the second largest share of Czech exports in the first two decades of the 21st century was class 6 - Manufactured goods classified mainly by material, whose share averaged 17.20%. In contrast to class

7, this share did not increase between the years 2000 and 2021, but rather decreased by 10.66 percentage points. Therefore, from the original value of 25.43%, it decreased to the final 14.77%. The actual stagnation of influence of individual commodity classes on Czech exports in the period analyzed by us is encountered in the third most strongly represented class, namely class 8 - Miscellaneous manufactured articles. In this case, its share in total Czech exports remained virtually unchanged, as the value of this share fell only by 0.32 percentage points, from 12.53 to 12.21%. The same can then de facto be said of the remaining seven classes.

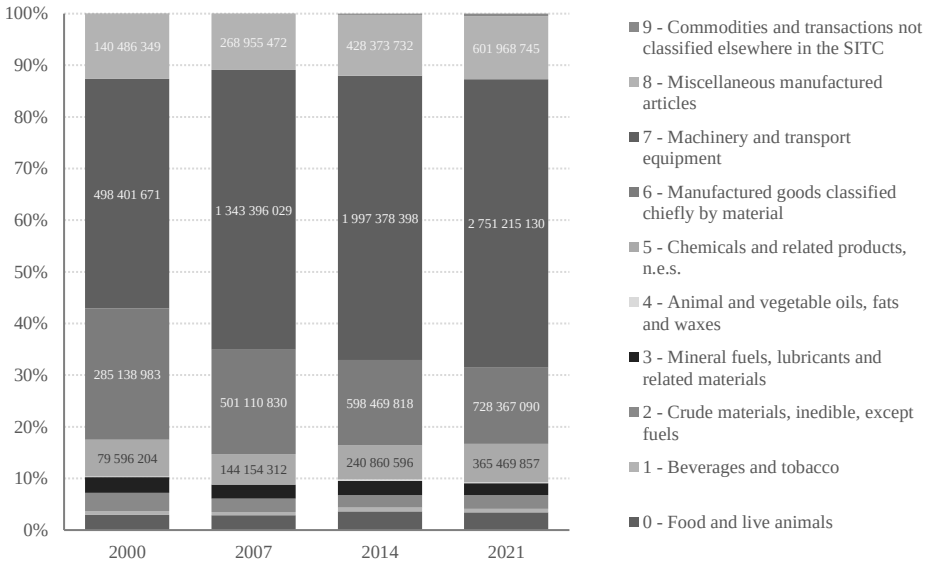


**Fig. 2.** Commodity structure of Czech exports (thousand CZK) (Source: Own calculation)

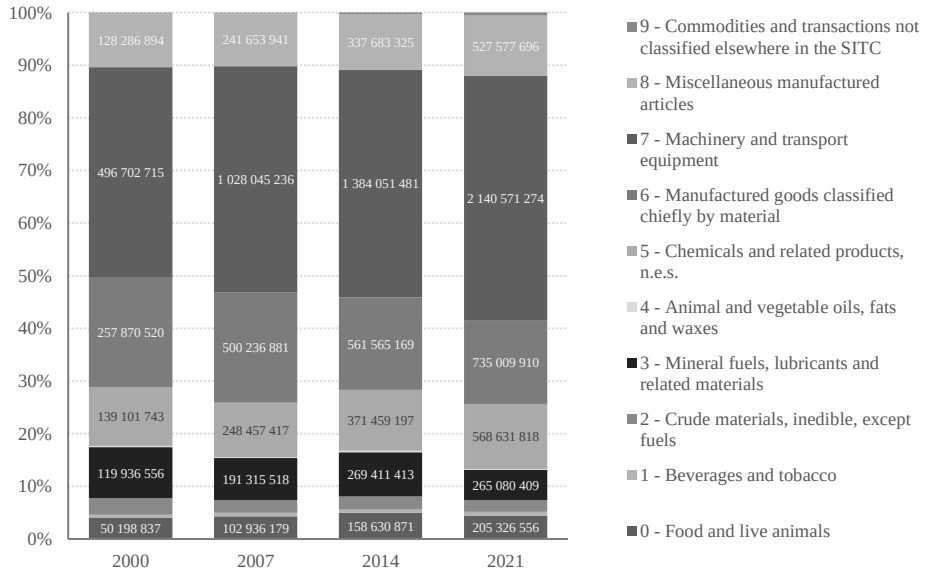


**Fig. 3.** Commodity structure of Czech imports (thousand CZK) (Source: Own calculation)

Imports of machinery and transport equipment also accounted for the largest share of Czech imports between 2000 and 2021, at 44.32%. As is also clear from these data, the impact of class 7 on the total amount of Czech imports was not as significant as in the case of Czech exports, as evidenced by the figure for 2021, according to which this class represented 46.40% of the demand for foreign goods by domestic entities. However, at the same time, it should be noted that, as in the case of exports, the share of individual commodities in total imports increased most significantly for

machinery and transport equipment, namely by 6.40% points. Given that the share of the remaining two classes, which also significantly affect the level of Czech exports, i.e. 6 and 8, is in this case de facto identical to the values of these shares given for the classes in the previous paragraph, it seems appropriate to point out that the lower share of imports of machinery and transport equipment in total Czech imports is a result of this, the more significant role played by classes 3 - Mineral fuels, lubricants, and related materials (the average share of exports was 2.64% and the average share of imports was 7.50%) and 5 - Chemicals and related products, n.e.s, with 6.38% to 11.20%. The average share of class 0 - Food and live animals is slightly higher than that of exports, with an average share of 3.26% of total imports between the years 2000-2021, compared to 4.62% for imports.

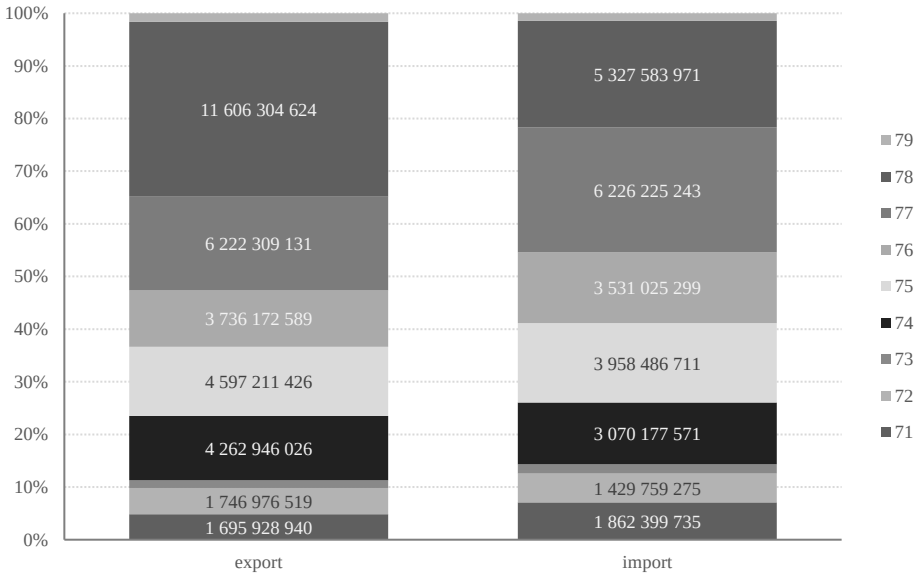


**Fig. 4.** Export and import of 7 - Machinery and transport equipment (2000-2021, thousand CZK)[1] (Source: Own calculation)

On the export side, Class 7 - Machinery and transport equipment has been dominated for a long time by Division 78 - Road vehicles (including air-cushion vehicles), whose share in total exports of goods and services falling under class 7 reached an average value of 33.21% between the years 2000 and 2021. This division then represented 18.25% of total exports, which makes it the division with the highest share of exports of Czech goods and services abroad. In addition to exports of road vehicles, the commodities that make up Sections 74 to 77 also play a significant role in Czech exports of goods and services, with the shares of these sections in total exports ranking them second to fifth overall in the notional ranking. While on the export side, section 78 played a dominant role in the long term, exports in the 21 years analyzed by us have been dominated by exports of commodities covered by section 77 - Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including nonelectrical counterparts, n.e.s.,of electrical household-t). This division represented 23,71 % of total exports of goods and services in class 7 and 10,51 % of total imports into the Czech Republic, which was also the highest average share achieved by the individual divisions included in the SITC classification in the Czech Republic in relation to total imports. Similarly to exports, Sections 74 to 76 and 78 in particular played a significant role in Czech foreign trade. When electrical equipment, apparatus and appliances came second, road vehicles (78) followed

[1] 71 - Power-generating machinery and equipment, 72 - Machinery specialized for particular industries, 73 - Metalworking machinery, 74 - General industrial machinery and equipment, n.e.s., and machine parts, n.e.s., 75 - Office machines and automatic data-processing machines, 76 - Telecommunications and sound-recording and reproducing apparatus and equipment, 77 - Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s.,of electrical household-t), 78 - Road vehicles (including air-cushion vehicles), 79 - Other transport equipment

by office machinery and automatic data processing machines (75), telecommunications and sound recording and reproducing apparatus and equipment (76), and general industrial machinery and equipment, n.e.s., and machine parts, n.e.s. (74).

