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NEW PARADIGMES IN THE ECONOMY: CONNECTIVITY, INNOVATION AND SUSTAINABILITY

2

Oikos Institute - Research Center Bijeljina
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ECOLOGICAL ENTREPRENEURSHIP: EMPIRICAL RESEARCH ON THE SUSTAINABLE DEVELOPMENT OF ECOTOURISM IN AZERBAIJAN

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ABSTRACT

As the host country for the 2024 United Nations Climate Change Conference (COP-29), Azerbaijan has intensified its focus on ecological entrepreneurship, with a special emphasis on ecotourism. This study aimed to explore the potential for growth in eco-entrepreneurship and ecotourism within Azerbaijan. To achieve this, a survey was conducted with Generation Z students at the Azerbaijan Tourism and Management University, a leading institution in tourism and management education in Azerbaijan. The survey sought to gauge Generation Z students' perspectives on ecological entrepreneurship and ecotourism.

Given that these individuals are poised to assume managerial roles in the tourism sector upon graduation, their attitudes toward ecotourism are crucial for the sector's future development in Azerbaijan. The findings revealed several key insights: (1) there is a robust interest among Generation Z students in pursuing careers in ecotourism; (2) they are optimistic about the growth potential for ecological entrepreneurship in Azerbaijan; (3) they believe that ecotourism will gain popularity and become a lucrative sector in the country; and (4) hosting COP-29 is expected to further stimulate interest in ecological entrepreneurial ventures in Azerbaijan.

The research, employing both quantitative and qualitative methodologies, indicates that an event like COP-29 can significantly boost entrepreneurial interest in Azerbaijan.

Key words: *COP-29, eco-entrepreneurship, ecotourism, Generation Z, green economy, development*

1. INTRODUCTION

Interest in ecological entrepreneurship is growing in Azerbaijan, which will host United Nations Climate Change Conference (COP-29). As a country rich in oil and gas, Azerbaijan is already implementing significant green energy projects (Gasimli, 2024). These projects, aimed at developing ecological entrepreneurship, are supported by the government. Within the scope of the COP-29 international event, approximately 70-80 thousand ecologically sensitive foreign visitors are expected to visit Azerbaijan in November 2024. Knowing that these guests are sensitive to environmental issues, entrepreneurs intend to offer services that meet their requirements. The Azerbaijani government also supports entrepreneurs with hosting projects related to COP-29, and the interest calculated on the loans they receive is subsidized, etc. The hosting of COP-29 is

characterized by innovations in the field of ecological entrepreneurship in Azerbaijan. This research is an applied research on ecological entrepreneurship in Azerbaijan. In this article, it is aimed to determine the factors that hinder the development and solution suggestions of eco-entrepreneurship and eco-tourism as well as the development potential of both eco-entrepreneurship and eco-tourism that do not threaten human health in the country. Also, the purpose of this article is to examine the economic, social and ecological benefits of green tourism and eco-entrepreneurship in terms of the development of Azerbaijan.

Also, in this study, the development perspectives of eco-entrepreneurship and eco-tourism in Azerbaijan were studied. In particular, the attitude of representatives of generation Z, who studied in the field of tourism and will work in this field in the future, towards ecotourism was determined through the survey. Interviewees were taken from the Azerbaijan Ecotourism Association, an institution specializing in the field of ecotourism. At the same time, we tried to summarize our observations in the study, evaluate their reliability, make comparisons and draw conclusions.

Following this introductory section, the next section reviews the literature covering the research in the field. Methodology and data sources are covered in Section 3. The result of survey and interviews are discussed in Section 4, whereas the last section we conclude the paper by providing a summary of the research findings.

2.LITERATURE REVIEW

In the 20th century, researchers proposed the idea of a new market dedicated to environmentally friendly products. This idea led to the emergence of a new entrepreneurial perspective in business. This type of entrepreneurship was called “ecological entrepreneurship”, “green entrepreneurship”, or “environmental entrepreneurship”. This term has been widely used since the 1990s. The term eco-entrepreneurs has come to refer to entrepreneurs whose business ideas are not only about profit, but also about caring for the environment (Gwyer, 1998). In contrast to the traditional entrepreneurship, whose primary goal is to maximize profits, sustainable and ecological entrepreneurship is a type of business that balances economic, social, and environmental aspects (Baxter, 2004; Farinelli et al. 2013; Gast et.al. 2017; Skordoulis et al. 2020; Soewarno and Tjahjadi, 2020).

Berle (1991) defined green entrepreneurship by referring to the idea of the “environmentally friendly entrepreneur”. Green entrepreneurship is the activity of consciously solving environmental and social problems and needs and coming up with bright innovative entrepreneurial ideas that will solve them. Green entrepreneurs are essential to economic development. They can make a significant contribution to the elimination of unemployment, poverty, and environmental problems. Green entrepreneurs play a greater role in environmentally friendly practices and responsibilities than other entrepreneurs. They may provide environmentally friendly products and services using technology and contribute to a green economy. Furthermore, Yousuf et al. (2017) described a green entrepreneur as a thinker capable of mitigating environmental threats.

Ecotourism, as a sustainable tourism phenomenon, has been extensively discussed by researchers and experts in the literature. Wheat (1994) defined ecotourism as travel by tourists who are interested in observing nature and are environmentally conscious. According to Steele (1993), it is an economic process where rare and attractive ecosystems are introduced to the international market in order to attract tourists (Steel, 1993). A tourist travels to unique, untouched, and uncontaminated places around the planet to

study the fascinating nature, wild animals, and plants, as well as past or present cultural and traditional manifestations found in these areas (Ceballos-Lascurain, 1987). Ecotourism involves trips to fragile, pristine, and protected areas. It helps educate travelers, provides funds for conservation, directly benefits the economic development and political empowerment of local communities, fosters respect for diverse cultures and human rights (Honey, 1999). According to the International Ecotourism Society (TIES - launched at a conference in Florida in 1989 as the world's first international non-profit dedicated to ecotourism), ecotourism is responsible travel to natural areas that protect the environment and enhance the well-being of local people (TIES, 2015).

In Azerbaijan, the concept of a Green Economy has drawn the attention of researchers (Gasimli, 2022; Abbaszade & Satiji, 2023; Kheirkhabarli, 2023), yet studies on ecological entrepreneurship remain relatively scarce. Asadov & Erdélyi (2020), Hajiyev (2021), Salmanova (2022) have noted the development perspective of eco-entrepreneurship and ecotourism in the country. More concretely, in recent years, deep research has been carried out in Azerbaijan on the development of tourism. For example, Allahverdiyeva's (2023) research on the most developing types of tourism in Azerbaijan included tourists who came to the country for religious purposes, for treatment, and visited relatives and friends. However, in this study, there was no analysis of tourists who visited Azerbaijan for the purpose of ecotourism. In general, this study is the first to explore Generation Z's perspectives on ecological entrepreneurship and ecotourism in Azerbaijan.

3. DATA AND METHODOLOGY

3.1 DATA

This study uses data from the Ministry of Environment and Natural Resources of Azerbaijan, the Ministry of Economy of Azerbaijan, and the State Tourism Agency of Azerbaijan. It also includes statistical data from the State Statistics Committee of Azerbaijan (SSC, 2023a; SSC, 2023b; SSC, 2023c; SSC, 2024a; SSC, 2024b). Eco-entrepreneurship and eco-tourism is a new field for Azerbaijan, and there is currently no data about this field in official statistics. That is, the green economy section of the official statistics in Azerbaijan provides different information. However, these data cover limited areas and do not include the types of tourism. The statistics give the total number of tourists visiting the country. But the number of tourists coming to the country and their costs related to ecotourism are not shown. Therefore, interviews and surveys were preferred during the research.

3.2 METHODS

In our study, the primary focus is on assessing the sustainable development of ecotourism in Azerbaijan, employing both quantitative and qualitative research methods. Primary research included a questionnaire survey and interviews. The survey was conducted among Generation Z students at the Azerbaijan Tourism and Management University (ATMU), who are pursuing bachelor's and master's degrees in tourism and management. The aim of the survey is to gather insights on ecological entrepreneurship and ecotourism from these young representatives of Generation Z. Considering their prospective roles in the tourism sector upon graduation, their perspectives on ecological entrepreneurship are crucial for the future development of this field in Azerbaijan.

A survey consisting of 11 questions, addressing all aspects of the research, was prepared, and presented to Generation Z students at the Azerbaijan Tourism and Manage-

ment University during January and February 2024. Participants included students from three faculties: Tourism and Hospitality, Business Administration, and Social Management. In total, 267 students representing Generation Z participated in the survey. Before distributing the questionnaire through the participants' corporate group emails, they were informed about the study's purpose. It was also explained that their participation was voluntary, and that the data collected would be used solely for scientific research purposes.

The methodology of the study is to examine the opinions of tourism and management students, representatives of Generation Z, regarding the current gaps and deficiencies in the eco-entrepreneurship and ecotourism system. 146 (54.7%) men and 121 (45.3%) women participated in the survey. The analysis of the causal relationship between the variables and their interpretation helped to answer the research questions and determine the view of Azerbaijani youth on ecotourism.

In the survey, open-ended questions allowed us to gather the students' thoughts, experiences, and comments. These questions included:

- As future experts, what problems do you see related to ecotourism?
- What improvements and suggestions do you have for the development of green entrepreneurship and ecotourism in our country?

Additionally, in March 2024, interviews were conducted with the chairman and five experts from the Azerbaijan Ecotourism Association to identify factors that hinder the development of ecotourism.

4. RESULTS AND FINDINGS

4.1. THE TENDENCY OF ENVIRONMENTAL ENTREPRENEURSHIP ON A GLOBAL SCALE

The rapid growth of the world population, climate change, unequal distribution of resources, and eco-efficiency are the driving forces behind the development of eco-entrepreneurship. This field merges the concepts of entrepreneurship and ecology to create what is known as green entrepreneurship. The aim is to foster an economically sustainable environment while protecting natural greenery. Green entrepreneurs are concerned not only with environmental protection but also strive to create an economically sustainable world. They develop business plans that aim to improve the quality of life for the communities they serve while minimizing the negative impact on environment. Unlike traditional entrepreneurs, eco-entrepreneurs seize market opportunities that align with sustainability efforts. Their activities include ecotourism, recycling, energy efficiency, sustainable mobility, organic agriculture, and the use of renewable energy sources. In summary, we can say that eco-entrepreneurs act as promoters of a sustainable future and guardians of the natural environment.

The primary goal of eco-entrepreneurship is to develop and implement projects that focus on environmental protection, promote the dissemination of clean technologies, facilitate recycling, and deepen societal knowledge and awareness, ultimately creating an ecologically clean economy. It is widely recognized that eco-entrepreneurship plays a crucial role in minimizing the negative impact of organizations and individuals on the environment. But how can eco-entrepreneurship achieve this? The question is complex, yet the answer is straightforward. Each organization or company must adopt highly advanced techniques and technological resources to improve the former pro-

duction environment. Additionally, specific measures need to be developed. These include the following (Elena Mieszajkina, 2016):

- Adopt environmental technologies that create less pollution and more efficiently use natural resources, and that protect soil, water, and air, prevent global climate change, and include sustainable production, consumption, and logistics, unlike previously used technologies;
- Improve the quality of life without increasing environmental degradation and without compromising the resource needs of future generations;
- Implement clean production technologies in production processes to save resources, reduce pollution and waste, conserve raw materials and energy, eliminate toxic materials, and decrease the amount and toxicity of emissions and waste;
- Design new products and services that are environmentally friendly;
- Spread non-technical innovations that either have a less negative impact on the environment or allow for optimal use of resources;
- Develop environmental education programs that raise awareness and knowledge about sustainable practices;
- Promote ecological education among the youth to foster an early awareness of and engagement with environmental issues.

Although there has been a stagnation in the development of the ecological market, interest in products and services that protect nature has surged following the COVID-19 epidemic that paralyzed the world. Projects and ideas rooted in sustainable development now hold the potential to become the most significant business areas of the near future. In recent years, eco-entrepreneurs have attracted various incentives and investments from socially conscious green investors and funding platforms. Countries facing depleted natural resources are paving the way for green entrepreneurs, with many introducing new regulations to support their ventures. For instance, the European Investment Bank (EIB) is actively providing special support to green initiatives (EIB, 2022). Research shows that the concept of ecoentrepreneurship has a linear relationship with the development of ecotourism, suggesting that this concept can serve as a strategy for advancing ecotourism. Massi and De Nisco (2018) emphasized that ecotourism is a rapidly growing tourism segment. Ecotourism is characterized by its aim to minimize environmental impact and avoid the negative effects associated with many large-scale tourism developments in environmentally sensitive and previously undeveloped areas (Massi & De Nisco, 2018)

The global ecotourism market size was estimated at USD 195.9 billion in 2022 and it is expected to attain around USD 656.19 billion by 2032, expanding at a compound annual growth rate (CAGR) of 12.90% over the forecast period 2023 to 2032 (Ecotourism Market, 2024)). Ecotourism has become a recognized business worldwide. For example, birdwatching in North America generates an annual revenue of 70-80 billion dollars. As evident, achieving the goals of sustainable development by 2030 relies on eco-entrepreneurship or green entrepreneurship, which involves the development of ecotourism.