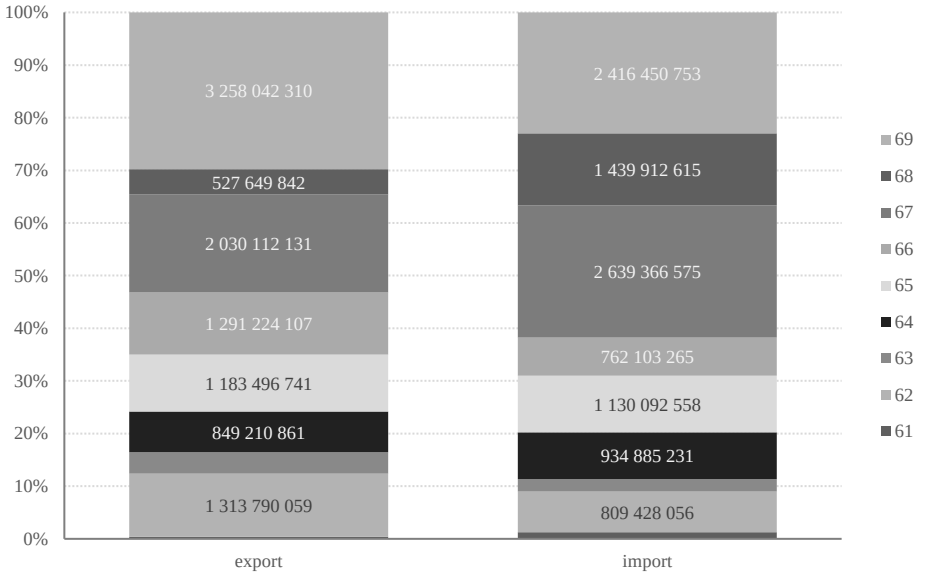


**Fig. 5.** Structure of export and import of 6 - Manufactured goods classified chiefly by material (2000-2021, thousand CZK)[2] (Source: Own calculation)

As we have already mentioned above, the class with the second largest share in the total turnover of Czech foreign trade between the years 2000 and 2022 was class 6 - Manufactured goods classified chiefly by material. Within this class, we then find two divisions that contributed significantly not only to total foreign trade turnover within the class, but also to foreign trade as a whole. Specifically, these are divisions 67 - Iron and steel and 69 - Manufactures of metals, n.e.s. Although the first of these two divisions played a decisive role in the case of imports into the Czech Republic, with its share within the class amounting to 25.10 % and within the total demand for foreign goods by domestic operators 4.45 % (7. The second played an even more significant role in the case of exports, where the share of the given section in class exports reached 29.79% between the years 2000-2021, which means that its share in the total exports from the Czech Republic reached 5.12%. Among the 20 divisions with the largest share in total Czech exports, we can also include divisions 62 - Rubber manufactures, n.e.s. (12th place), 66 - Non-metallic mineral manufactures, n.e.s. (13th place), 65 - Textile yarn, fabrics, made-up articles, n.e.s., and related products (14th place) and 64 - Paper, paperboard, and articles of paper pulp, of paper, or of paperboard (16th place). On the import side, there were three divisions in the TOP 20 in this case, namely, in addition to the above-mentioned divisions 65 (16th place) and 64 (19th place), also division 68, Non-ferrous metals.

The class with the third largest share, class 8 - Miscellaneous manufactured articles, has long been dominated by Division 89 - Miscellaneous manufactured articles, n.e.s., with this dominance occurring both on the export and import side. In the case of the demand of foreign economic agents for domestic goods, this division represented 5.37% of this demand and 44.96% of the demand for production included in class 6. We reach similar conclusions when we look at imports. Here, Section 89 represented 41.96% of imports of goods and services included in class 8 and 4.64% of total imports. The role of divisions 82 - Furniture and parts thereof; bedding, mattresses, mattress supports,

[2] 61 - Leather, leather manufactures, n.e.s., and dressed fur-skins, 62 - Rubber manufactures, n.e.s. , 63 - Cork and wood manufactures (excluding furniture), 64 - Paper, paperboard and articles of paper pulp, of paper or of paperboard, 65 - Textile yarn, fabrics, made-up articles, n.e.s., and related products, 66 - Non-metallic mineral manufactures, n.e.s., 67 - Iron and steel, 68 - Non-ferrous metals, 69 - Manufactures of metals, n.e.s.

cushions, and similar stuffed furnishings, 87 - Professional, scientific, and controlling instruments and apparatus, n.e.s., and 84 - Articles of apparel and clothing accessories, which ranked 11th, 15th, and 18th, respectively, in the notional ranking, can also be considered more significant in the case of exports. On the import side, we can only include among these more important divisions division 87, which ranked 17th in this ranking.

The influence of classes 6 to 8 on Czech foreign trade is also underlined by the fact that among the ten divisions with the largest share in Czech exports, only the divisions[3] falling into these three classes are found, with the share of these divisions in total Czech exports reaching an average value of 66.94% between the years 2000-2021. For imports, the situation is similar, except that one division from class 3, namely division 33 - Petroleum, petroleum products and related materials, squeezed in between divisions of classes 6-8, accounting for 4.40% of total imports into the Czech Republic, which earned it the final eighth place in this ranking. The share of the remaining nine sections[4] in total Czech imports then exceeded the 50% threshold again by 3.64 percentage points.

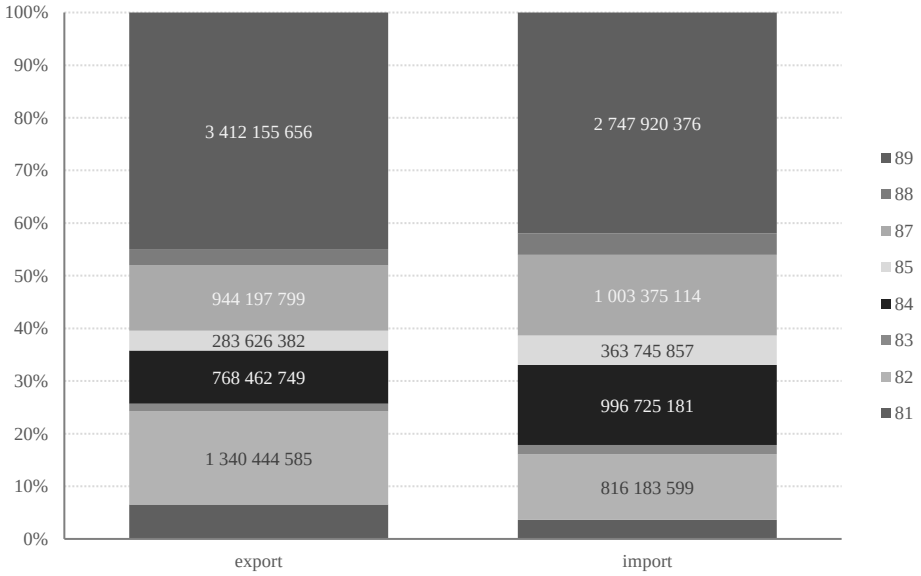


**Fig. 6.** Export and import of 8 - Miscellaneous manufactured articles (2000-2021, thousand CZK)[5] (Source: Own calculation)

## 2 Foreign Trade of the Czech Republic and its Territorial Distribution

It will probably not be a big surprise if we state at the beginning of this part of our article that from a territorial point of view, the main trading partner of the Czech Republic is European countries, which is also confirmed by our calculated data, which show that the share of European countries in the turnover of Czech foreign trade reached an average value of 82.67% between 2000 and 2021. At the same time, however, it should be noted that the value of this share fell by 8.76% in the period in question, from the initial 88.25% to the final 79.49%. This decrease was mainly due to the demand for foreign goods by domestic economic operators, where the share of European countries in total

[3] These are sections 78, 77, 75, 74, 76, 89, 69, 67, 72 and 71. The sections are ranked according to their share of total exports.

[4] These are sections 77, 78, 75, 76, 74, 89, 67, 33, 69 and 71. The sections are ranked according to their share of total imports.

[5] 81 - Prefabricated buildings; sanitary, plumbing, heating and lighting fixtures and fittings, n.e.s. , 82 - Furniture, and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings, 83 - Travel goods, handbags and similar containers, 84 - Articles of apparel and clothing accessories, 85 - Footwear, 87 - Professional, scientific and controlling instruments and apparatus, n.e.s. , 88 - Photographic apparatus, equipment and supplies and optical goods, n.e.s.; watches and clocks, 89 - Miscellaneous manufactured articles, n.e.s.

imports decreased by 17.03 percentage points, while on the export side this share fell by only 1.47 percentage points.

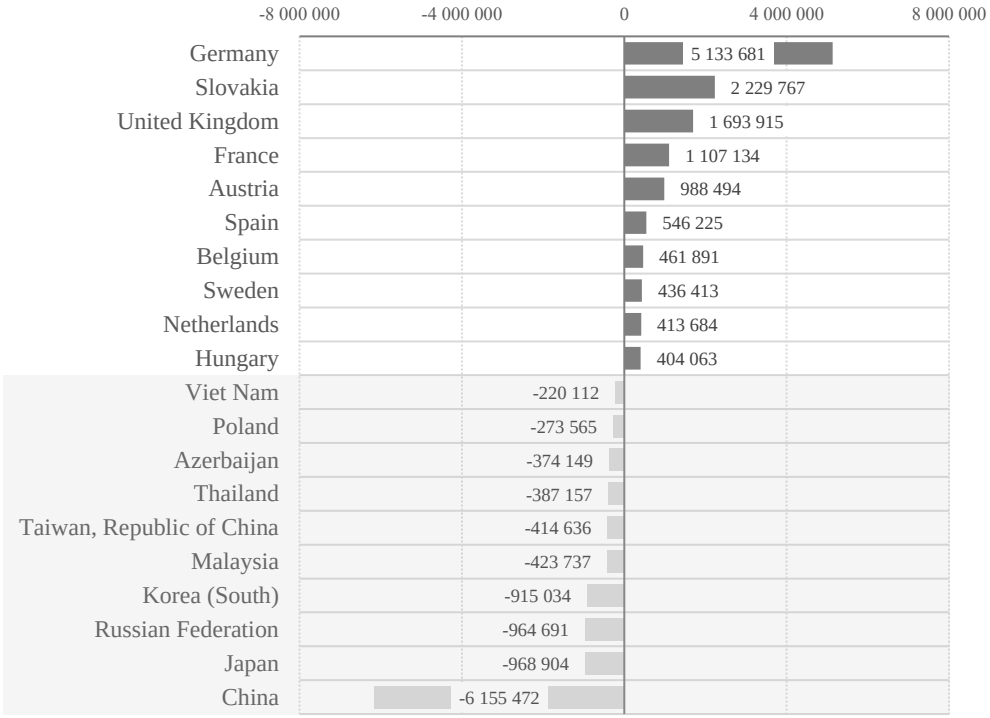


**Fig. 7.** Ten countries with which the Czech Republic has the largest balance of foreign trade deficits and surpluses (2000 - 2021, mil. CZK) (Source: Own calculation)