4.2. DEVELOPMENT POTENTIAL OF ECO-ENTREPRENEURSHIP AND ECO-TOURISM IN AZERBAIJAN

In recent years, research and studies have focused on issues related to the environment, ecology, ecotourism, eco-entrepreneurship, and green development. These studies are

driven by several factors: industrialization, a rapidly growing population, environmental challenges associated with modern lifestyles, and global warming. Environmental pollution, rapid consumption of natural resources, and the depletion of biodiversity all impede sustainable development. Environmental entrepreneurship plays a crucial role in achieving the Sustainable Development Goals (SDGs) as it encompasses activities aimed at devising effective, innovative, and sustainable solutions to environmental problems.

In Azerbaijan, the 5th fifth priority of "Azerbaijan 2030: National Priorities for Socio-economic Development" is titled "A Clean Environment and a Country of Green Growth" (NP, 2021). This document outlines key tasks including the adoption of ecologically clean technologies, promoting waste recycling, restoring polluted areas, and expanding the use of "green" technologies that are ecologically beneficial(SSED, 2022).

Azerbaijan will host the 29th session of the Conference of the Parties to the UN Climate Change Convention (COP 29) in November 2024. Simultaneously, 2024 has been declared the "Year of Solidarity for the Green World" in Azerbaijan. In general, taking such steps will positively impact eco-entrepreneurship, eco-tourism, and the economic, political, and tourism sectors of our country. Azerbaijan has declared its lands liberated from occupation as a "Green Energy" zone. These areas are planned to be transformed into "Net Zero Emission" zones by 2050.

Azerbaijan, an oil and natural gas-rich country, is set to host COP-29 in 2024. As part of its commitment to sustainability, the nation is focusing on environmental and green entrepreneurship, as well as green development initiatives. Currently, large green energy projects are underway, which include significant investments in solar and wind energy (Gasimli, 2024). These efforts are supported by the Entrepreneurship Development Fund, which prioritizes the financing of such green projects. Additionally, the construction of electric transportation infrastructure is a key component of these priorities. As Azerbaijan transitions from a traditional oil and gas powerhouse, the priority of its energy policy is to develop and promote green energy solutions and facilitate their entry into global markets.

On the other hand, since the beginning of the 2000, Baku (capital of Azerbaijan) developed rapidly with the increase in oil revenues and the challenges related to maintaining the balance between the development of villages and cities of the country emerged. Currently, it is most important to ensure a balance between development of villages and cities in order to make an economic growth inclusive and sustainable in Azerbaijan (Huseyn, 2023). From this perspective, green tourism and rural tourism can play an extraordinary role in rural development, employment of the rural population, increase in income and reduction of poverty.

The development of ecotourism is also included in the national development plan of the Republic of Azerbaijan. Azerbaijan has significant prospects and opportunities for ecotourism, and a number of state-level events have been implemented in this direction. One of the significant institutional reforms is the establishment of the Management Center for Reserves (MCR) by the State Tourism Agency. The main duties of this center are to protect the fauna, flora, and historical heritage of the reserves, and to develop the tourism component within them. It should be noted that these reforms have already been implemented in the "Yanardagh" reserve, and new strategic management models are being applied in the "Yuxharı Bash", "Basgha", and "Khinaliq" reserves (Samedova & Abasova, 2020). However, Azerbaijan is not fully utilizing the

potential of its ecotourism. According to the tourism development strategy, Azerbaijan can enhance its ecotourism system and achieve one of its national development goals.

Azerbaijan has 10 national parks, 10 State Nature Reserves, and 24 State Nature Sanctuaries (Specially protected natural areas encompass 10.3% of the country's territory). Additionally, there are approximately 3,000 natural monuments of global, national, and local significance. Shahdag National Park (SNP), considered the largest and most diverse, was established on December 8, 2006. It is located in the Greater Caucasus mountain range and covers an area of 130,508 hectares. Shahdag National Park has significant ecotourism potential, yet this potential is not fully utilized. Thus, in 2022, 147,359 tourists (both domestic and international) visited our national parks. However, in the same year, only 1,602,279 foreign visitors came to Azerbaijan, which means that those visiting the parks constituted only about 6-9% of the total.

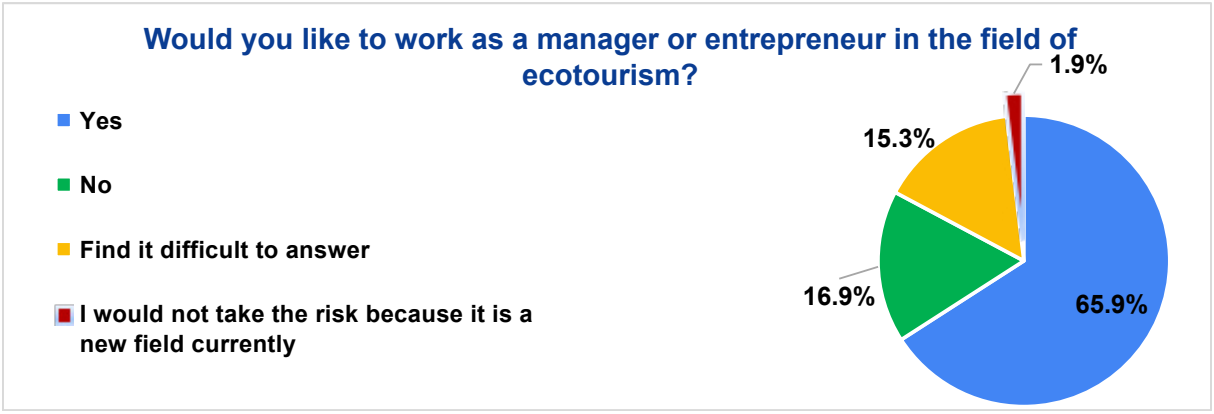
If we look at the world experience in successfully managing national parks, we can see a variety of ecotourism activities and services offered to visitors. These activities include rafting, hot air ballooning, zip lining, paragliding, bungee jumping, bird watching, themed hikes, camping tours, and more. According to the interviewed experts, Azerbaijan has a shortage of experienced workers in ecotourism, mountain tourism, and national parks, or some lack experience and professional knowledge in these fields. They also noted that Shahdag National Park, as well as other parks, possess significant ecotourism potential. Regrettably, only 10% of SNP's ecotourism potential is being utilized, with the remaining 90% still not used for ecotourism and undeveloped. A majority of survey participants (186 people) emphasized the rich ecotourism potential of the Karabakh region and the wide opportunities for the development of eco-entrepreneurship.

Ecotourism is rapidly emerging as one of the most attractive and promising tourism sectors in Azerbaijan. The rich fauna and flora, along with the abundance of rivers, lakes, and other water resources, particularly in our liberated territories, enhance our country's appeal as an ecotourism destination. It is crucial that these resources are effectively showcased to both domestic and international tourists. Although ecotourism is a relatively new phenomenon in Azerbaijan, it holds significant potential for development. Our research further indicates that Generation Z, along with future tourism managers, recognize the substantial growth prospects for eco-entrepreneurship and ecotourism.

4.3. ATTITUDE OF GENERATION Z INDIVIDUALS STUDYING TOURISM TOWARDS ECO-ENTREPRENEURSHIP AND ECOTOURISM

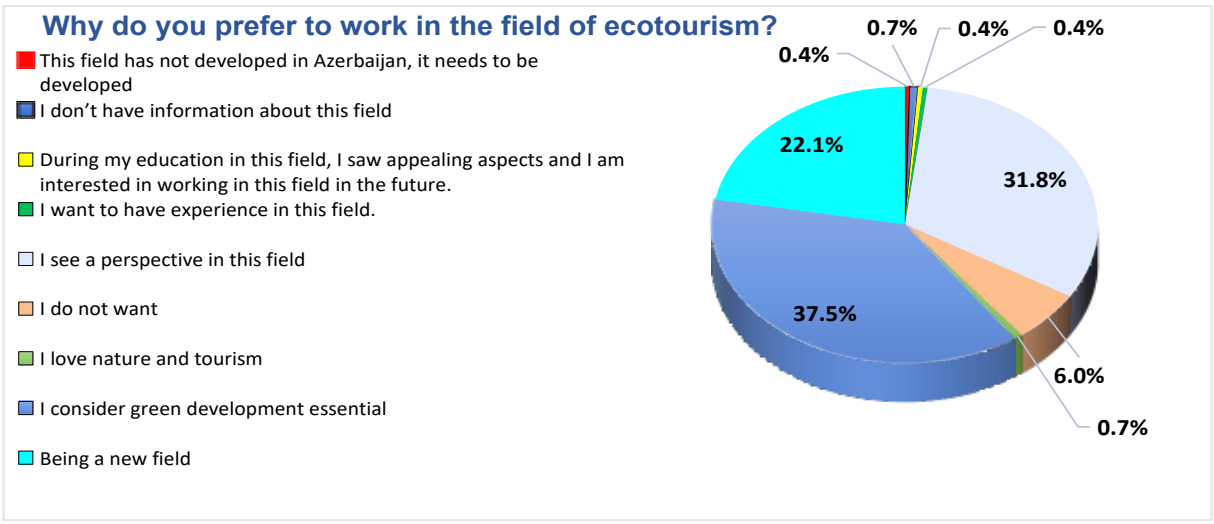
During the analysis of the submitted questions, it was revealed that 65.9% of the respondents are interested in working in the field of ecotourism. 16.9% of the respondents are not interested in this field, 15.3% found it difficult to answer, and 1.9% considered it risky because it is a new field (Fig. 1).

Figure 1. Desires of Generation Z representatives to pursue roles as managers or entrepreneurs in the field of ecotourism<



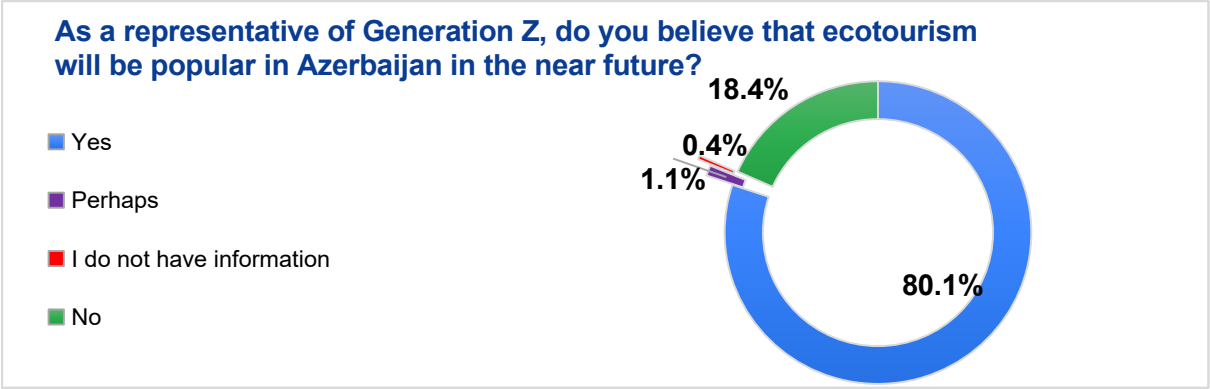
Furthermore, 37.5% of the participants acknowledged the necessity of green development, and 31.8% viewed it as promising (Fig. 2). Merely 6% expressed a disinterest in working within the green tourism sector. Overall, the youth exhibit greater optimism regarding the ecotourism prospects in the country.

Figure 2. The desire of Generation Z to work in the field of ecotourism



Additionally, vast the majority of participants, 80.1% (214 people), strongly agreed with the hypothesis that Azerbaijan has great potential for ecotourism and that this field will become popular in the future. On the other hand, 18.4% expressed skepticism that the field of ecotourism will become popular in the near future (Fig. 3).