Although imports and exports of goods and services had a rather negative effect on the Czech foreign trade turnover between 2000 and 2021, the opposite is true for the foreign trade balance. From the data we have calculated, it is clear that while in 2000 European countries accounted for -26.43% of the Czech trade balance, which was the second worst figure when evaluating foreign trade by continent, in 2021 this share was already 450.80%, which implies that the value of this share increased by almost 480 percentage points. The most significant contributor to this positive change has been the improvement in the Czech trade balance with ten countries, most of whom were members of the European Union (Stanbic, online). These countries include Germany (an improvement of CZK 525.33 billion), Slovakia (CZK 180.79 billion), Great Britain (CZK 121.06 billion), France (CZK 112.45 billion), Austria (CZK 84.51 billion), the Netherlands (CZK 65.77 billion), Sweden (CZK 51.96 billion), Spain (CZK 46.21 billion), Hungary (CZK 44.62 billion) and Belgium, whose trade balance improved by CZK 33.79 billion. In contrast, the growth of the trade surplus was counteracted by the widening of trade deficits with mostly Asian countries.  CZK), Malaysia (-40.83 billion CZK), Vietnam (-39.38 billion CZK), Thailand (-28.89 billion CZK), Taiwan (-18.33 billion CZK), Bangladesh (-15.90 billion CZK), and Azerbaijan, where the balance of trade balance fell by 11.64 billion CZK. As can be seen in Figure 7, most of these countries are also among the countries with which the Czech Republic achieved the highest surpluses or, in contrast, the highest deficits in its trade balance. The only exception to this list was the Russian Federation, whose trade deficit did not increase between the years 2000 and 2021 but decreased by CZK 6.85 billion. However, despite this positive development, it should be noted that in the context of trade relations with the Russian Federation, the Czech Republic remains in the position of a country that imports more goods and services from this economy than it exports to it, as evidenced by the level of the trade deficit in 2021, which stood at CZK 58.47 billion.

As we have already mentioned, trade with European countries had a positive impact on the Czech trade balance. Within this group, the countries of the European Union, of which the Czech Republic

has been a part since 2004, had a special position. If we start from the data we have calculated, which are shown in Figure 8, we find that the total balance of the Czech Republic's trade balance with the countries that were members of the European Union as of 31 August 2022 reached a cumulative value of CZK 12.65 trillion in the period under review, while the balance of this balance increased from the initial CZK 40.65 billion in 2000 to the final CZK 1,248.17 billion in the same period. Although the trade balance surplus has increased significantly in the past 21 years, the share of countries from the European Union in the total turnover of Czech foreign trade has decreased from the original 76.25% to the final 69.18%. The average share of the countries that make up the European Union in the trade balance in 2022 was 71.43% in the period analyzed by us. Furthermore, in this case, the decrease in the share of EU countries in the total turnover of Czech foreign trade was significantly influenced by the decline in the demand of domestic economic entities for goods and services produced in these countries, as in this case the share decreased by almost 13 percentage points, while in the case of exports we recorded a decline of only 2.43 percentage points in the period.

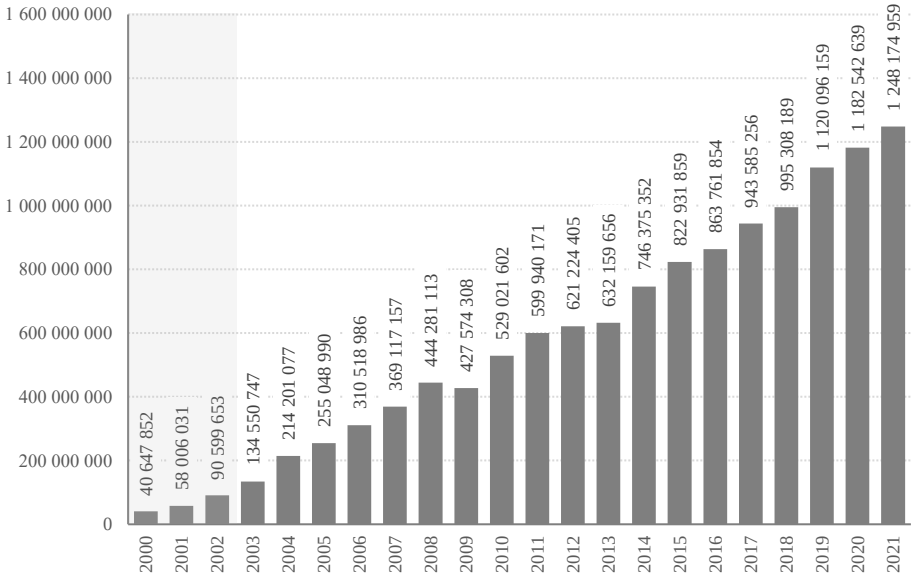


**Fig. 8.** Balance of foreign trade of the Czech Republic with the countries of the European Union as of 31 August 2022 (thousand CZK) (Source: Own calculation)

If we look at the issue of foreign trade through the lens of non-European countries, then we find that these economies accounted for only 17.33% of the total turnover of Czech foreign trade. In the case of exports of goods and services from the Czech Republic, this share was on average 9.36%, while for imports it reached an average value of 25.85%. It can be said that while in the case of exports the influence of non-European economies on Czech foreign trade is relatively negligible, this conclusion does not hold for imports, since domestic economic entities demand more than one quarter of the goods imported to the Czech Republic from abroad in non-European countries. Within the non-European countries, the Czech foreign trade is dominated by Asian countries, which are at least partially followed by North American countries, especially in the area of exports.

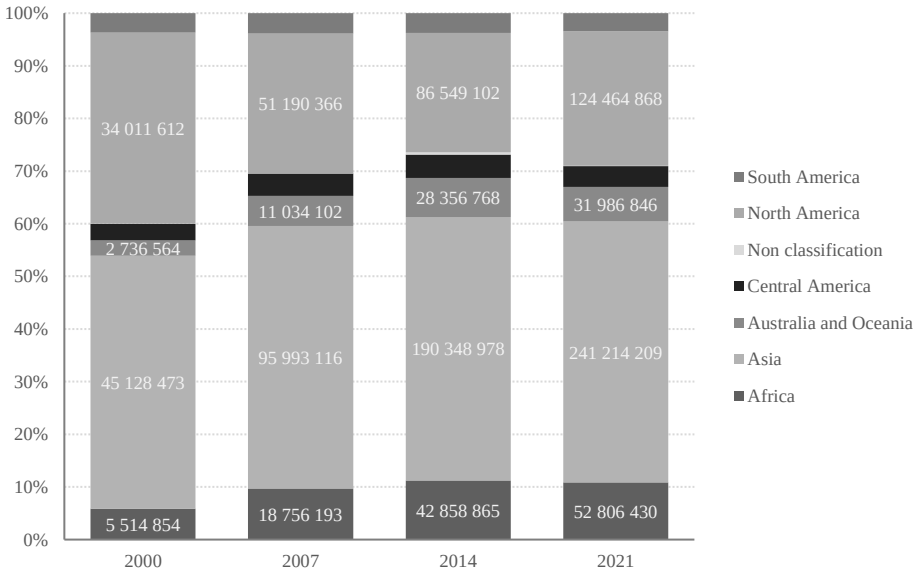


**Fig. 9.** Territorial composition of Czech exports outside Europe (thousand CZK) (Source: Own calculation)

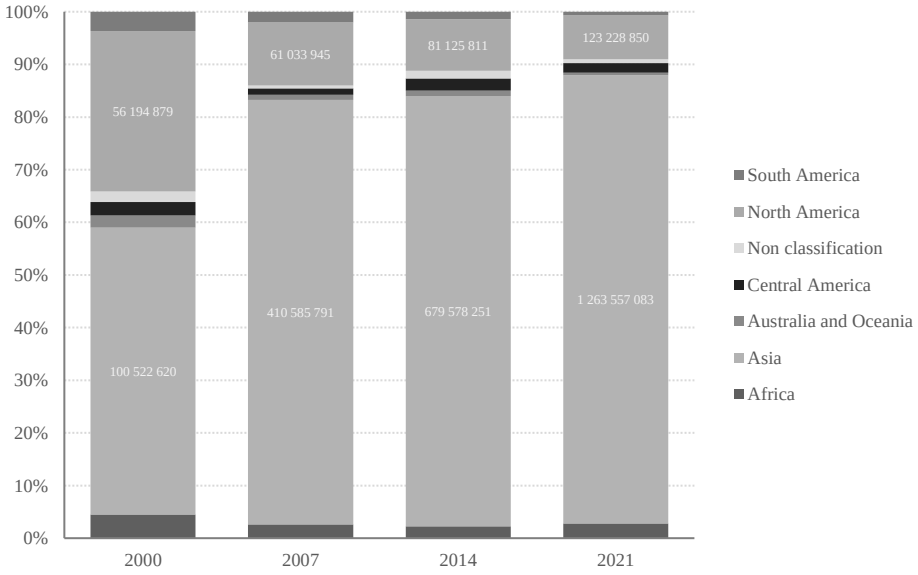


**Fig. 10.** Territorial composition of Czech imports outside Europe (thousand CZK) (Source: Own calculation)

As we have already indicated in the previous paragraph, non-European countries accounted for less than 10% of Czech exports. The data captured in Figure 9 shows that during 2000 Asian economies accounted for 48.07% of the demand for Czech goods and services (4.02% when European countries are included), 21 years later this figure had increased by 1.48 percentage points to reach 49.55%. The average value of this share was thus 48.81% over the period under review. The non-European region with the second largest share of Czech exports between the years 2000 and 2021 was North America, with a value of 30.90% (2.36% when European countries were included). In contrast to Asia, the share in this case did not increase in the first twenty-one years of the 21st century, but rather decreased by 10.66 percentage points. Thus, from an initial value slightly exceeding thirty-six percentage points, it has fallen to a final 25.57%. Thus, together with Europe, North America is the only territory in which we have recorded a decline in its share of Czech exports in the period analyzed. In addition to the aforementioned increase in the share of Asia, it is also worth mentioning the growth in the share of African economies and the economies of Australia and Oceania, whose respective shares increased by 10.85 and 6.57%, respectively. However, despite these increases, the

overall share of these two territories in Czech exports did not exceed 17.42% and 1.71% when European countries are included in our assessment.

Imports from Asian countries also accounted for the largest share of Czech imports from non-European territories between the years 2000 and 2021, with an average share of 69.80%, or 21.15% if we include European economies in this comparison. It is evident from these data that the influence of Asian economies on the level of non-European imports to the Czech Republic was significantly higher than in the case of exports, which is also confirmed by the data for 2021, according to which this territory accounted for 85.10% of the demand of domestic economic entities for foreign goods from non-European countries. Although the aggregate share of Asian countries in Czech imports has increased by almost a third over the last twenty-one years, the shares of other theories have declined, with the largest drop occurring in North America, where the value of this indicator has decreased by 22.17 percentage points. Therefore, the share of North American economies in imports of goods and services from non-European countries fell from 30.47% to just 8.30%. At the same time, however, it should be noted that even this decline did not jeopardize North America's position as the territory with the third largest imports of goods into the Czech Republic. The remaining five territories, that is, Africa, Central America, South America, Australia, and Oceania, and unclassified territories, accounted for volumes of Czech imports that did not exceed the 2.82% threshold, a figure that corresponds to Africa's share in the demand of Czech economic operators for goods and services produced abroad.

## Conclusion

The total foreign trade turnover of the Czech Republic between the years 2000 and 2021 increased in absolute terms by 7.18 trillion, that is, from the initial CZK 2.36 trillion to the final CZK 9.54 trillion. From the data we can therefore conclude that the aggregate of financial flows associated with imports and exports of goods and services in the case of the Czech Republic has more than tripled over the years analyzed. If we look at this issue through the lens of ratios rather than absolute data, we find that over the last 21 years the ratio of Czech exports to GDP has increased by more than one third, i.e. by exactly 33.73 percentage points (from 46.98% to 80.71%), and the ratio of Czech imports to GDP by 23.49 percentage points, i.e. from the original 52.04% to the final 75.53%. Thanks to this relatively high dynamism, the Czech economy has thus been increasingly opening up to the world, which, as Pour (2018) notes, „... on the one hand, means greater involvement in global production chains and the associated access to technologies leading to faster labor productivity growth, on the other hand... also greater sensitivity to external economic shocks. "In our opinion, this conclusion is quite logical and can be fully shared in the case of the Czech Republic.

Since in the Introduction of this article we set the goal to evaluate the development of Czech foreign trade, both in terms of its commodity structure and its territorial composition, let us now summarize the most important conclusions we have reached in this analysis.

As is evident from the opening passage of this section, foreign trade has had a significant impact on the development of the Czech economy over the last 21 years, and the growing importance of this area of the economy is most likely linked to the Czech Republic's entry into the structures of the European Union. This conclusion is also supported by the available data. As can be seen in Figure 11, until 2004 the Czech trade balance was in deficit, ranging from CZK -120.82 billion to CZK -26.44 billion. A major change in this trend occurred only after 2004, i.e. after the year in which the Czech Republic was admitted to the European Union and thus entered the common European market, which is significantly larger than the Czech market in terms of the number of consumers. After joining the EU, the Czech trade balance became permanently surplus, with surpluses ranging from CZK 38.62 billion in 2005 to a peak of CZK 479.37 billion in 2016. If we compare this surplus with the value of the gross domestic product produced in the Czech economy in 2016, we see that this ratio reached just under 10%, which is also the highest value achieved by this indicator throughout the period

analyzed by us. This figure also confirms the above conclusion that **foreign trade is quite important for the Czech economy and can contribute both to its growth and to its economic decline.**

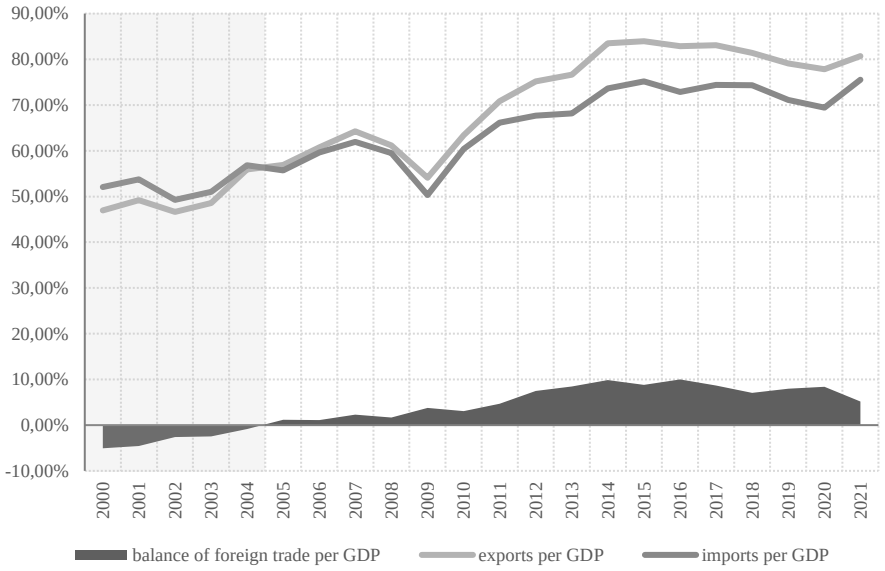


**Fig. 11.** Development of the share of foreign trade per GDP (Source: Own calculation)

The entry of the Czech Republic into the European Union and the subsequent expansion of Czech goods into the common market led not only to greater openness of the Czech economy, but also to **its close link with the economy of the European Union countries.** We can also back up this claim with figures. As we have already mentioned above, the share of the current EU member states in the Czech Republic's foreign trade turnover averaged 71.43% between the years 2000 and 2021, which in absolute terms means an amount in excess of EUR 88 billion. CZK. As can be seen from the above, trade with EU countries covered almost three quarters of Czech foreign trade, from which it can be concluded that the economic development of the Czech Republic is de facto dependent on the economic development of the former 26 EU countries, a situation that cannot be considered too favorable. In this case, we can consider a slight decrease in this dependence as somewhat positive since between the years 2000 and 2021, the share of the Czech foreign trade turnover with EU countries fell from 76.25% to 69.18%. Even so, it must be said that this ratio remains very high.

If we look at the overall composition of foreign trade through the lens of individual countries, then it must be said that in this case we can also state that **through foreign trade the Czech economy is relatively closely linked to only one of the EU countries, namely Germany**. If we look at this statement through the lens of numbers, we find that during the period 2000 to 2021, Germany accounted for an average of 29.47% of Czech foreign trade turnover. Therefore, the foreign trade turnover with Germany reached a cumulative value of CZK 36.41 trillion in this period. In this case, too, the fact that trade with Germany accounts for almost one-third of Czech foreign trade means that this situation cannot be described as too positive, as it shows the very strong dependence of the Czech economy on the development of the German economy. In this case, we can point to the decline in this share between the years 2000 and 2021 as a certain positive. In particular, this value has decreased by 8.85 percentage points, i.e. from the original 36.05% to the final 27.20% for the time being. Despite this change, the Czech Republic continues to trade more than one quarter of its goods and services with economic entities from Germany, which only confirms the above-mentioned idea of the excessive dependence of the Czech economy on the German economy.

If we talk about the risk factors that promote Czech foreign trade, then we must not forget the **growing share of machinery and transport equipment, both in total turnover and in imports and exports**. We have already stated in the text itself that the share of class 7 - Machinery and transport equipment grew between the years 2000 and 2021 on both the export and import side. While

on the import side, this share grew by 6.40 percentage points, on the export side it grew by as much as 11.35 percentage points, which in turn was reflected in the share of this class in total foreign trade turnover, which grew by 9.15 percentage points over the 21 years. The growing importance of foreign trade in machinery and transport equipment has subsequently been reflected in the share of class 7 in the aggregate trade balance, which has also increased by a full 191.71 percentage points between the years 2000 and 2021. While in 2000, class 7 - Machinery and transport equipment accounted for 1.41% of the total balance of foreign trade and was thus the class with the third highest trade surplus, in 2021 this share was already 193.12% and the balance of trade reached a clear high of CZK 610.64 billion. As it is clear from the above, we can also say at this point that class 7 - Machinery and transport equipment plays a very important role in Czech foreign trade and thus in the Czech economy, due to which it can be an area that can significantly disrupt the stability of the Czech economy in the coming years, especially due to its dependence on the demand of foreign economic entities.