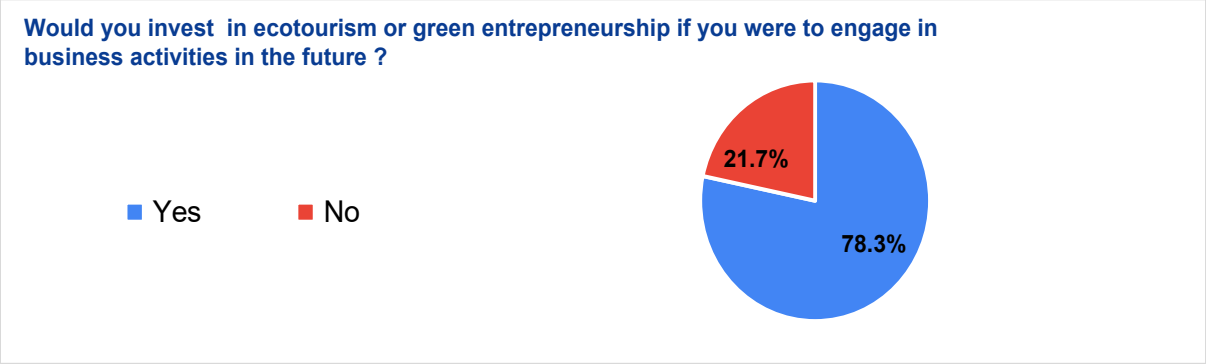
Figure 3. The attitude of Generation Z representatives toward the increase in ecotourism in Azerbaijan



Questions such as "Have you been on any ecotourism trips? If so, what have you learned the most from these trips?" were posed to determine the respondents' participation in ecotours. It should be noted that 81.6% of the respondents have not participated in an ecotourism trip.

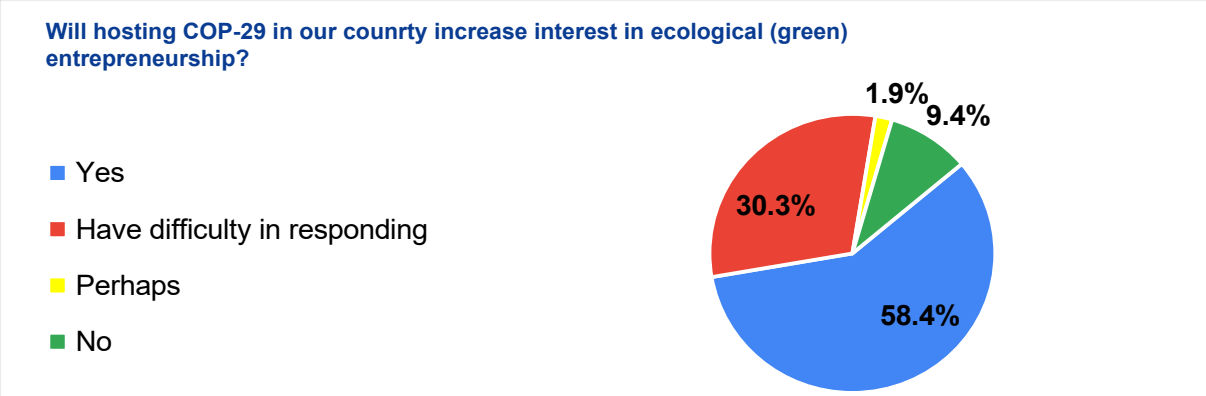
To determine the willingness of Generation Z to engage in entrepreneurship, the question was posed: "If you were to start a business in the future, would you invest in ecotourism or green entrepreneurship?". 78.3% of the respondents indicated that they are willing to invest in eco-entrepreneurship and ecotourism if they have the opportunity in the future. However, 21.7% expressed no interest in investing in this field (Fig. 4).

Figure 4. Willingness of Generation Z to invest in ecotourism



Regarding the impact of hosting COP-29 in Azerbaijan on the development of ecological (green) entrepreneurship and ecotourism, 58.4% of the participants stated that they were confident it would have a positive effect, while 30.3% had difficulty responding. Additionally, 9.4% of respondents chose not to respond (Fig. 5).

Figure 5. Respondents' expectations regarding the impact of COP-29 in Azerbaijan on the development of ecological (green) entrepreneurship



Thus, in summary, we can say that the survey highlights the expectations and decision-influencing factors of students from Azerbaijan Tourism and Management University, who are the representatives of Generation Z. The analysis concludes that a vast majority of the students view these fields as promising for the future and express a desire to work in this area.

In addition to analyzing the survey results, we conducted interviews with five employees from the Azerbaijan Ecotourism Association to further enrich our research. The insights from these interviews corroborate the high expectations in Azerbaijan for the positive influence of COP-29 on eco-entrepreneurship. This anticipation is partly due to the expected influx of 70-80 thousand environmentally conscious individuals vis-

iting Azerbaijan within a month. Moreover, our discussions with experts suggest that there is significant potential for the growth of environmental entrepreneurship in the country. The anticipation of COP-29 has notably increased interest in this sector. Experts deem environmental entrepreneurship a lucrative venture, particularly within the tourism industry. The study also revealed the following findings:

a. The factors hindering the development of ecotourism include:
   - Improper organization of ecotours;
   - Lack of regular promotion and insufficient encouragement of green entrepreneurship and ecotourism development;
   - Underdeveloped or inadequately planned infrastructure;
   - Insufficient involvement of young people and specialists in ecotourism, along with inadequate eco-certification processes.

b. The development of ecotourism and eco-entrepreneurship can be facilitated through five strategic solutions:
   - Planning of the green entrepreneurship model;
   - Effective and strategic utilization of the country's ecotourism resources;
   - Development of comprehensive strategies for ecotourism and green entrepreneurship;
   - Enhanced state support and greater promotion of municipal involvement in ecotourism projects;
   - Enhancing the professionalism and skills of specialists in the field.

For the successful implementation of the green entrepreneurship model, key initiatives include fostering a culture of green entrepreneurship, and providing training in the production of environmentally friendly products and services.

5. CONCLUSION

As a result of the research, it has been concluded that future sustainable development begins with green growth: green economy, green energy, green entrepreneurship, eco-entrepreneurship, ecotourism, etc. In oil-rich Azerbaijan, the development path prioritizes the non-oil sector, which is supported by the state for both sectors. Moreover, both sectors possess sufficient potential for development. Students, who are representatives of Generation Z, have also proposed reasons hindering the development of both eco-entrepreneurship and ecotourism, as well as solutions. These include:

- İnsufficient public awareness about these fields and irresponsible, indifferent attitudes;
- A lack of investment;
- A shortage of experienced professionals;
- Poor organization of marketing, promotion, and advocacy;
- İnadequate preparation of ecotour routes;
- Lack of awareness of the local population about the potential of ecotourism, etc.

Additionally, factors that hinder the development of ecotourism include the improper organization of ecotours, continuous promotion and encouragement of green entrepreneurship and ecotourism, development of infrastructure, attracting more young people and specialists to this activity, and the implementation of eco-certification, among others. Experts have emphasized the importance of developing a plan for ecotourism

growth. For the implementation of the green entrepreneurship model, it is also necessary to foster the spirit of green entrepreneurship and to conduct training on the production of ecologically clean products and services. Other recommendations include:

- Providing state support to both eco-entrepreneurs and tourism companies engaged in ecotourism;
- Proper and abundant organization of ecotours;
- Improvement of infrastructure;
- Strengthening the protection of the environment and nature;
- Ongoing promotion and advocacy of eco-entrepreneurship and ecotourism

In turn, from conducted surveys, observations, and interviews, we conclude that to achieve successful development of sustainable eco-entrepreneurship and an ecotourism system, a National Strategy must be prepared that systematically encompasses activities related to planning, development, and management. A crucial aspect here is the planning phase. During this stage, a comprehensive discussion of the main questions and issues from various government ministries (tourism, finance, agriculture, environment, forestry, parks, public works, and education) should take place.

In addition, it is essential to involve the views and opinions of the private sector, municipalities, non-governmental organizations, international financial institutions and local residents. Conservation groups and local communities should be involved in decision-making processes. The close cooperation and effective interaction of these structural components of the tourism industry provides a synergistic effect in the implementation of administrative functions and creates a basis for the sustainable growth of the field.

Moreover, there is a need for serious research in universities on the effective use and development of the existing potential of eco-entrepreneurship and ecotourism.

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THE EFFECT OF RENEWABLE OBLIGATIONS ON ELECTRICITY PRICES – ESTIMATES FOR THE UK

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ABSTRACT

As global warming escalates, largely fueled by greenhouse gas emissions from electricity generation, European nations have enacted regulations to encourage the use of renewable energy sources (RES-E). This paper provides a detailed analysis of how adjustments in Renewable Obligations, specifically quota obligations and the prices of Renewable Obligation Certificates (ROCs), influence electricity prices in the UK, spanning two separate periods: 2011-2013 and 2021-2023, using a regression analysis. In the first period, we observe a significant positive association between the prices of ROCs and the market price of electricity, underscoring the direct influence of ROC pricing mechanisms on energy costs. However, the data does not support a similar impact from quota obligations, suggesting that while ROC prices are integral to electricity price formation, quotas do not exhibit a directly proportional effect. In contrast, in the second period the scenario changes. Here, quota obligations become significant, indicating a growing influence on electricity prices as the UK's energy policy evolved. In this later period, the effect of ROC prices on electricity prices is not significant. This research contributes to the ongoing discourse on the economic implications of RES-E policies and their burden on consumers. The insights gathered herein provide a foundational understanding of the impacts that RES-E regulations have on electricity prices, serving as an essential resource for policymakers and energy economists alike.

Key words: *renewable energy, green certificates, electricity prices, renewable obligations, energy economics*

1. INTRODUCTION

Environmental concerns have been growing exponentially in the past decades. The release of dangerous gases into the atmosphere, such as CO_2, caused by the generation of electricity is a threat to our ecosystem. Furthermore, reserves of oil and gas are exhaustible and present efforts towards mending the situation can only prolong and not avoid it. Although plenty has changed in the last decades, such as a tendency of turning towards alternative energy sources, burning fossil fuels is still the main method of generating power (Bose, 2010). Known substitutes for such reserves are either renewable energy sources (RES-E) or nuclear energy, however, because of the dangers involved in

processing the latter, there is a strong preference towards the former. Additionally, this transition aligns with broader European initiatives, notably the European Green Deal. Launched by the European Commission, the Green Deal aims to reduce net greenhouse gas emissions by 55% by 2030 and make Europe a climate-neutral continent by 2050 (European Commission, 2020). Its objectives include a significant reduction in greenhouse gas emissions, investing in cutting-edge research and innovation, and preserving Europe's natural environment.

The need for government intervention is thus, clear. In this paper the specifics of these interventions will be analyzed and the focus will be shifted to how these affect consumers. Therefore, the main goal of this paper is to observe the effect that the regulations imposed on the use of renewable energy have on power prices, mainly electricity. The analysis will be focused on data from the United Kingdom. The UK has made significant strides towards integrating renewable energy sources into its national grid, driven by both environmental concerns and energy security. Among the mechanisms introduced was the Renewable Obligation Certificate (ROC) system, which obliges energy suppliers to source a certain percentage of their power from renewable sources (Ofgem, 2023). As a critical component of the UK's energy policy, ROCs aimed to encourage renewable energy production and contribute to the reduction of carbon emissions.

However, the impact of these obligations on electricity prices remains a contentious issue. While some argue that such schemes raise electricity costs for consumers, others believe they can stabilize or even reduce prices by increasing energy supply diversity and reducing dependency on imported fuels. Furthermore, previous studies have mainly focused on the advantages and possible drawbacks of the certificates trading system, many of them not being concerned with the impact they have on consumers. Hence, this is exactly what this research will focus on.

This paper seeks to address the debate by analyzing the effect of the ROC quota system on electricity prices within the UK market. In order to measure these effects, data from the UK were gathered for the periods 2011-2013 and 2021-2023 on the prices of electricity and several variables that might influence these prices, whilst the regulated levels of renewable energy that are required have been observed.

Our approach includes a detailed analysis of historical price data, the regulatory framework, and other determinants of electricity prices. By examining these elements, the paper aims to provide a comprehensive view of how the ROCs have influenced electricity pricing dynamics, specifically how legislation has affected the end consumers.

The significance of understanding this impact cannot be overstated. For policymakers, a clear analysis helps in crafting informed energy policies that balance economic, environmental, and social goals. For the energy industry and consumers, it informs investment and consumption decisions in an increasingly green economy. From a societal point of view, the importance of this topic is colossal because the methods of generating electricity release CO_2 into the atmosphere along with other greenhouse gases, which is one of the main causes of global warming (Bose, 2010). The reduction of such emissions would require the use of renewable sources, such as wind, solar, tidal energy etc.

The rest of the paper has the following structure: in the subsequent section the available literature will be reviewed in order to shed some light on the regulations that are in use at present in Europe with a detailed analysis for the UK, which will be followed by a description of power markets in general and its characteristics. Next, sample se-

lection will be discussed and the key variables will be introduced. The subsequent step is to introduce the model and the regression that will be used for two time periods separated by a decade. The last sections of this paper will introduce the results, which will be followed by a discussion.