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# PENSION AND TAX POLICIES FOR CZECHIA

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**Abstract**
Czech pension policy in the 90s led to a de facto fundamental predominance of a flat-rate pension over the social pension insurance, while total public pension expenditure is covered by pension premiums. Even more inadequate and complicated is the financing of the so-called public health insurance. Pension and health insurance premiums are predominantly merely earmarked taxes, moreover socially unfair. Moreover, at least until recently, the complex construction of state payments for "state health insureds" was used for lobbying manipulation of public finances. The Fiala´s government has promised a pension reform and the introduction of a single collection point. The paper analyses the experience of these reforms and offers quick and effective solutions to these problems, including strengthening the role of the income tax on wages and at the expense of the social security contributions. The five-party coalition Fiala´s Government can handle these tasks. Moreover, current, not only domestic, but fiscal problems may also require the generally necessary reforms of corporate income taxation and financial services taxation.

**Keywords**
Pension reform. Health insurance. Social security contributions. Income tax. Financial services taxation. Single collection point.

**JEL classification**
H24; I13; E62; H25.

## Introduction

Economic and social policy, not only in Europe, has undergone and is undergoing a whole series of transformations, going beyond the framework brought about by the era of globalization and the fall of communist regimes. Recently, the global pandemic and the war in Ukraine have contributed to this. On a general illustration of the background of these transformations, Václav Klaus states: "Today's reality of the West, both in the political and economic spheres, is closer to the reality of communism than it seems when comparing the ideal constructions of both systems... The political system of the West is no longer a classic parliamentary pluralism; we live in a world of inauthentic political parties (not to mention ideologically empty coalitions), in which civic associations and so-called non-profit organizations have long dominated. In them the chosen but unelected ones have the say. Similarly, we must ask whether the economic system of the West is close to the free-market ideal of classical political economy, or whether it is an oligarchic system of powerful economic entities that regulate the market in their own image through the state? Isn't the suppression of the market in today's European Union relatively close to the economic system of late communism with its "planning game", in which strong enterprises, not the central planner, had the decisive say?" (Klaus, 2022). In the case of Czech politics, this assessment is above average.

However, let us not lose hope of influencing politicians and political parties towards coherent concepts of economic and social policy, which are manifested, for example, in the distinction between four welfare regimes. Otherwise, we would essentially give up scientific research as a tool for knowledge and optimization of systems, with exceptions such as the purely marketing concept of economic and social policy or the most general conception of public politics theory, which are limited or concentrated on the analysis of who has allied with whom to win over another party (movement, coalition). We will focus our attention on current Czech pension and tax policies, which also overlap significantly and there are opportunities for relatively easy, fast, and significant effects (for people) in their optimization, in suppressing explicitly marketing tendencies in politics. Our experience shows that *it is not expedient to pursue a comprehensive, complex reform* (feasible in the horizon of several years), *a reform of the key structural element of e.g.*, income tax, pensions, or health insurance premiums, *feasible during a year, may be much more promising.*

## 1 Pension Policy

The Czech pension system officially consists of two pension pillars: public "pension insurance" and private "supplementary pension savings". Occupational pensions are de facto prohibited; only soldiers, police and firemen have special additional schemes funded by the state. In parallel to the supplementary pension savings, there is also the traditional and unit-linked "private life insurance" – with state support, which is identical and common to supplementary pension savings only for employer contributions. Investment in housing is becoming increasingly important as a form of old age security.

In the former, predominantly uniform Communist pension system, the newly awarded old-age pensions were mostly dependent on final salaries; the regime preferred 'labour categories' (miners and other risk-involving professions) and discriminated the almost non-existent private farmers and entrepreneurs. With these exceptions, it was a defined-benefit pension system, and the pensions are calculated from the final salary (the average wage of the best three years in the last ten years). An ordinary employee with a national average earning (NAE) received a relatively high pension of 85-90% of the net wage in 1989 after 45 years of career (employment and secondary and tertiary education). However, after 20 years of receiving the pension, he or she may have expected a pension at the minimum level ('social pension'), which would be equivalent to 37% of net NAE. The relation of the nation-wide average pension and net wage was at 64%, the relation to gross wage was at 50%. Inadequate indexation of pensions was mostly caused by the hidden inflation (long-term average of the hidden increase of consumer prices was approx. 2.5% annually); one-off campaign increases of pensions did not take hidden inflation into account. Bend points were used to reduce higher earnings when calculating pensions. However, the first bend point in 1989 was at 79% of NAE, the second bend point at 189% of NAE. Up to the first bend point, the wage has not been reduced when calculating the pension. Officially, it was a state 'pension security', not social insurance; the public expenditure program was financed from the state budget. However, the construction of pensions was considerably Bismarck-like.

Inflation and the low indexation of bend points in the first half of the 1990s substantially reduced the dependence of newly granted old-age pensions on previous earnings. The pension reform from 1996 created a "pension insurance" with two "amounts": flat-rate and earnings-related. Each pensioner receives a flat-rate basic pension, not foreseen in the original draft Act, it was in fact a "stick-on" addition, replacing the previous universal "state compensation contribution" of 1990, which compensated the cancellation of retail price subsidies. The stick-on has survived to this day and its amount is now 10% of NAE. The earnings-related "percentage amount" of the pension generates a partial dependence of pension on previous lifetime earnings, adjusted by bend points and reduction coefficients: the crucial earnings are reduced to just 26% once the first low bend point of 44% is exceeded. Up to 2014, there was a second bend point, last time at 116% of NAE, above which the crucial earnings were reduced to only 10% (2010). The original third bend point was 600% of NAE in 2010, then 400% of NAE; today's second bend point is at this level and from 2015 it is a classical earnings ceiling, used in social pension insurance. Figure 1 shows these current parameters of the Czech "pension insurance". The "progressivity" of this system is high: a newly granted old-age pension is roughly by 30% earnings-related. Thus, 70% of it is a Beveridge type pension. This is a rarity in Central Europe as "Bismarck" clearly dominates in all neighbouring countries.

The transformation of the Czechoslovak predominantly Bismarckian pension system into the Czech predominantly Beveridgean system was influenced by the liberal policy of Klaus' government and by the creation of a complicated and poorly understandable calculation of both newly granted old-age pensions and indexation of pensions. Recently, the marketing approach of politicians on these issues has also contributed to strengthening the levelling of pensions. More than half of Czechs nevertheless prefer "Bismarck" to "Beveridge".

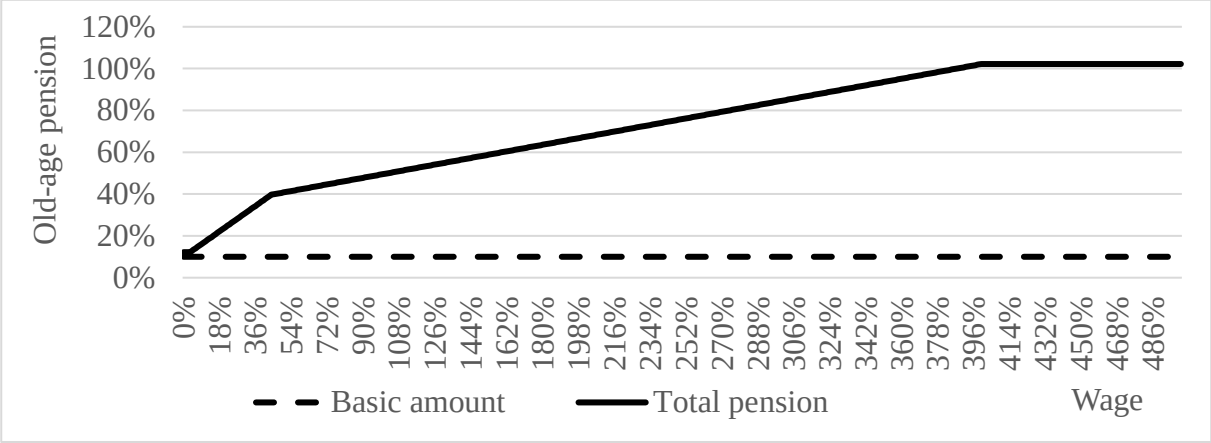


Figure 1: Newly granted (net) old-age pension in relation to lifetime earnings, in % of NAE in 2022, 45 years of insurance. Source: Author

The Czech Constitutional Court (2010) concluded that “whole complex design of the pension system is non-transparent to a degree that it is de facto incomprehensible for its addressees; and for most of the insureds the calculated amount of the pension benefit becomes unverifiable”. In addition, the court declared the provisions of the Pension Insurance Act on bend points to be unconstitutional, “because in its consequences and in combination with other parameters and the existing construction of the pension system it does not guarantee a sufficiently constitutionally guaranteed right to adequate material security in accordance with … the Charter of Fundamental Rights and Freedoms and it leads to unacceptable inequalities between different groups of pension insureds”. The Constitutional Court abolished the section of the Act containing the bend points and reduction coefficients and it forced the government to react quickly; the government has reintroduced the first bend point within the scope of the half-hearted, so-called small pension reform. Unfortunately, the “small pension reform” (2011) did not increase the transparency and clarity of the pension system. The only comprehensible parameter of the Czech “pension insurance” has been the basic pensionable age, which is differentiated for women according to the number of children raised (a remnant of the timid Communist pension policy). To date, it has also not been possible to establish a comprehensible system of indexing the percentage amount of pensions; after the introduction of parameterization of the basic pension amount, the indexation of the percentage amount of the old-age pension depends on the total room for increasing the average old-age pension, the increase in the basic amount being deducted; so far, nobody has even tried to explain the logic of this dependence of the indexation of the percentage-based amount on the indexation of the basic pension amount. On top of that, for the indexation during the year due to high inflation another, simple and comprehensive, rule applies.