2. LITERATURE REVIEW

2.1. LIBERALIZATION OF POWER MARKETS

Under the influence of neoliberal ideologies, the energy market began transitioning toward a capitalist framework in the late 20th century. Directives from the late 1990's set the stage for market liberalization, competition, and the introduction of new market mechanisms in the electricity sector (Parcebois, 2008). The restructuring was designed to break down monopolistic structures, encourage private investment, and introduce market dynamics to an industry traditionally under government control. Consequently, electricity prices are no longer dictated by state control but are influenced by market forces."

Despite these significant market reforms, the UK power market maintains a concentration of influence within the 'Big 6' electricity suppliers. Together, they serve a total of 72% of the market consisting of both industrial and domestic consumers. These suppliers are, in order of their market share: British Gas (18.23%), OVO Energy (15.34%), E.ON UK4 (12%), EDF Energy (10.73%), Scottish Power (9.11%), npower (6.53%) (Ofgem, 2023). Although dominant, their collective market share has seen a decrease from 2009, as a growing number of consumers have shifted to independent, emerging companies that have gained traction, particularly among environmentally conscious consumers for their commitment to renewable energy.

Before continuing, a distinction needs to be made between suppliers and producers of energy. Electricity is generated by producers and is then bought at a wholesale price by the suppliers, such as the ones mentioned above, which subsequently pay network and government policy costs and sell it for a market price to consumers.

2.2. TYPES OF REGULATIONS: OVERVIEW FOR EUROPE

In 2001, the European Commission released a Directive that pushed its members to drastically increase the share of electricity coming from RES-E from 12% to 21% by 2010 (Held & Ragwitz, 2006). Nevertheless, the member countries had different approaches towards achieving these goals.

Some of the main strategies that were implemented are the Feed-in-Tariff systems (FIT) and the Quota obligations system based on Tradable Green Certificates (TGC). The feed-in tariff system involves paying a set rate to renewable energy producers for the electricity they generate, typically differentiated based on technology and installation size (Connor et al., 2015). This system provides financial incentives to renewable energy producers, encouraging the adoption of renewable energy sources and supporting their integration into the energy market. On the other hand, the quota system mandates that energy suppliers acquire a specified quota of electricity from renewable sources to sell to consumers (Connor et al., 2014). This system creates demand for renewable energy among suppliers, compelling them to either purchase renewable energy or pay a penalty for falling short of the quota.

While the feed-in tariff system focuses on incentivizing renewable energy production through guaranteed payments, the quota system emphasizes meeting renewable ener-

gy targets through market mechanisms and penalties for non-compliance. These systems play complementary roles in driving the transition to a more sustainable energy landscape by promoting renewable energy generation and ensuring the integration of renewables into the electricity market.

The feed-in-tariff system has been particularly successful in countries like Germany, Spain, Portugal, Denmark, and various other EU nations, where it has significantly increased the utilization of renewable energy sources (Krajačić et al., 2011). The quota system is most notably implemented in the UK. The latter is the focus of this paper.

In their paper, Held & Ragwitz compared the efficiency of the FIT versus the quota system, using two main criteria: effectiveness of deployment, measured by the increase in RES-E capacity, and economic efficiency represented by competitive and decreasing costs of renewable energy generation (2006). They conclude that an FIT system is more efficient and has an overall lower cost for society than a quota system. Moreover, Lipp (2007) found evidence suggesting that the feed-in tariff (FIT) policy is more cost-effective than the quota system, indicating that the FIT system may offer better economic efficiency in incentivizing renewable energy production compared to the quota system while a study by comparing support schemes for renewable energy deployment in the UK and Germany found that the feed-in tariff reduced costs to consumers and led to larger deployment of renewable energy (Butler & Neuhoff, 2008). This suggests that the FIT system may be more effective in driving renewable energy deployment and achieving scale compared to the quota system.

However, the quota system is still being implemented. One of the drawbacks of this system will be tested in this paper. The rest of the paper will focus on the quota system for renewable energy obligations in the UK.

2.3. UK'S RENEWABLE OBLIGATION SYSTEMS

The British Government decided to take a more "market based" approach towards renewable energy policies and thus avoided the FIT systems (Toke & Lauber, 2007). In order to achieve this, the government implemented "Renewable Obligations", which mandates that electricity suppliers in the UK must procure an increasing proportion of their electricity from renewable sources or make payments for certificates instead (Canbulat et al., 2021). Since its' implementation in 2002, the quota of the percentage of electricity that must come for renewable sources has risen from 3% to a whopping 11% by 2012 and further a 49% currently (Ofgem, 2024).

Renewable Obligation Certificates (the equivalent of Tradable Green Certificates for other European countries) are issued for producers who generate electricity from renewable sources; one ROC is issue for every MWh of electricity. Subsequently, these ROCs can be bought by suppliers in the necessary quantities to prove that they met their legal obligations. The ROCs are traded on a separate market and their price is determined by a monthly auction, in which the winner is the lowest bid (Allan et al., 2011). The auction process further exemplifies why the existing system should, at least in theory, provide renewable energy at the lowest possible cost.

If electricity suppliers fail to comply or do not meet the quota, they have to compensate for the shortage of ROCs by paying a penalty, also called the "buy-out" price. The penalty is usually the price of a ROC minus 10% (Ofgem, 20024). A specific trait of the British system is that the penalties are accumulated in a buy-out fund, which is then redistributed to RES-E generators. The system of recycled penalties has received widespread criticism because it provides an incentive to keep the amount of renewable en-

ergy low and therefore drive ROC prices up in order to prevent suppliers from fulfilling their quota (Held & Ragwitz, 2006).

The Renewable Obligation scheme has been a fundamental policy tool in the UK from 2002 to 2017 (Li, Liu & Shao, 2020). It was initially designed to encourage the generation of electricity from renewable sources, however, it is closed to all new generating capacity as of April 1, 2017 (Ofgem, 2023). The scheme continues to place an obligation on electricity suppliers to present a certain number of Renewables Obligation Certificates (ROCs) to Ofgem, based on their electricity supply to customers. This means that while no new generating stations can join the RO, existing accredited stations continue to generate ROCs, and suppliers are still required to meet their obligations under the scheme for the time being. Balaman et al. found that RO are a key mechanism for providing financial support to renewable electricity sources (2019) while Connor et al. suggest that RO has significantly contributed to the growth of large-scale renewable electricity generation in the UK (2014).

The basics of the British system are described above, however several changes have been made along the years. The most notable one is the The UK's banding system, providing differentiated support levels for various renewable technologies based on their maturity and cost-effectiveness (Allan et al., 2011). This approach has aimed to ensure a balanced development of different renewable energy sources and to drive innovation in the sector (Gürkan & Langestraat, 2014).

Furthermore, the RO scheme was closed to new generating capacity in 2017, but it still applies to existing eligible renewable generators (Ofgem, 2023). The main government scheme for supporting renewable energy generation is now the Contract for Difference (CfD) scheme, which guarantees renewable energy producers a fixed price for their electricity by paying the difference if market prices are lower (UK Government, 2024).

2.4. POWER MARKETS

In order to move on to the analysis of the data set, the characteristics of power markets in general need to be examined in more detail. Three key features that describe markets for electricity will be discussed below.

First of all, a special feature of electricity is that it cannot be stored or transported and as a consequence, supply and demand have to be permanently in equilibrium (Klessmann, 2008). Consequently, market prices are fully determined by supply and demand and every factor that influences either of the two will have an impact on the price.

Second of all, demand for electricity is highly inelastic (Klessmann, 2008). This is because it would be problematic for consumers to readjust their consumption of electricity every time prices change. Also, electricity spot prices are quoted either daily or hourly and therefore it is quite likely that most consumers, especially domestic ones, are unaware of the price changes that occur.

Lastly, since electricity markets were privatized they became highly competitive. Consequently, market prices are fully determined by supply and demand; in compliance with economic theory (Xu & Nijmura, 2004). Every factor that influences either of the two will have an impact on the price.

Some of the fundamental factors that would influence electricity prices would the cost of production and fuel prices, weather conditions, temperature and seasonal effects (Girish et al, 2013). Furthermore, the level of government regulation on electricity would also impact the supply. These effects will be tested in the following sections.

3.METHODOLOGY

3.1. DETERMINANTS OF ELECTRICITY PRICES

The attributes highlighted earlier were pivotal in the development of our model. Because increases in both ROC prices and quotas change the cost structure of electricity suppliers, it is fair to assume that some of these changes will be transferred to consumers through the prices of electricity. Therefore, the model in this paper will focus on estimating how much of the variations in electricity prices are due to Renewable Obligations. For these estimates to be as valid as possible, other determinants of electricity prices that could be a potential cause for these changes need to be accounted for.

As mentioned in the preceding section, all factors that affect the supply or demand for electricity will be reflected in the prices. Of course, there are countless such factors and taking all of them into consideration would be impossible. As a result, in order to model electricity price fluctuations several of the most important factors will be incorporated. The model will consist of an OLS regression that will include the variables presented in this section.

To begin with, the attention will turn towards determinants of electricity demand. First of all, one such deterministic factor is economic health, which can be observed by indicators such as GDP growth rates. Second, as discussed by Huisman, one explanation for sudden spikes in electricity prices are changing weather conditions, especially abnormal ones (2008). It should be clear that weather affects demand since unusually high or low temperatures would increase the use of cooling or heating systems respectively by consumers, which would in turn raise the consumption of electricity and therefore the demand. One other variable that could measure weather conditions is wind speed. However, this factor is also a determinant of the supply of electricity, since more wind would benefit the production of renewable energy.

Other main determinants of supply are the raw materials that are used in the production of electricity. Electricity is mostly generated by heat energy created by burning substances such as gas or oil (Bose, 2010). Hence, natural gas and crude oil prices are the next two determinants of supply included in the model.

Last but not least, the main question of this paper, as introduced in the beginning, must not be forgotten . The regression that will be used has the role of estimating the effect of Renewable Obligations on electricity prices. Therefore, the last factors that are included in the model are those of interest. In order to quantify renewable energy regulations data has been collected on the prices of Renewable Obligations Certificates and on the yearly quota of renewable energy that is set yearly by the government. Since the obligations have to be met by suppliers and they increase their production costs, naturally, they are determinants of the supply of electricity.

3.2. DATA COLLECTION

So as to perform the regression analysis, the paper looks at data from the UK across periods: business days between 2011-2013 and 2021-2023. Since there is no existing database that includes all the variables of interest, each of them has been collected from individual sources. This section is dedicated to explaining how the dataset has been compiled.

First of all, historical daily electricity and gas prices were gathered from the Office for national statistics. for electricity, the prices are quoted in £/MWh and are calculated as

a weighted average of the half hour prices during 07:00 and 23:00 London time. Gas prices are quoted in

£/Therm (equivalent of 29.3 kwh). Second of all, the database for daily crude oil prices in Europe, quoted in $/barrel, was acquired from the official Energy Information Administration website.

Moreover, extended data from the London Weather Center can be found on online, which provides recordings of historical weather conditions. The relevant values that have been extracted from this dataset are maximum and minimum daily temperatures, as well as the average daily wind speed. The temperatures are measured in Celsius degrees whereas wind speed is in km/h. As for GDP growth rates, values were collected from www.ec.europa.eu, however they are annual (not daily) and quite stable over the 3 years of data included in the research. Because there is not enough variation in GDP growth rates, they were eventually excluded from the regression. Lastly, data about the buy-out prices and the yearly quota of renewable energy for ROCs can be found on the OFGEM website.

The final dataset used for the regression contains 744 observations for the first period, and 757 for the second period. A table of the summary statistics for each period is presented below.

Table 1. Summary statistics for the periods 2011-2013 and 2021-2023

Variable	Obs	Mean	Std. Dev.	Min	Max
2011-2013					
Electricity price (£)	744	53.59	6.93	39.13	92.72
ROC buyout price (£)	744	44.47	3.11	39.5	51.24
quota (%)	744	15.49	3.38	11.1	20.6
Gas price (£/therm)	744	61.62	5.42	50.67	72.57
Oil price ($/barrel)	744	110.46	6.90	88.69	128.14
Max daily temperature (C)	744	15.14	6.55	0	34
Min daily temperature (C)	744	7.46	4.96	-5	19
Wind speed (km/h)	744	13.09	6.07	4	90
GDP growth (%)	744	1.8	0.43	1.2	2.2
2021-2023					
Electricity price (£)	757	141.78	91.95	17.69	777.90
ROC buyout price (£)	757	53.46	3.33	50.05	59.01
quota (%)	757	48.42	1.04	46.90	49.20
Gas price(£/therm)	757	142.36	89.50	12.60	536.93
Oil price ($/barrel)	757	84.74	15.74	50.37	133.18
Max daily temperature (C)	757	15.72	6.69	-1.20	39.10
Min daily temperature (C)	757	8.43	5.28	-5.10	21.10
Wind speed (km/h)	757	4.68	2.62	0.00	15.10
GDP growth (%)	757	4.38	3.51	0.10	8.70

Straight away, we can observe some distinctions. The first period shows more variability in the quota obligations and the buyout price, so our predictions might be clearer there.