The fundamental challenge for Czech 'pension insurance' is its rather technical reform, which would lead to the clarity and meaningful combination of the Beveridge (non-insurance) and Bismarck (insurance) components of this 'system'. The Ministry of Labour and Social Affairs was brought around of the effectiveness of this reform during the preparation of several variants of the old-age pension. The author prepared a narrowly conceived separate amendment to the Pension Insurance Act, removing bend points, but the proposal was not included on the agenda of the Commission for Fair Pensions; it is still topical. To minimize differences with existing newly awarded pensions, this proposal increases the basic amount of the old-age pension from 10% to 32% of NAE and equivalently reduces the percentage amount of the pension. Indeed, this "calculating" reconstruction of insurance and non-insurance components of (old-age) pensions were proposed before, including in an expertise of the World Bank for the Ministry of Labour and Social Affairs (Chłoń-Domińczak, 2003). The novelty is "only" in that the amendment to the Pension Insurance Act does not include any further reform steps – apart from the mentioned new calculation parameters of old-age, disability, widow/widower and orphan pensions.

Minister Maláčová managed to "stick on" (through MP Sklenák) to the amendment to the Pension Insurance Act before the 2021 elections, the purpose of which was to exceptionally increase the indexation of the percentage amount of pensions by CZK 300 per month from 2022, the introduction of a supplement to the percentage amount of the old-age pension of CZK 500 per month for the mother (or the main parent), who cared for the child, with effect from 2023. Maláčová explained this by saying that "the state does not appraise women for caring for children, and because of this, they have on average by CZK 2,856 a lower pension than men" (MPSV, 2021). In reality, on average, lower old-age pensions for women are mainly the result of Czech family policy (Pertold, 2019) and also the lower retirement age of mothers. Women with children still retire earlier than men – it's gender discrimination. The gender pension gap in our country is (only) about 13%. Czech governments ignored the OECD's earlier recommendation to accelerate the increase in the retirement age of women. Currently, for example, the retirement age of women with two children is more than by 2 years lower than the retirement age of men. If this mother postponed her retirement for 2 years, her pension percentage rate would increase by about 13 percentage points, and her total assessed pension would then be almost identical to a man of the same age (otherwise under the same conditions). So lower pensions for Czech women with children are not a topical problem from this point of view; rather, the problem is that, on average, our people retire shortly after reaching retirement age (and that women live longer on average). In any case, the introduction of an increase in the percentage of the old-age pension for a child brought up (in addition to the current substitute period of insurance for the care of a child under 4 years of age, which increases the pension roughly by the same amount) is unjustified, it is an additional complication of the whole system, which will also be introduced into the pensions already paid. To explain the coexistence of these two institutes with the same purpose, the Ministry of Labour and Social Affairs did not even try! It is a product of pure political marketing. This is an additional problem to be addressed in the context of a comprehensive pension reform.

According to its programme statement, *the Fiala's government promises in the section of pensions*: "• We implement and present a real pension reform by the end of 2023 with the aim of setting up a stable system of fair pensions. • We prepare a pension reform proposal that will consist of two main components and a third, voluntary one; the basic component will be increased and will reflect the requirements for the dignity of life in old age and the financial limitations of the state. • The merit component will be based on contributions to the insurance system and the number of children raised. • The voluntary component will be set up in the form of a state or public fund inspired by foreign experience. • We will maintain and support private pension savings. • We will also improve information on the expected amount of pensions in the pension calculator, including the possibility to complete documents online and find out data on years worked in time. • We will support seniors working at retirement age and take greater account of their total years of service. • We will reduce the period needed to qualify for a pension. • We will return the period of study to the substitutive period. • We will enable earlier retirement for employees in demanding professions with greater employer responsibility. • We will introduce a fictitious assessment base for extending the excluded care period. • The bonus for raised children will be given to current pensioners. • We will introduce a voluntary joint assessment base for spouses. • We will increase widow's and widower's pensions. • We will introduce the possibility to pay 1% of own pension insurance premiums to parents or grandparents. • We will support voluntary pension savings, e.g. in the form of a long-term investment account" (Fiala et al., 2022). According to the statement, the reform of the pension system is to be "built on a society-wide consensus that ensures a long-term perspective". Minister Jurečka has set up an advisory team for the preparation of the pension reform, which has already met twice to discuss two sub-topics; the conclusions were not published.

I recommend that the government starts implementing the (already prepared, in fact) mentioned technical reform of pension insurance; it could still be possible to implement it with effect from 2023. In the meantime, the government can clarify how it will carry out the next phase of rationalization:

the definitive *division of the existing "pension insurance" into two pension pillars*: flat-rate pension (we can copy the concept from Great Britain) and fair social pension insurance (the law can be copied from Austria, the calculation of pension entitlement is done there every year). The above-mentioned "wish list" in the government's programme statement might be entered in these two bills (if possible). According to this wish list, a "third, voluntary" component is also to be set up in the form of a state or public fund "inspired by foreign experience"; here I do not know any applicable foreign model, but I can imagine adding voluntary supplementary insurance to the Austrian social pension insurance (Austrians do not need this; their pensions are significantly higher). In our country, the "pension gap" (between the average pre-retirement earnings and the corresponding newly granted old-age pension) has increased significantly (in addition) after the abolition of the super-gross wage tax construct!

The Fiala´s government intends to "preserve and promote" *private pension savings*; the fundamental problem, however, is that we have 3-5 different systems of this state support, which is also beyond the edge of constitutionality (unequal business conditions) and, moreover, these systems have the highest public support in the world, nevertheless they have no practical significance for the workers; the unnecessary existence of (special) pension companies tops this mess (elsewhere private insurance companies and banks "can handle" it). In addition to all this, the government wants to support "voluntary pension savings, e.g. in the form of a long-term investment account" (see the last item of the above "wish list", it was probably attached by mistake). Updated analyses of the Czech 3rd pension pillar and similar products are available (Vostatek, 2021a).

A fundamental reform of the supplementary pension insurance, supplementary pension savings, private life insurance (and building savings, too) is indispensable and, in general, we have several options for the public choice. From a technical point of view, the liberal policy is the simplest solution: abolishing all fiscal support for financial products and reducing taxes. The social democratic policy could have a broader scope: the abolition of fiscal support for financial products could be linked to an increase in pensions or other social expenditure – for example based on the argument that the relative amount of old-age pensions in our country lags behind the OECD and EU average (“pension gap”). A conservative (Christian Democratic) policy can be described as the transition to exclusive tax deductions, with the pay-out of pension savings being fully burdened by the personal income tax (EET tax regime). This is the most common practice in the world, which is especially beneficial for higher income groups, due to the usual existence of progressive income tax rates. Under the conditions of a single income tax rate (as in Czechia, practically), this system is equivalent to the TEE tax regime, where savings or investments are made from taxed income and the state support has the form of an exemption of capital income from taxation. In Czechia, the TEE tax regime applies to the investments into mutual and investment funds. The TEE tax regime has been increasingly recommended around the world over the last decade, at the expense of the EET regime, as it is significantly simpler and more equitable (equal approach to all income groups); notwithstanding the fact that when applying EET, there is a significant risk that tax rates will be different in the future (when, for example, entire pension savings are taxed). Thus, the TEE tax regime can be unambiguously recommended for Czechia; British *Individual Savings Accounts* (ISA) or Canadian *Tax-Free Savings Accounts* (TFSA) is the optimal solution of this type. Their basic behavioural trick is that the client is limited in the annual and lifetime deposit/investment and the time and amount of savings withdrawal is unlimited. Therefore, it is stated that “TFSA is best utilized as a retirement savings vehicle” (Kasper, 2019).

## 2 Single collection point

The Czech system of taxes and social security contributions is relatively fragmented, and its structure differs significantly from typical Western countries, especially *by the low role of personal income taxation and the high share of social security contributions*. This already indicates significant possibilities for systemic and purely technical rationalization of the tax system. In this respect we are pleased with 2 items in the Fiala’s government programme statement, in the section Support for

Employees and Entrepreneurship in the chapter Public Finances: • "We will reduce the bureaucratic burden in the administration of taxes and fees ... • We will introduce a single collection point ..." (Fiala et al., 2022).

The Czech government had the ambitious intention to introduce a single collection point more than 10 years ago, the project anticipated the creation of a single collection point for taxes, customs duties and social and health insurance premiums. From the institutional point of view, the single collection point was to be created based on tax administration bodies, the target state was to be achieved in 2014. The project resulted in Act No. 458/2011 Coll., on the amendment of laws in connection with the establishment of one collection point and other changes to tax and insurance laws. Employer insurance premiums were transformed by this act into a "levy on total wages for public insurance and the state employment policy", which included: pension insurance premium 21.5%, sickness insurance premium 2.3%, accident insurance premium 0.4%, health insurance premium 7% and contribution to the state employment policy 1.2% (all rates from the same basis). Employee rates for pension insurance premiums (6.5%) and health insurance premiums (4.5%) remained unchanged. The effect of the law was proposed by the government since 2013, in the end it was postponed by 2 years; the grounds were the fighting sparked by interest groups and four exchanges of government: Topolánek was Prime Minister in 2008, followed by Fischer, Nečas (2010-2013), Rusnok (less than a year) and Sobotka (2014-2017). In October 2014, law No. 458/2011 was practically repealed; the relevant proposal, including the explanatory memorandum, was submitted by Minister of Finance Babiš. The Babiš´ government (2017-2021) promised to implement a project Modern and Simple Taxes "with the aim of simplifying tax administration and the tax system. We will launch an online tax portal that will provide a comprehensive overview of the taxpayer's tax history, allow the tax collection and offer "pre-filled tax returns" ... We will push through a proposal for a new conceptual legal regulation of income taxes, which will newly regulate taxation and the system of insurance contributions from these incomes with the aim of simplifying taxes and eliminating tax distortions. We will conclude the process of recodification of income taxes by preparing an integrated system of tax and insurance contributions administration that will allow the collection of these legal obligations in one point" (Babiš et al. (2018). Neither of these promises was fulfilled.