3.3. THE MODEL

By now, there is sufficient theoretical background as well as empirical data in order to proceed with introducing the OLS regression that will give the estimates on how changes in renewable energy regulations affect electricity prices, and therefore will measure the impact they have on consumers.

To begin with, new variables were generated as the natural logarithms (log) of each set of prices respectively. This is necessary since the prices for electricity, gas, oil and ROCs are measured in different units. Also, by doing this the coefficients on the new variables will represent percentage changes as opposed to unit changes which are more relevant when it comes to prices in general. As a result, the regression will consist of the log of electricity price as the dependent variable and will have as regressors variables that describe the Renewable Obligations, such as the log of ROC price and the quota and other relevant control variables such as the log of the gas and oil price, wind and temperature.

Because oil and gas are used in the generation of electricity and take part in the production costs, an increase in their prices should also drive up the electricity price. Hence, a positive relationship is expected between them. As for the wind, the effect is ambiguous and would be difficult to predict since it affects both the demand and the supply of electricity. Furthermore, in order to introduce temperature in the regression, two different methods have been used, both of which will be discussed below. Consequently, two main regressions were carried out; their effectiveness is discussed in the next section.

For the first regression, an assumption is made that the electricity prices depend on temperatures differently conditional on the season. As a result, 3 separate dummy variables were created for winter, summer and spring. Thus, the final form of the regression is:

$$\boldsymbol{lpel} = \beta_0 + \beta_1 * lproc + \beta_2 * quota + \beta_3 * lpgas + \beta_4 * lpoil + \beta_5 * wind + \\ + \beta_6 * winter + \beta_7 * summer + \beta_8 * spring + \varepsilon \quad (1)$$

For the second regression, a new variable for temperature (t) was created. In order to clarify how t was defined, an additional assumption needs to be made, that spikes in prices

occur when temperatures reach extreme values. This assumption is plausible because increasing the quantity of electricity in a day enough to have an effect on the price would imply temperatures whose difference from the average in the corresponding periods are large. Therefore, the variable for temperature was defined as the minimum daily temperature for autumn and winter months and the maximum daily temperature for spring and summer months (March to August).

Furthermore, as explained above, low minimums and high maximums would impact the prices more than values that are closer to the average. This implies a dependence of electricity prices on the variable for temperature that could be described by a parabolic shape with a minimum point. Hence, it is safe to assume a quadratic relationship between the two, which will be included in the regression accordingly. So, the second regression will have the following form:

$$\boldsymbol{lpel} = \beta_0 + \beta_1 * lproc + \beta_2 * quota + \beta_3 * lpgas + \beta_4 * lpoil + \beta_5 * wind + \\ + \beta_6 * t + \beta_7 * t^2 + \varepsilon \quad (2)$$

The methodology will be implemented for two time periods : 2011-2013 and 2021-2023. The period 2011-2013 was selected to ensure the Renewable Obligation (RO) scheme had reached a level of maturity, thereby avoiding fluctuations associated with its initial implementation. Additionally, technology banding was introduced in 2009, so we chose a time period after this introduction so as to analyze the system under consistent regulatory conditions for both timeframes. The second period, 2021-2023, was chosen as it provides the most recent data, enabling us to determine if the observed trends persist as the UK transitions to Contracts for Difference (CfDs). In each of the four cases (2 time periods with two regressions each) we will be testing whether the coefficients on the quota level and the buy-out-price of TGFs are significant. By examining these coefficients, we aim to address our primary question: whether more stringent renewable energy obligations lead to an increase in electricity prices.

4. RESULTS

To proceed with the findings, the results will be analyzed for the two time periods separately, followed by a comparison of the findings.

4.1. RESULTS FOR THE PERIOD 2011-2013

The results of the regressions for the 2011-2013 period are summarized in Table 3 below. The 5% significance of each coefficient is signaled by the "*" sign. As we can see, in regression

(1) with the dummy variables for season, all coefficients on the control variables are significant. In contrast, for regression (2) in which the variable t was used for temperature , the coefficient on the log of oil price was not found significant.

Moreover, the coefficient on the price of gas is positive and significant for all regressions so an increase in gas prices will increase electricity prices, as expected. Furthermore, there seems to be a negative relationship between oil and electricity prices in regression (1). Additionally, the coefficient on the variable wind is negative and significant in all three cases which means that the shift in supply caused by increased wind speed outweighs the shift in demand. As for weather conditions, we observe positive coefficients on the dummy variables, which means that the impact on electricity prices is higher in winter, summer and spring than it is in autumn. For regression (2), we found significant effects of both t and t^2, with a positive coefficient on t^2, which indeed infers a parabolic dependence with a minimum, as predicted.

Because of the insensitivity of regression (1) towards the actual values for temperatures, this simplistic approach seems slightly inferior to the other method. A quadratic relationship between the extreme daily temperatures (maximums or minimums) and the electricity prices appears to be a more plausible description of reality.

Table 2. Regression results for the period 2011-2013

Variable	Coefficient	Std. Error	t-value	P-value	95% CI Lower	95% CI Upper
Regression (1)						
constant	0.243	0.455	0.53	0.594	-0.65	1.136
ln of gas price (lpgas)	0.855	0.072	11.91	0.000*	0.714	0.996
ln of oil price (lpoil)	-0.15	0.066	-2.26	0.024*	-0.280	-0.020
ln of ROC buyout price (lproc)	0.258	0.070	3.69	0.000*	0.121	0.395
Quota	-0.003	0.002	-1.48	0.139	-0.007	0.001
Wind	-0.004	0.001	-5.89	0.000*	-0.005	-0.002

Variable	Coefficient	Std. Error	t-value	P-value	95% CI Lower	95% CI Upper
spring	0.065	0.012	5.46	0.000*	0.041	0.089
summer	0.037	0.014	2.64	0.009*	0.010	0.065
winter	0.028	0.011	2.47	0.014*	0.006	0.050
Regression (2)						
constant	-1.687	0.443	-0.38	0.703	-1.038	0.701
ln of gas price (lpgas)	0.663	0.068	9.80	0.000*	0.530	0.795
ln of oil price (lpoil)	-0.024	0.670	-0.37	0.715	-0.156	0.107
ln of ROC buyout price (lproc)	0.415	0.070	5.95	0.000*	0.278	0.552
Quota	0.002	0.002	1.10	0.271	-0.017	0.006
Wind	-0.003	0.001	-5.40	0.000*	-0.005	-0.002
Temperature (t)	-0.005	0.002	-3.65	0.000*	-0.008	-0.003
Temperature squared (tsquared)	0.0002	0.0001	2.89	0.004*	0.0001	0.0003

More specifically, according to the result, the biggest impact on the price occurs during spring months, which is in violation of the assumption that prices are affected when temperatures reach abnormal values; this is more likely to happen in summer or winter than in spring. Since regression 2 seems to presents what appears to be an accurate relationship between temperature and prices, it will be used for the interpretation of results in the rest of the paper.

Finally, we can turn our attention towards the estimations for the variables of interest: the log of ROC price and the quota. As we can observe from the regression results, the hypothesis, the coefficient on the log of the ROC price (lproc in the table 2, regression (2)) is approximately

0.417. Because logarithms were used, the meaning is that a 1% increase in the price of ROCs leads to a 0.417% increase in the piece of electricity. In other words, almost half of the extra costs incurred by a rise in the certificate prices is transferred to electricity prices and therefore incurred by consumers instead of suppliers. The effect is quite large and should at least raise some suspicion towards the efficiency and the cost-effectiveness of the British Renewable Obligations system.

4.2 RESULTS FOR THE PERIOD 2021-2023

In the previous section, we concluded that regression 2 is more valid for our experimental design, hence it is the only one that we have run for this section. Furthermore, since GDP fluctuations have been unusually high in the time period studied, we have added a GDP factor in the regression. The results are in table 3 below.

Table 3. Results of the regressions for the period 2021-2023

Variable	Coefficient	Std Error	t-value	P-value	95% CI Lower	95% CI Upper
constant	1.787	2.579	0.693	0.488	-3.275	6.850
ln of gas price (lpgas)	0.725*	0.023	31.280	<0.001	0.680	0.771
ln of oil price (lpoil)	0.127	0.080	1.599	0.110	-0.029	0.283
ln of ROC buyout price (lproc)	-0.797	0.472	-1.689	0.092	-1.723	0.129
Quota	0.050*	0.019	2.607	0.009	0.012	0.088
GDP growth	-0.010	0.007	-1.544	0.123	-0.023	0.003
Wind	-0.034*	0.004	-8.593	<0.001	-0.042	-0.026
Temperature (t)	-0.020*	0.004	-4.872	<0.001	-0.028	-0.012
Temperature squared(tsquared)	0.001*	0.000	5.376	<0.001	0.000	0.001

Similarly to the previous period analyzed, We see that the price of gas remains a significant predictor with a strong positive coefficient. Furthermore, the direction of the effects of wind and temperature are also maintained compared to the first period, while the crude oil price shows some positive influence but is not statistically significant.

Contrarily to the previous analysis, in this case the coefficient on the buy-out price of TGS is not significant, however the positive effect of more stringent regulations on electricity process is still observable through the coefficient on the 'quota' variable, which is significant at the 5% level.

5. DISCUSSION

The relevance of this research lies in its direct engagement with the complex question of how policy instruments, specifically renewable energy obligations, impact electricity pricing - a matter of significant importance to economic stability, environmental sustainability, and social welfare. As nations globally grapple with the challenges of transitioning to renewable energy, understanding the economic implications of such policies is critical. This study is particularly relevant in the context of growing concerns about climate change and the pressing need to reduce carbon emissions. By analyzing the financial outcomes associated with renewable energy policies, the research helps illuminate the path to a low-carbon future, highlighting the potential economic hurdles and enabling better-informed decisions.

This study builds upon existing research by providing a detailed empirical analysis of how Renewable Obligations impact electricity prices in the UK. While previous studies have focused on the general advantages and disadvantages of renewable energy policies, our research examines the temporal effects of policy adjustments over two distinct periods. By taking the periods ten years apart, we demonstrate the evolving influence of renewable energy policies on market prices and consumer costs. This analysis underscores the importance of continuously updating policy frameworks to adapt to changing market conditions and technological advancements.

As regulations impose that electricity needs to be generated from both conventional and renewable sources and the latter can be assured by purchasing ROCs, it is clear that the two markets are linked. Therefore, it makes sense that price changes in one market would induce the same in the other. In order to understand the effect that the ROC market has on electricity prices, two defining characteristics for every market will

be investigated: quantity and price. In the UK, the quantity of ROC that each suppliers needs to purchase is expressed by the quota and is set by the government. Afterward, the price is set by the market. In our analysis of the first period (2011-2013) we can observe that changes in the quota do not affect electricity prices significantly, contrary to ROC prices, which have a sizeable impact, illustrating the cost burden of renewable obligations on consumers. Contrarily, the opposite is seen for the second period (2021-2023), with quotas having a significant effect, demonstrating that stringent renewable energy regulations still contribute to higher electricity prices.. The findings could be due to the fact that the ROC prices had a much smaller variation in the second period, which was not enough to study the effects on electricity prices on it. Also, we must keep in mind that the quota level and the buy-out-price tend to increase together as the government urges suppliers of electricity in the direction of renewable energy; therefore the positive effect of stricter regulation on electricity prices might be captured by one or the other.

Furthermore, the results from the analysis of the 2011-2013 and 2021-2023 periods provide valuable insights into the factors influencing electricity prices in the UK. For the 2011-2013 period, gas prices consistently show a significant positive impact on electricity prices, indicating that increases in gas prices directly drive up electricity costs. Wind speeds, conversely, exhibit a significant negative effect, suggesting that higher wind speeds, which enhance wind power generation, help to reduce electricity prices by increasing supply. The quadratic relationship between temperature extremes and electricity prices further emphasizes that both very high and very low temperatures lead to price spikes, highlighting the importance of weather conditions. In the 2021-2023 period, the positive relationship between gas prices and electricity costs remains significant, reinforcing the pivotal role of gas prices in the energy market. Although the oil price shows a positive influence, it is not statistically significant in this period, indicating some variability in its impact over time. Wind speed continues to have a significant negative effect on electricity prices, consistent with the earlier period.