*If Czech old-age and disability pensions are only about 30% dependent on the premiums paid, they should be financed from insurance premiums to the same extent*; the remaining 70% is taxation, and namely unjustified. For this reason alone, the overall pension premium rate of 28% should be reduced by up to 20 percentage points; to this extent, it should be financed from general taxes. In countries with "fair" social pension insurance, the substitute periods of pension insurance for childcare are paid from general taxes (from the state budget). These facts already fully justify the "reclassification" of today's Czech total employee insurance premium with a rate of 11% to income tax (from dependent activities) with the same rate, respectively *the inclusion of these premiums in this income tax*; its basic rate will thus increase from 15% to 26%. In this way, one "collection point" can disappear very easily and quickly. At the same time, we can abolish the almost unnecessary current increased income tax rate (26% of income over 400% NAE), moreover, pointing out that the existing pension premium is collected from wages up to 400% NAE. Withholding income tax, which has a rate of 15%, will not be affected by this operation! Self-employed people can be pleased by the fact that the social insurance contributions paid by them will be newly deductible from the income tax base (which is, after all, a standard in countries with social insurance, even for employees it is a tax-deductible expense!).

*Czech premiums for general health insurance are unique in the world*, they arose during the tax reform of 1993; not only the historical model of sickness funds in the Czech lands played a role here, but also efforts to privatize health insurance at least partially, or to introduce competition among non-profit health insurance companies. Already in advance of the tax reform, 15 of these insurance companies were established, in 1996 there were already 27. Then came the integration process: today we have 7 health insurance companies, of which 3 are state-owned. There were both attempts to privatize them and efforts to introduce medical savings accounts. The consequence of the cost

explosion after the introduction of market methods of reimbursement of health services by health insurance companies was a fundamental change in state policy, which resulted in the introduction of the so-called *reimbursement decree of the Ministry of Health*, which annually sets out all the basic financial parameters of the provision of health care (this replaces the state budget).

"The Czech health system provides virtually universal coverage with the state paying contribution on behalf of almost 60% of the total population (the so-called "state-insured"). This group is mostly economically inactive and includes children, students, people on parental leave, pensioners, the unemployed, prisoners and asylum seekers. The contributions that the state makes on their behalf are financed through general taxation but amount to only a quarter of all SHI funds" (OECD/European Observatory on Health Systems and Policies, 2017). Why does the state pay premiums (only) for economically inactive individuals, when it can pay "premiums" for all "insureds" – from general taxation? If nothing else, the state itself could collect (into the state budget) "health insurance premiums" and pay health insurance companies from it what they receive today from the so-called one hundred percent redistribution of health insurance premiums. The systemic, professional solution in this respect is very simple, but it always runs up against the personal interests of the bureaucrats concerned – opponents of one collection point (almost to life and death!). A similar solution was attempted by the Ministry of Finance in 2018: in a working group, it proposed to abolish insurance premiums for state-insureds and to increase the rate of health insurance premiums paid by employees accordingly, at the expense of the personal income tax. The attempt was in vain after the rapid intervention of the health insurance lobby, which considered rising payments for state-insureds to be a convenient tool for increasing health spending. The situation has changed recently when, after the rapid growth of these payments under the influence of the pandemic, there was (by mistake) an excessive increase in the financial reserves of health insurance companies and the government proceeded to reduce payments for state insured persons, under the pressure of the growing state budget deficit.

*The premium for state insured persons is completely non-systemic*, regardless of its amount – unless the state pays "premiums" (in fact a subsidy) for the entire population. Equally absurd is the collection of premiums by individual health insurance companies, its (de facto) transfer to a common, trust fund (formally just a "special public health insurance account" with the General Health Insurance Company) and subsequently (de facto) transfer to individual insurance companies with which individual insured persons are registered. These complicated and unnecessary operations/transfers will be cancelled (at the latest) with the implementation of single collection point, even if implemented only for health insurance premiums, which would then be transferred to the financing of health care as before.

The so-called persons without taxable income (PWTI), who have not been included by the state among the state insured, are to pay a flat-rate premium of 13.5% of the minimum wage (CZK 2,187 per month this year). About half of these insured persons do not pay insurance premiums – and they must be recovered from them even at the high administrative costs (even so, they are very often irrecoverable). When reforming health insurance premiums, or as soon as possible, PWTI premiums should be abolished; it is, in fact, an unfair tax.

The Czech public health insurance has no basic attribute of social insurance; it is *a public expenditure program that is unjustifiably funded by a tax called as health insurance premiums. The primary political task is to create a single collection point*, concurrently health insurance premiums may be directly incorporated into today's social insurance premiums ("social security premiums and contribution to the state employment policy"); the above-mentioned intermediate stage with the single collection point for health insurance premiums only is an unnecessary waste of time (and public money).

The Czech social security includes *statutory employer liability insurance for accident at work and occupational disease*, too. It is a universal system of supplementary social accident insurance. Insurance benefits are actually paid from the state budget in the mode of pay-as-you-go financing, with the administration of the system, including the collection of premiums, being outsourced to two

private insurance companies (Kooperativa, Generali Česká) for a fee, which currently amounts to 4% of the collected premiums for this insurance. Written premiums for this insurance in 2017 were CZK 7.6 billion, insurance benefits CZK 4.8 billion; this results in a surplus for the state budget of CZK 2.5 billion. According to the Ministry of Finance, this insurance cannot be characterized as private insurance and its main drawback is its implementation by two private insurance companies (Ministry of Finance of the Czech Republic, 2018). The system requires reform (Vostatek, 2019). For us here it is essential that these insurance premiums may be included in social security contributions (including collection) without reservation and delay. The average premium rate is 0.45%; to cover the insurance benefits and overheads of this social accident insurance, an (average) premium rate of 0.3% is sufficient.

In the Czech *sickness insurance*, the most important benefit is the sickness benefit; it is a typical insurance benefit, but its weight (after the reform in 2018) fell to 59% in 2020. The role of care allowance has increased (21%), the role of maternity benefit has decreased (from 37% in 2012 to 19% in 2020). Parental allowance is the dominant benefit (81%) of the so-called state social support; expenditure on this allowance (CZK 39 billion) is higher than expenditure on sickness benefits (CZK 33 billion). After the proposed integration of parental allowance into maternity benefit (Vostatek, 2021b), we could rename sickness insurance to family and sickness insurance. However, we are mainly interested here in the necessary amount of sickness insurance premiums – and this rate (2.1%) is already insufficient, it should be increased to at least 3.4%; if it were to cover today's parental allowance, the premium rate should be at least 5.8%; administrative costs should also be included in the premium rate. The increase in the rate of sickness insurance premiums itself is easily realized when implementing a single collection point.

*The contribution to the state employment policy* can be integrated into a single collection point, though there is no strong link between contributions and benefits in this social security component, and therefore wider financing is also possible: taxation of capital gains, assets or consumption (Brys et al., 2016). The rate of contribution to the state employment policy is 1.2%. In the crisis conditions of 2020 and 2021, this rate was insufficient: spending on the state employment policy in 2020 would correspond to a rate of 2.8%. This fact does not imply the need to change the rate of contribution to the state employment policy: in general, let alone at the start of the single collection point.

*Overall, Czech social security has the quality of social insurance to a low degree only*, in the total "premium" of about 45.1% of wages, the existence of premiums with a rate of the order of 12% of wages is justified from this point of view. As part of the basic stage of the transition to a single collection point, we can easily get rid of only 11% of the salary, by including today's both employee insurance premiums in the income tax from dependent activities. *Employer insurance premiums* (in the total amount of 34.1% of wages) *can be combined into one collection item in this situation*, knowing and justifying that they are mainly a tax, not an insurance premium. In the interest of rapid implementation (if possible, from next year), it is advisable to keep the collection of single/combined social insurance contributions in the Czech Social Security Administration.

The author's proposal to implement the basic stage of the single collection point (SCP) has been rejected by the Deputy Minister of Finance for Taxes and Customs Stanislav Kouba (quote from a private e-mail): "Crucial for launching SCP or any similar change ... is to have a relatively robust IT solution built, which under the conditions of the Financial Administration means to replace the existing system, which is philosophically still based on the foundations of the 90s. We are now focusing on this milestone (it will also make it easier to implement anything that will be implemented in taxes) – the SCP legislation itself is the smaller problem – (the latest version is already in the Public Insurance Premiums Act)". As the direct discussion also showed, it would be an event lasting more than 5 years. And today's Fiala´s government will no longer be here. And there would be nothing from the SCP again. By contrast, *there is no need to replace software for a simple change of insurance premiums and income tax rates* – just as there was no need to do it in the case of the abolition of the super-gross wage taxation. Moreover, the bill on Public Insurance Premiums (Ministry of Finance of the Czech Republic, 2013) is completely unusable here.

## 3 Corporate and value-added taxation

*The high deficits of the Czech state budget will sooner or later manifest themselves in the need to raise taxes*. However, this problem cannot be combined with the creation of a "single collection point", otherwise we will get nowhere in rationalization and savings of unnecessary administrative overhead. Of course, we bear in mind that the war in Ukraine broke out 2 months after the publication of the government statement; therefore, we do not criticize the absence of a plan to eliminate or substantially reduce the public finance deficit today. However, let us commend the government for having committed itself to “meeting the Maastricht criteria and other EU budgetary rules as soon as possible" (Fiala et al., 2022).