These findings underscore the complex interplay of multiple factors, including gas prices, wind, temperature variations, and renewable energy policies, in shaping electricity prices over time. Policymakers must consider these dynamics to strike a balance between advancing renewable energy objectives and managing electricity costs for consumers.

Lastly, we must mention that the years 2021-2023 were far from typical. Following the COVID- 19 pandemic's profound impact on global energy markets, there was a mix of factors that disrupted energy supply chains and affected electricity prices. Numerous publications have documented how the pandemic led to significant volatility in energy prices due to supply chain disruptions, changes in consumption patterns, and a shift towards renewable energy sources as part of a green recovery effort. The International Energy Agency (IEA) reported that global energy demand dropped significantly, with electricity consumption falling sharply during lockdowns (2020). Gollakota and Shu (2022) noted that the pandemic resulted in a steep drop in oil prices and an imbalance in energy demand due to restricted travel and reduced industrial activity. However, they also observed that renewable energy systems maintained or even increased their output, underscoring the resilience of renewables during the crisis. This shift in investor mindset from conventional fuels to renewable energy was also highlighted, suggesting a potential long-term impact on energy markets (Gollakota & Shu, 2022).

Moreover, the conflict in Ukraine, which began in 2022, led to unprecedented spikes in energy prices, particularly in Europe. The war significantly impacted the availability and cost of natural gas, a key input in electricity generation, due to sanctions and reduced gas flows from Russia to European countries. This situation likely compounded the usual market forces, however there are still no final data on the full impact of the war in Ukraine.

Such extraordinary circumstances must be taken into account when interpreting the regression results from the second period, as they may reflect the unique and extreme market conditions of that time rather than the typical influence of renewable energy obligations on electricity prices. Thus, the lack of significance in some explanatory variables could also be attributed to the unusually high fluctuation of electricity prices during this period.

6. CONCLUSION

Electricity generation is an essential cause of pollution and global warming. A possible remedy for the present situation is the use of renewable sources, which in most European countries is regulated by the government. In the United Kingdom, the approach in use is the Renewable Obligations system, which consist of two parts: a quota imposed on supplier set by the British Government that concerns the quantity of electricity generated from RES-E and Renewable Obligations Certificates that attest the fulfillment of obligations; these certificates are traded on a separate market.

This research marks a step forward in the empirical examination of renewable energy policies and their economic ramifications. It calls for ongoing analysis to refine our understanding and ensure that the pursuit of environmental objectives is accompanied by sound economic outcomes for all stakeholders.

The paper gave an analysis on the impact of renewable energy regulations on fluctuating electricity prices in the UK. The question was answered by creating a dataset prices for the years 2011-2013 and 2021-2023 with the quotas and the prices of ROCs along with observations on four other variables that could potentially explain changes in electricity prices. Subsequently, a regression was performed using OLS with electricity prices as the dependent variable and the above factors as regressors.

The results for the first period showed that the yearly quota does not significantly affect electricity prices. In contrast, a relationship was found between ROC and the dependent variable, mainly a 1% increase in the former leads to close to half percent increase in the latter.

The opposite was found in our analysis of the second period. Our cumulated work leads us to believe that there is definitely and effect between renewable energy regulations and electricity prices. Furthermore, a consistent observation across both periods is the statistical significance of certain factors—namely the price of gas, daily wind values and extreme temperature events—which have demonstrated a steadfast influence on electricity prices. The persistence of these factors as significant predictors suggests their potential as key indicators in forecasting electricity price trends.

In addition to examining the impacts of Renewable Obligations on electricity prices, this study contributes to broader economic theory and policy discussions by providing insights into how renewable energy regulations can influence market dynamics and consumer costs. The findings of this study can inform future policy decisions, particularly in designing more effective and equitable renewable energy support mechanisms.

Overall, this research underscores the need for ongoing policy refinement to balance the goals of environmental sustainability, economic efficiency, and consumer protection. By continuously monitoring and adapting renewable energy policies, the UK can ensure a smooth and equitable transition to a low-carbon future.

Overall, our findings indicate that the existing Renewable Obligation (RO) system, which includes a market for Tradable Green Certificates, might not be optimal. The analysis suggests that this mechanism may not be the most effective solution for advancing the UK's renewable energy goals. In response to these challenges and in pursuit of more efficient and targeted renewable energy support, the UK is in the process of transitioning towards a different system. A significant step forward in this transition is the increasing reliance on Contracts for Difference (CfDs). This system aims to provide more stable and predictable incentives for renewable energy production.

The UK's ongoing transition from the Renewable Obligation (RO) system to Contracts for Difference (CfDs) underscores the importance of our findings. The observed inefficiencies and significant consumer cost impacts associated with ROC prices highlight the need for a more stable support mechanism. CfDs, which offer fixed-price contracts to renewable energy generators, aim to mitigate the price volatility and market uncertainties that were prevalent under the RO system. Our results, demonstrating the substantial impact of ROC prices on electricity costs, provide empirical support for this policy shift. By protecting developers from volatile wholesale prices and shielding consumers from fluctuating certificate prices, CfDs can promote a more efficient and equitable integration of renewable energy into the market. Thus, our study not only informs current policy decisions but also reinforces the strategic direction towards CfDs as a means to enhance the economic viability and sustainability of the UK.

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CHALLENGES TO GLOBAL MONETARY AND FINANCIAL STABILITY

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ABSTRACT
Central banks have undertaken one of the most significant and synchronized global monetary policy tightening in their recent history. Tightening monetary policy primarily meant raising interest rates, reducing the money supply, and other measures to control inflation and stabilize the economy. While the downward trend in inflation is positive, lower inflation does not mean low inflation. In most countries, inflation remains above central bank targets but is expected to continue to decline. Financial forecasters believe that the central bank's inflation targets will be reached by mid-2025 since monetary policy works with lags. However, the current state of monetary and financial stability is shaped by a complex interplay of factors, including high inflation, geopolitical risks, banking sector vulnerabilities, debt sustainability, and climate-related risks as well as the challenges posed by tighter monetary and financial conditions. Examining challenges to global monetary and financial stability requires a systematic and multidisciplinary approach based on economic, political and international relations. In this paper, the research strategy encompasses a comprehensive literature review to understand the theoretical underpinnings and historical context of global financial stability, monitoring global economic trends, policy development and implementation, investigating geopolitical risks as well as assessment of financial risks from climate change. The research aims to understand the complexity and dynamics of the challenges facing global monetary and financial stability and contribute to the formulation of effective strategies to mitigate these risks.

Key words: *central banks, inflation, monetary stability, monetary policy, financial crises, financial stability, sovereign debt*

1. INTRODUCTION

Recent geopolitical and economic developments have once again focused on the phenomenon of inflation, which proved to be an inevitable result of market disruptions caused by the pandemic crisis, and subsequent conflict in Ukraine. These circumstances are having a significant impact on the global economy, trade, and finance. Along with these movements, geopolitical shifts are taking place in the form of the strengthening of the economic position of Asian countries, primarily China, reflected in the appreciating value of the Chinese currency, the yuan. The changing monetary landscape, which includes the current global currency system, exchange rate fluctuations,

and macroeconomic trends, is posing new challenges for the development of monetary policies. To navigate this dynamic environment, it is necessary to implement modified monetary policy instruments and closely monitor the functioning of macroeconomic mechanisms.

The financial globalization has been observed to contribute to a heightened frequency of financial crises, thereby presenting a new challenge in the maintenance of financial stability and its impact on overall macroeconomic stability. Financial stability is reflected in the smooth functioning of all segments of the financial system, risk assessment and management, as well as in the system's resistance to sudden shocks. A well-organized financial system plays a pivotal role in directing economic growth and fostering social prosperity through the efficient allocation of financial resources. Geopolitical tensions shape global dynamics, with conflicts and rivalries impacting trade, investment, and regional stability.

Many countries around the world have enacted state policies in response to market shocks, which typically involve a combination of macroeconomic measures such as monetary and fiscal policies to mitigate the repercussions of the crisis. In light of these challenges, central banks in developed nations have implemented a range of unconventional monetary tools to bolster weakening economic conditions. The global financial crisis has prompted the evolution of novel policies and strategies, as well as enhanced communication channels of monetary authorities. However, the widespread adoption of these unconventional measures also presents critical challenges, as their practical implications have not been comprehensively studied thus far.

The unconventional monetary policy measures implemented by major central banks in response to the global pandemic crisis were intended to stimulate the sluggish economy and combat deflationary pressures. Central banks injected substantial amounts of liquidity into financial markets, yet the anticipated economic revitalization did not manifest immediately. This delay in the transmission of monetary policy can be attributed to the complexity of the mechanism, necessitating a prolonged period for the full impact to materialize. Research has underscored concerns that prolonged loose monetary policy could potentially sow the seeds of financial instability.

A concerted effort comprising both fiscal and monetary stimulus measures was orchestrated to revive the global economy, prompting apprehensions regarding the inflationary consequences of unprecedented money supply expansion. The current increase in inflation, which is thought to be temporary, has been attributed to various factors including intent consumer demand, disruptions in the supply chain, rising energy costs, and increased prices of manufactured goods. However, lingering uncertainties persisted as to whether the inflation surge stemmed from short-term imbalances or prolonged monetary excess. Global policy interventions, primarily involving monetary and fiscal measures, have led to the expected inflationary path commonly seen during post-crisis recovery periods, promoting a stronger economic rebound. Inflationary pressures, unfolding gradually in the aftermath of the crisis, acquired a new dimension amidst geopolitical tensions between Ukraine and Russia. The escalating inflationary environment prompted analysis of Keynesian theories regarding inflation mechanisms, such as the cost-push and supply shock theories. The inflation developments observed in the aftermath of the crisis highlighted the significance of increased input costs in driving inflationary pressures (Dastgerdi, 2020).

The intersection of elevated inflation rates and geopolitical turmoil has resulted in un-

anticipated economic outcomes, necessitating central banks to implement corrective strategies in the immediate term. This has entailed the escalation of benchmark interest rates to their peak levels in the preceding 25 years, intending to curb inflation and return it to the desired range of around 2%. The principal aim of these efforts is to uphold monetary stability and instill trust in the currency, marking the onset of a new phase of complexities and vulnerabilities for the worldwide financial framework.

The shifts in monetary policy have the potential to introduce uncertainty and heightened volatility in financial markets, impacting investment decisions and creating unstable market conditions. These factors can exert pressure on government budgets and debt levels, increase the risk of loan defaults, elevate the likelihood of a recession, raise unemployment rates, and facilitate global spillovers. The current landscape of monetary and financial stability is influenced by a multitude of factors, encompassing high inflation, geopolitical uncertainties, vulnerabilities within the banking sector, sustainability of debt levels, climate-related risks, and the challenges of tighter monetary and financial conditions. Political uncertainties and growing structural obstacles for banks have implications for the entire financial system. The strategy of this research includes a comprehensive literature review to understand the theoretical foundations and historical context of global financial stability, monitoring of global economic trends, policy development and implementation, research on geopolitical risks, as well as assessment of financial risks from climate change. The goal of the research is to understand the complexity and dynamics of the challenges facing global monetary and financial stability and to contribute to the formulation of effective strategies to mitigate these risks.

2. METHODOLOGY

The study of challenges to global monetary and financial stability requires a systematic and interdisciplinary approach drawing from the fields of economics, politics and international relations. The research strategy of this article includes a thorough literature review of theoretical foundations and historical context of global financial stability, monitoring global economic trends, policy development and implementation, examining geopolitical risks, and assessing financial risks from climate change. The results of this study will contribute to a better understanding of the complex dynamics affecting global monetary and financial stability.

2.1. THEORETICAL REVIEW OF MONETARY AND FINANCIAL STABILITY

Theoretical and empirical research on financial system stability is focused on identifying measures and instruments that can maintain the stability of the entire financial system. This research primarily encompasses the examination of non-traditional monetary policy instruments, whose efficacy has been demonstrated in addressing market and banking imbalances. The stability and growth of the national economy are heavily reliant on the solvency, liquidity, and crisis management capabilities of the financial sector (Topić - Pavković et al., 2023). Key measures such as low inflation and macroprudential supervision of the banking sector play a crucial role in mitigating financial imbalances and systemic risk, thus underscoring the significant impact of monetary and financial stability on overall macroeconomic stability. With the growing complexity of financial systems, there is a greater interconnectedness between monetary and financial stability. The maintenance of monetary stability, which is achieved through the effective implementation of monetary policy, plays a crucial role in reducing the likelihood of financial instability. At the same time, financial stability contributes to

macroeconomic stability, thus enabling the efficient execution of monetary policy. The correlation between these factors highlights the significance of upholding both monetary and financial stability in safeguarding overall economic stability.