In this respect, let us deal first with the issue of corporate income taxation. *The primary socio-political question is whether dividends should be taxed once as part of corporate income taxation and for the second time as individual income.* The classical theory and policy of corporate taxation had no problem with the "double taxation of dividends" because the theoretical basis for taxing the income of joint-stock companies was their so-called material ability-to-pay (Engliš, 1929). On the other hand, the integrated concept of personal and corporate income taxation is based solely on personal ability-to-pay. The Czech taxation of dividend income is based on the classic concept: the company pays corporate income tax at a rate of 19% and if it pays out fully the after-tax profit in the form of a dividend which is taxed at a rate of 15%, the resulting aggregate tax burden on profit is: $0.19 + (1 – 0.19) * 0.15 = 31.15\%$. In some countries, the corporate tax paid may be taken into account in full or in part in the calculation of personal income tax. In Estonia and Latvia, dividends are not taxed, and corporations pay tax at a rate of 20%. The total Czech taxation of corporate and personal income is the 7$^{th}$ lowest of the 36 OECD countries; this corresponds to the post-communist policies, but we should (already) get rid of them. We recommend *increasing the corporate tax rate from 19% to 31.15% and abolishing the withholding tax on dividends.* Foreign capital will certainly "survive" it because the overall level of profits in our country is significantly higher, de facto at the expense of wages. In general, we recommend implementing (preferably in all EU countries) the CBIT (comprehensive business income tax) concept of the corporate tax, in which interest is not deducted from the corporate tax base. Corporate income is taxed here regardless of whether the company is funded by bonds or shares. This will remove the "debt bias" of corporate taxation.

Value added tax in the EU is an exemplary policy failure. Its predecessor was the turnover tax, introduced in European countries after the First World War as a "temporary" measure until public finances "normalize". The turnover tax was/is not "competitively neutral" because it favours large enterprises (processing plants). For these reasons, it has been replaced, especially in the EEC/EU countries, by the value added tax, which is competitively neutral in its model form. VAT has been introduced in more than 150 countries around the world and is hailed as "unquestionably the most successful fiscal innovation of the last half-century" (Mirrlees et al., 2010). The only (authoritative) country that has not introduced VAT is the US; there are state and possibly local sales taxes; this is also reflected in the US tax mix, in a significantly lower share of consumption taxation. Leaving aside the (generally quite substantial) question of whether to tax consumption at all, the disadvantages are, among other things, complex administration, tax evasion, rate differentiation and tax exemptions. The value-added tax system used in the EU is the worst in this respect; it is also the oldest one, that is why it is considered the first generation of VAT. The second generation of VAT (with one tax rate and significantly fewer exemptions) includes, for example, New Zealand, Australia, Canada and South Africa. The 'revenue type' of VAT applied in Japan is also referred to as the value added tax system; the 'direct differential method' used here consists in the fact that, at the level of the undertaking, the taxable amount is total turnover/sales after deduction of total purchases; it is therefore essentially a taxation of wages and profits.

*One of the fundamental weaknesses of the current value added tax system* in the EU and in other countries *is the treatment of financial services*, where these products are in principle exempt from VAT, which also means the impossibility of deducting the tax contained in the price of products purchased by the companies concerned. This approach is explained by the specifics of the functioning

of these financial services. The taxation of "explicit" VAT charges and commissions is considered to be trouble-free in this respect. However, the problem is reportedly with margin-based financial services. Margins, e.g. interest rate spreads themselves, even represent added value, but the basic problem is allegedly to "divide" this margin into a part belonging to the business with the supplier (deposit) and with the customer (credit). At the same time, the opposition to these purpose-built constructions is very simple because "on margin" all business is based! Credit transactions are not excluded. Interest on the loan is constructed in the same way as "explicit" fees and commissions, and it is not the slightest problem to add VAT to it. Similarly, it is the case with interest on deposits, it is only a little "complicated" if the "supplier" is an individual who is not a VAT payer. However, the same is the case, for example, when buying scrap from the population. This may seem like a complication, but the problem is not in the so-called implicit fees. In several countries of the world, financial services are "normally" taxed by VAT. *The problem stems primarily from lobbying*. Alternatively, let us look for the problem in the very existence of VAT, or rather in its "differential" construction in the EU.

*Insufficient taxation of financial services may be compensated by special taxes*. International theory and policy in this direction recommends the use of the concept of a tax on financial activities; the most appropriate construction is the taxation of the wages and profits of financial service providers. In Denmark, for example, financial service providers pay a special payroll tax at a rate of 15.3%; the tax is deductible from the corporate income tax base. Another option is a higher corporate tax rate. In the UK, banks pay a corporate tax surcharge at a rate of 8% of profits. The corporate tax rate there is 19%, from 1/04/2023 a second corporate tax rate of 25% is to be introduced for profits over £250,000, and on this occasion the bank surcharge rate is to be reduced to 3% of profits above £25m. Mirrlees et al. (2011) recommended eliminating almost all zero and reduced VAT rates and introducing a *financial services tax as a VAT equivalent*.

Another specialty is the taxation of insurance services by *an insurance tax* that is levied on premiums: in about 20 European countries it taxes almost all non-life insurance, several of them at a high rate identical to or close to the standard rate of value added tax (Finland, the Netherlands, Germany). German insurance tax accounts for 4% of all tax revenues; the country's Christian Democratic model of income taxation provides a deduction of the entire premium from the personal income tax base. Austria and a few other countries also tax life insurance premiums. The Baltic countries and Norway do not have this taxation, Slovakia (and some other post-communist countries) introduced a sectoral tax ("special levy of selected financial institutions", rate in thousandths on assets) and after a few years "replaced" it with an insurance tax (8% of non-life insurance premiums). In Czechia, insurance companies pay only 3% of the premiums received from vehicle liability insurance to the Damage Prevention Fund, which is administered by the Czech Insurers' Bureau; de facto it is an earmarked tax.

In general, the approach to taxation of the financial sector should depend on the reform of value added tax, because the (now necessary) alternative solution to this issue can hardly consider the unevenness of the tax burden resulting from the very construction of the first generation of value added tax. However, the modernisation of value added tax is very difficult in the EU conditions, although it could theoretically be relatively simple. In the medium term, we *have no choice but to accept the concept of value added tax in the EU*. This implies the *necessity of introducing a substitute tax on financial services in Czechia* – unlike most EU countries we have no such solution. In doing so, we should give preference to the most general solution, which is a financial services tax constructed as VAT, along the lines of Mirrlees et al. Special taxes, such as *bank tax or insurance tax, are secondary solutions*.

Tax policy can relatively quickly contribute to increasing the efficiency of the entire economy, primarily by rationalizing and unifying the entire existing spectrum of social security contributions, resulting in a uniform employer contribution to social security and the inclusion of contributions paid by employees into the tax on income from dependent activities. In the area of corporate tax, it is advisable to focus on a fundamental reform consisting of the integration of the dividend tax into the

corporate tax and the exclusion of interest from the corporate tax deductions; here, the EU is developing (only) partial activities towards a common corporate tax base, which will probably require international discussions.

## Conclusion

Since 1996, the Pension Insurance Act has added a small basic amount of all pensions to the system of "percentage amount" of individual pensions, strongly equalized by reduction limits and coefficients; "Beveridge" won over "Bismarck" during the transformation in the 90s, but pension premiums were introduced and persisted. That was the reason for the fundamental negative opinion of the Czech Constitutional Court. Even later pension reforms did not eliminate the conceptual contradiction. The main problem is the related lack of transparency and incomprehensibility of the system, not only for ordinary clients. Given the continuing unpreparedness of the overall reform of public pensions, we recommend *dividing* this *reform into two steps*: a small reform and a major one. A small (technical) pension reform focuses on a simple but fundamental rationalization of the basic and percentage amount of the old-age pension. The new rate of the basic amount of this pension shall be at the level of 32% of the national average wage, while the percentage amount will reduce the valuation of one year of insurance from 1.5% to 0.39%. All this may be easily implemented within one year.

A major pension reform should result in a coherent, paradigmatic reform of old-age, disability, and survivor pensions. The basic amount of the old-age pension should be converted into a separate flat-rate pension, with a separate system of retirement age, minimum period of residence or economic activity in Czechia (optimally as in Great Britain) and indexation. The percentage amount of the old-age pension shall become a separate pension pillar of social insurance, optimally with the construction of the Austrian pension accounts, also with a separate retirement age and indexation system and with a significantly shorter minimum insurance period (3-5 years).

Model-wise, only social pension insurance is to be financed in the form of pension premiums, which facilitates a substantial reduction in the rate of these premiums. The national economic approach favours the abolition of health insurance premiums over the reduction of pension premiums – both with regard to the existing Czech public health care system and the absurd conception and structuring of health insurance premiums and their collection by all health insurance companies. Simply put, we can easily and quickly cancel this or that premium *by integrating the entire employee premium into the personal income tax*. The prevailing tax nature of total employer premiums makes it possible to realize a rapid progress in the creation *of a single collection point for employer premiums as a whole* (including the existing employer liability insurance for accidents at work and occupational diseases), both *within one year*.

The complicated and generous, unconstitutional Czech system of state support for "personal pensions" is primarily the result of lobbying by useless "pension companies" that have a monopoly on the provision of supplementary pension savings. However, its real role in pension security is as low as in other countries. In line with foreign experience, we recommend either the complete abolition of state support for all financial products or the transition to a single tax regime – optimally in the form of British individual savings accounts or Canadian tax-free savings accounts, where annual deposits are limited, and withdrawals are unlimited. Not only in Czech practice, (previous) investments in housing are far more important for (future) pensioners than any third pension pillar.

The Czech tax structure and policy is significantly deformed, especially as for income tax and value added tax. Within a year, a basic manoeuvre in the introduction of a single collection point can be implemented: *to concentrate the collection of all insurance premiums into the Czech Social Security Administration*, including health insurance premiums and insurance premiums for employer liability insurance for accidents at work and occupational diseases.

In an already politically demanding tax reform, it is rational to increase the corporate income tax rate by the current taxation of dividend income to a total of 31.15%. At the same time, it is fair to set

aside interest from the tax-deductible costs of corporations. Both are covered by relevant model policies, including efforts to tax revenues in the country where they were generated. All this also in view of the need for additional revenue to start implementing the EU's Maastricht budgetary rules.

Value added tax is heavily harmonised in the EU, but with several outdated and lobbying constructs. The most important fair solution for Czechia is to introduce a tax on financial services.

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