In the traditional sense, monetary stability is characterized by low, stable, and predictable inflation rates, as well as confidence in the local currency. Financial stability, on the other hand, denotes a robust financial system where banks and other financial institutions operate efficiently and responsibly manage their clients' funds. In periods of steady economic growth devoid of market disturbances, monetary policy serves as an effective tool for macroeconomic stabilization, while fiscal policy focuses on addressing medium-term growth and efficiency issues. The primary objective of most central banks is to uphold price stability, typically manifested through the maintenance of low and stable inflation levels using standard monetary policy instruments. Common tools utilized for this purpose include open market operations and the management of short-term interest rates. Academic researchers, including Ayuso and Repullo (2003), Bindseil and Nyborg (2008), Blanchard et al. (2014), Sellin and Sommar (2014), Mastilo et al., (2021) have emphasized the significance of utilizing these strategies to reach liquidity and inflation control goals.

Research conducted during the COVID-19 crisis has revealed that central banks have adopted varying measures to navigate the evolving market conditions, with the distribution of liquidity by financial institutions resulting in heightened competition and increased costs for accessing liquidity. A key inquiry in the realm of monetary and financial stability research pertains to the potential risks associated with prolonged loose monetary policies, which some scholars and policymakers attribute to exacerbating financial fragility and precipitating financial crises.

Unlike conventional monetary policy approaches, unconventional measures have been devised to target long-term risk-free rates, liquidity provision, and credit spreads to reinforce the effectiveness of the monetary policy transmission mechanism and promote financial stability. Strategies adopted by central banks in response to the global financial crisis encompassed the introduction of innovative policy instruments and adjustments to existing monetary policy frameworks, including the implementation of credit operations, negative interest rate policies, forward guidance, and asset purchase programs. Quantitative easing is the most obvious unconventional instrument of monetary policy. This measure became widely used in response to the mitigation of the 2008 crisis. In contrast to conventional monetary policy, unconventional measures were aimed at something other than short-term interest rates, which included: reduction deadlines (or, equivalently, long-term risk-free rates); liquidity spreads and credits (or, equivalently, interest rates on various risk-free instruments); financial stability to support the monetary policy transmission mechanism (Bindseil, 2016). The tightening of monetary policy in one country, especially a major economy like the United States, can have global repercussions. It can lead to capital outflows and financial market volatility in emerging markets and other economies. This is often due to the increased attractiveness of higher-yielding assets in the country implementing the tightening.

The global financial crisis highlighted the crucial importance of financial stability, placing it as a top priority above other instruments and objectives of economic policy. Financial crises, often originating from banking crises, are deemed controllable and subject to regulation by central banks. In contrast, monetary policy can play a crucial role during crises by bolstering liquidity through actions such as granting bank loans, reducing reserve requirements, and lowering reference interest rates. These measures

can enhance public confidence and significantly contribute to the fortification of macroeconomic stability (Topić - Pavković, 2015).

According to Gjedrem (2005), financial stability is achieved when households and businesses can make optimal decisions between consumption and investment within a well-operating financial system. This system acts as an intermediary between lenders and borrowers, effectively redistributing risks and optimizing the allocation of economic resources over time. A stable financial system facilitates the efficient allocation of economic resources, determines prices, and manages financial risks. It is adept at fulfilling these functions even in the face of external shocks and imbalances (Schinasi, 2006). Contrarily, Ferguson (2003) proposes that it is more feasible to define financial instability rather than stability.

The stability of the banking system is particularly crucial in periods of steady economic growth and is even more vital for transitioning economies. The relationship between the banking sector and broader macroeconomic stability is commonly utilized by researchers to define banking stability, given the sector's substantial impact on the overall economy. Banks play a critical role as financial intermediaries, resulting in other sectors being highly dependent on the banking system, thus highlighting its significance to the economy. A stable and healthy banking sector, in conjunction with the balance of public finances, can contribute to the stability and growth of the entire economic system. The stability of the banking i.e. financial sector contrasts with the banks' expansionary credit policy. The capitalization ratio is an indicator that provides information on the ratio of capital to bank assets. The higher the capital-to-assets ratio, the more restrictive the banking system is in lending. In this way, capital regulation plays an important role in increasing the stability of the financial system (Craig & Koepke, 2012). There has been a notable amount of research in the literature on the correlation between financial stability of the banking system and the relationship between capital, bank assets, and performance in the real economy (Bloom, 1999; Diamond & Rajan, 2002; Kopecky & VanHoose, 2006; Hakenes & Schnabel, 2011; Fratzscher et al, 2016; Gorton & Winton, 2017; Agenor & Pereira da Silva, 2021).

Two distinct models of financial systems are identified in developed market economies based on who plays the main role in financing firms: market-based and bank-based financial systems. This classification approach is known as the classical dichotomy (Veysov & Stolbov, 2012). In the early stages of economic development, banks are believed to hold an advantage over the securities market when the institutional environment lacks the efficiency to support securities market activities (Grbić & Jovanović, 2020).

In their empirical study, Grimm et al. (2023) examine the impact of excessively loose monetary policy on financial instability. They are investigating potential mechanisms through which accommodative monetary policy leads to increased financial fragility, with a focus on the credit market and asset prices. The results indicate that loose monetary policy has significant implications for medium-term financial instability. Using instrumental variables, results show, that a 1 percentage point reduction in policy over 5 years is associated with a 5.5 percentage point increase in the probability of a financial crisis in the next 5 to 7 years and a 15.5 percentage point increase in the next 7 to 9 years. Given the unconditional probability of experiencing a crisis within 3 years at 10.5%, these effects are significant. Additionally, the results remain consistent across alternative measures of stance and definitions of financial stability. The study highlights a connection between monetary policy conduct, financial fragility, and real eco-

nomic activity, supporting the existing literature on growth risks (Adrian et al., 2019; Adrian et al., 2022). This suggests that an overly accommodative monetary policy stance contributes to financial instability in the medium term.

The preservation of financial stability is a crucial economic objective due to the well-documented macroeconomic disruptions and significant economic and social costs associated with financial crises. The growing importance and highlighted role of financial stability as the primary focus of monetary policy in the contemporary global economic scene is evident in a multitude of recent studies. Notably, the approach to financial stability entails a thorough analysis by monetary policymakers to identify and mitigate any factors that may jeopardize financial stability. This approach typically encompasses two dimensions: a micro dimension, which assesses risks at the level of individual financial institutions, and a macro dimension, which evaluates risks from the perspective of the entire financial system (Grubišić & Galić, 2011). The objective of this two-dimensional approach is to accurately evaluate systemic risk, defined as the risk that issues of illiquidity or insolvency within a single institution propagate throughout the entire system (Fabris and Galić, 2009).

There is an ongoing debate regarding the potential consequences of tightening monetary policy, with some arguing that moderation or cessation of such measures may be necessary to avoid a recession and mitigate increases in unemployment. Central banks primarily rely on creating economic slack, particularly in labor markets, to curb inflationary pressures. However, given the current high level of uncertainty, the prospect of effectively fine-tuning monetary policy to reduce inflation without triggering a recession is deemed unrealistic. The European Central Bank (ECB) acknowledges the challenges associated with this dilemma (Lane, 2023; Schnabel, 2023), suggesting that policies aimed at reducing demand pressure could complement monetary efforts to restore price stability. This approach would lessen the extent of monetary tightening required and minimize the risks to financial stability posed by abrupt shifts in monetary stance (Gern et al., 2023).

Tightening monetary and financial conditions typically occur in response to inflation management, currency stabilization, or addressing economic imbalances. Heightened interest rates raise the cost of borrowing, potentially leading businesses to scale back investment in essential areas such as infrastructure, technology, and expansion initiatives. Consequently, reduced investment could impede economic growth, as consumers may also curtail spending. Excessive or rapid tightening of monetary policy has the potential to significantly dampen economic activity, possibly resulting in a recession - especially if the economy is already fragile or facing multiple simultaneous shocks. Rising capital costs and weakened demand may prompt businesses to reduce hiring or implement layoffs to maintain profitability, contributing to elevated unemployment rates and broader societal and economic repercussions. Furthermore, escalating interest rates can squeeze the profit margins of banks and other financial institutions, particularly those heavily invested in fixed-income assets whose value diminishes as interest rates climb. Additionally, higher interest rates increase the burden of servicing government debt, potentially pushing countries with substantial debt levels toward higher fiscal deficits. This may require reductions in public spending or increases in taxes, potentially exacerbating the downturn in economic activity.

The rise in servicing costs for debt has the potential to pose challenges for both individuals and businesses in meeting their loan obligations. This situation could result in an upsurge in default rates, thereby exposing financial institutions to risks and potentially

jeopardizing the stability of the financial system. Consequent to tighter monetary conditions, there could be a decline in asset values, encompassing stocks and real estate, as investors adjust their expectations for growth and returns. This devaluation of assets could lead to a reduction in household wealth, a decrease in consumer confidence, and a hindrance to consumer spending. Emerging markets, in particular, are vulnerable to the effects of tight financial conditions in major economies such as the United States. Increased interest rates in developed countries may cause capital to flow out of emerging markets as investors seek higher returns, leading to currency devaluation and inflation in these regions (Topić - Pavković and Šoja, 2023).

2.2. INSIGHT INTO GLOBAL GEOPOLITICAL AND ECONOMIC TRENDS

Geopolitical tensions and turbulence are currently unprecedented, with problematic political, war, and economic hotspots emerging worldwide. This situation has a detrimental impact on economic growth, leading to increased uncertainty that manifests in financial market instability, disrupted supply chains, fluctuating oil prices, and rising costs of various products. The global pandemic, the conflict in Ukraine, the turmoil in the Middle East, sporadic terrorist attacks, and uncertain global forecasts have heightened global geopolitical risks. This has raised concerns among investors, market participants, and policymakers that conflicts and adverse geopolitical events could hinder global economic growth and exacerbate inflation.

In a study by Caldara and Iacoviello (2022) and Caldara et al. (2023) based on a unique dataset of historical macroeconomic data spanning back to 1900 for 44 economies, it was found that geopolitical risks are strongly associated with high inflation. The impact of these risks on inflation varied across countries and historical periods. The rise in inflation was accompanied by reduced economic activity, increased military spending, higher public debt, money growth, supply disruptions, and a decline in international trade. Geopolitical risks were also linked to heightened uncertainty surrounding inflation and the potential for a significant increase in inflation. These studies revealed that increased commodity prices and currency depreciation have a greater influence on inflation compared to the deflationary effects caused by reduced consumer sentiment and tighter financial conditions. This underscores the complex interplay between geopolitical risks and economic outcomes, highlighting the need for policymakers to consider these factors when making decisions related to inflation and economic stability.

In the shaping of international economic conditions, uncertain geopolitical events play an increasingly important role, often acting as triggers for substantial fluctuations in markets and economies on a worldwide scale. Given the complex interplay of supply, demand, and policy forces that can influence inflation in various directions, geopolitics have the potential to disrupt international trade, flows of goods and capital, global supply chains, and prompt spikes in commodity prices - factors that could contribute to inflationary pressures. Discussing the demand side, unpredictable geopolitical events have the potential to restrict financial conditions, undermine the confidence of investors and consumers, and lead to inflationary pressures too. Geopolitical crises play a significant role in influencing the decision-making of central banks regarding monetary policy adjustments. Depending on the prevailing economic conditions and policy objectives, central banks may opt to either tighten or ease monetary policy in response to geopolitical crises. This can result in increased government debt as a consequence of heightened spending and targeted fiscal support measures.

Current geopolitical and global economic trends are continuously changing, influenced

by a range of factors such as political choices, economic progress, technological innovations, and societal shifts. Understanding these trends requires ongoing analysis and adaptation to navigate the complexities of the global economic and geopolitical landscape. In order to respond to these changes, governments, businesses, and international organizations are required to adjust through strategic planning, policy development, and collaboration at the international level.

Many countries are currently grappling with escalated levels of inflation as a result of a combination of supply chain bottlenecks, escalating energy costs, and a surge in demand driven by economic recovery efforts. This situation has placed central banks in a position of scrutiny as they are tasked with determining whether the inflationary pressures being experienced are short-term in nature or have deeper, long-lasting roots, thereby impacting global monetary policy decisions. The International Monetary Fund is projecting a moderate global economic growth rate of around 3.1% for 2024. However, inflation continues to be a significant concern, with global inflation expected to decrease to 5.8% in 2024, although there are significant regional variations (IMF, 2024). In emerging markets, inflation is significantly high, contributing to economic challenges in those areas. Geopolitical crises may prompt central banks to modify their monetary policy in response to current economic conditions and goals, such as tightening or loosening it. Moreover, research appraisals of global risks have indicated a discernible likelihood of global GDP growth trailing below parity due to the advent of tighter monetary policies (Bremmer and Kupchan, 2024). Additionally, these crises can result in elevated government debt as a consequence of increased spending and specific fiscal aid efforts.

The increase in global debt levels has become a prominent trend in recent years, driven by various factors and carrying significant implications for economic stability and policy development. In response to crises such as the 2008 financial crisis and the COVID-19 pandemic, governments around the world have implemented substantial increases in spending to support their economies. This has often involved significant borrowing to finance stimulus packages, leading to a notable rise in public debt levels. The prolonged period of historically low interest rates, instituted by central banks to encourage economic growth, has made borrowing more attractive for both governments and private businesses. This favorable environment has contributed to the escalation of debt levels by reducing the costs of servicing debt. However, higher levels of debt leave economies vulnerable to financial, economic, and geopolitical shocks. An increase in interest rates could have a significant impact on heavily indebted entities, potentially triggering defaults and financial crises. For companies, a higher debt burden can restrict investment in expansion due to increased interest payments, hindering overall economic growth. Elevated debt levels also pose risks to the financial system, as financial institutions and banks face greater risks of loan defaults, particularly in times of economic downturn. This could lead to tighter credit conditions, reduced lending activity, and potential banking crises.

Simultaneously, there are concerns about the reliability of supply chains, as seen in recent disruptions caused by events like the COVID-19 pandemic and geopolitical conflicts. These disruptions, which stem from logistical challenges, labor shortages, and intermittent lockdowns, have impacted production processes and led to price increases for a wide range of goods. Additionally, the trend toward nationalism and protectionism, which was already apparent before the pandemic, continues to influence global trade dynamics. Countries are reevaluating their trade relationships and supply chain

dependencies, especially in crucial sectors like technology and pharmaceuticals. This reassessment reflects a broader shift toward trade practices and highlights the changing nature of the global economy.

The growing significance of emerging markets in shaping global economic and political dynamics is a subject of increasing scholarly interest. Countries like India, Brazil, and select regions in Africa are gaining prominence, owing to factors such as demographic shifts including a youthful population and an expanding middle class. These regions are expected to play pivotal roles in shaping future economic trends.

The geopolitical rivalry, particularly between major powers like the USA and China, is a crucial issue that spans across various aspects such as military, technology, economy, and diplomacy. This rivalry affects the strategic choices of other countries and international organizations. The tense relationship between the United States and China - characterized by ongoing disagreements on trade, technology, and security - continues to impact global geopolitical trends and influence the foreign and economic strategies of other nations. Following Brexit, the European Union (EU) faces both internal and external challenges, with a focus on areas like migration, regulatory standards, and the establishment of a unified foreign policy. The EU is also actively addressing digital regulations and climate change, demonstrating its dedication to addressing pressing global issues.

The importance of climate change policy and the global energy transition is increasing significantly. International focus on environmental policies and efforts to achieve carbon neutrality are growing, with agreements like the Paris Accord and national strategies being key in addressing climate challenges. As the impacts of climate change become more apparent, there is a greater need for global cooperation to tackle these issues. The shift from fossil fuels to renewable energy sources is progressing, but it brings about geopolitical complexities, especially for countries heavily reliant on oil and gas exports. The move towards a low-carbon economy is reshaping the energy sector, emphasizing renewable energy sources, electric vehicles, and sustainable infrastructure. Geopolitical dynamics are evolving as nations aim to reduce their reliance on fossil fuels and address climate risks.

The current economic and geopolitical landscape is undergoing a period of transformation, presenting both challenges and opportunities on a global scale. The possibility of an economic downturn has slightly increased due to factors such as monetary tightening, financial instability, and rising energy costs linked to heightened geopolitical tensions. Leaders and policymakers worldwide need to take into account these ongoing trends when making strategic decisions to adapt to this evolving reality effectively.

2.3. ASSESSMENT OF FINANCIAL RISKS FROM CLIMATE CHANGE

The primary focus of modern countries is the transition to an economy that efficiently utilizes resources while protecting people from the adverse impacts of environmental change. Various reforms and policies are being implemented to enhance environmental protection mechanisms and strategies. A key consideration is how to achieve environmental and fiscal sustainability simultaneously, particularly in light of competing priorities resulting from post-crisis economic policies.

The urgency of addressing accelerated climate change risks has been somewhat overshadowed by the impact of the COVID-19 pandemic and the conflict in Ukraine. Despite 2020 being recorded as the hottest year to date, it received limited attention. Amid the pandemic, the European Union set a target of achieving zero greenhouse gas

emissions by 2050, which has become a pivotal aspect of the EU's fiscal policy. This is particularly significant as the national debt of the Eurozone has exceeded 95 percent of GDP. Concerns have emerged regarding the potential implications of climate change on a global scale and the increased allocation of public funds for its mitigation, which may jeopardize countries' ability to manage debt obligations in the aftermath of recent crises (Dibley et al., 2021).

The assessment of financial stability risks stemming from climate change is increasingly important as the economic impacts of environmental changes become more pronounced. Climate change presents numerous risks to financial stability, both directly and indirectly. Prioritizing the protection and enhancement of the environment has become a focal point for contemporary businesses with an eye toward long-term sustainability. To attain sustainable development that aligns with environmental needs and limitations, it is essential to forge links between economic and environmental policies to yield positive financial outcomes and enhance consumer satisfaction. To this end, there has been a heightened push for raising awareness about climate change, elucidating the detrimental impacts of certain activities and products on health, and advocating for responsible and sustainable governance by both the government and the private sector. This has prompted a shift toward social responsibility and the integration of ecological criteria in capital investments.

The impact of global warming on the frequency and severity of natural disasters has led to a growing interest among both public and private investors in promoting environmental sustainability within their businesses. Adapting to and mitigating the effects of climate change has become a priority to prevent further damage to local and global climates.

Recent assessments by the European Environment Agency (2023), have highlighted the significant economic consequences of weather and climate events on public costs in various countries. From 1980 to 2020, the EEA member countries experienced economic losses totaling €450-510 billion, with a reported number of deaths ranging from 85,000 to 143,000. Despite only 3% of events accounting for 60% of economic losses, it is crucial to consider the impacts of smaller-scale events to fully understand the challenges posed by climate change. A noteworthy finding from the analysis is that a majority of deaths (more than 85%) over the past four decades were attributed to heat waves. In light of these findings, it is essential to evaluate the potential financial stability risks posed by climate change, including how climate-related events could destabilize financial systems, institutions, and markets. This assessment involves examining various indicators to understand the risks involved, as well as the tools and methodologies used for evaluation and the broader implications for the financial sector. Furthermore, the influence of climate change on macroeconomic variables such as growth, inflation, and employment underscores the need for proactive measures to address the broader financial implications of climate change.

By examining the effects of climate change on monetary policy, fiscal stability, and overall economic health, decision-makers and stakeholders can collaborate to develop more robust financial systems to address persistent climate-related challenges. Commonly utilized tools in these evaluations include Scenario Analysis and Stress Testing, alongside comprehensive reporting and careful risk management.

The utilization of tools for simulating various climate scenarios plays a crucial role in assessing the potential impacts of climate change. These tools enable the evaluation of

factors such as gradual increases in global temperatures, sudden policy shifts towards decarbonization, and frequent severe weather events. Stress testing is an essential tool for helping institutions identify vulnerabilities and develop resilience strategies in the face of climate-related challenges. Major frameworks like the Task Force on Climate-related Financial Disclosures (TCFD) recommend that businesses disclose climate-related financial risks to stakeholders including investors and regulators. These disclosures are crucial for enhancing understanding of the risks associated with climate change and promoting informed decision-making. Financial institutions are increasingly required to integrate climate risks into their risk management strategies by adjusting credit risk models, asset valuations, and investment approaches. This underscores the importance of addressing climate-related risks in the financial sector to ensure sustainable and resilient investment practices.

The integrated structure of the financial system means that shocks arising from climate change can spread through different channels and cause serious problems. Therefore, understanding and mitigating systemic risks is critical to maintaining financial stability in the face of climate-related risks.

3. RESULTS AND DISCUSSION

The recent comprehensive analysis highlights the challenges facing the global economy in the aftermath of the COVID-19 pandemic, the ongoing conflict between Russia and Ukraine, geopolitical tensions in the Middle East, announcements of recession, and the implications of prolonged high inflation. These developments have presented the world economic scene with new obstacles and realities.

In addition to the aforementioned challenges, the world is also grappling with environmental issues, arguably the most significant challenge of all. Recent climate-related disasters, such as record-high temperatures, devastating floods, storms, extreme colds, and wildfires, underscore the urgent need for lifestyle changes, heightened awareness, and concrete action by accountable parties. The widespread occurrence of natural disasters has significant impacts on various aspects including the economy, society, and natural resources. One area of current concern is the interconnection between monetary and financial stability, public finances, and measures to combat climate change. Global monetary and financial stability plays a critical role in ensuring the efficient functioning of international markets and the global economy. However, numerous challenges such as macroeconomic conditions, technological advancements, and geopolitical uncertainties pose a threat to this stability.

The primary economic goal of any country is to achieve macroeconomic stability, which includes maintaining stable prices, a strong employment rate, and a balanced external economy, all while ensuring consistent economic growth. However, due to the changing market conditions and the effects of the recent crisis, financial stability has become the top priority among other economic policy objectives. During periods of financial stability, monetary policy typically focuses on maintaining price stability and ensuring predictable inflation levels. However, in times of crisis or instability, issues related to liquidity and financial instability become paramount. In such situations, a combination of traditional and innovative monetary policy tools may be required, along with adjustments to the primary goals of economic policy.

The economic downturn triggered by the pandemic has underscored the importance of sound financial management. Countries have grappled with reduced economic activity, escalating unemployment, and declining incomes. In such circumstances, ef-

fective management of public policies and monetary measures is essential to restore economic recovery.

The existing macroeconomic framework emphasizes important principles such as the free movement of goods and capital, rule-based fiscal policy, independent central banks focusing on controlling inflation, public institutions prioritizing financial stability, and international oversight bodies promoting cooperation between nations. While abandoning this framework may not be wise due to the significant benefits it has brought to the global economy through a private sector-centric approach, incremental reforms are seen as necessary to address geopolitical risks, market fragmentation, and climate challenges. These reforms could involve adjusting central bank mandates and fiscal rules to enhance flexibility in responding to economic shocks, as well as revising international institutions like the WTO's dispute settlement mechanism to improve consensus-building processes.

Global challenges in policy demand swift action in the realms of monetary policy, fiscal policy, and regulatory measures. Governments must create plans to boost economic growth without worsening public debt levels. This could involve prioritizing spending, enhancing tax collection methods, and gradually decreasing the deficit. The mounting levels of global debt present a major threat to financial stability worldwide, necessitating coordinated policy measures to effectively handle default risks and financial contagion while establishing a strong foundation for sustainable economic progress. To tackle these obstacles, governments may have to enforce fiscal discipline to prevent inflationary forces from spiraling out of control, particularly in economies burdened with high public debt. Collaboration among policymakers, regulators, and financial institutions is vital to navigate the intricate dynamics of current debt levels and thoroughly mitigate related risks.

Central banks face the challenging task of adjusting the pace of interest rate hikes to control inflation without overly burdening borrowers. This delicate balance is essential for maintaining economic stability and ensuring the credibility of financial markets. If interest rates are adjusted too quickly or too slowly, there is a risk of causing instability in financial markets. The emergence of inflationary pressures, particularly in the aftermath of the COVID-19 pandemic, has become a significant obstacle to global monetary and financial stability. These pressures stem from various sources and have complex effects on economies and financial systems worldwide. Central banks must navigate this complexity by adapting their monetary policy to find the right balance between combating inflation and promoting economic growth.

The conventional goal of monetary policy - to uphold price stability - has been reconsidered in light of lessons learned from the global financial crisis. This crisis highlighted the importance of addressing both monetary and financial instability, as they present similar risks to the financial system. While economies can endure inflationary conditions, financial instability can lead to a breakdown in real and financial flows. Additionally, dealing with financial instability requires more resources and time than addressing inflationary pressures.

Fiscal policy serves as a crucial supplementary factor. Through consolidation, it can alleviate pressure on currency demands, diminish the risk of financial instability, and allow for more leeway in addressing payment management issues when necessary. Reflecting upon the insights gained from this journey, the long-term query revolves around the sustainability of monetary and fiscal policies within a harmonious environ-

ment. This has implications for businesses and institutions (Borio, 2023).

Regulation of financial institutions is crucial for maintaining stability in the global financial system. Banks and other lenders need to uphold strong capital reserves and efficient risk management strategies to reduce the risk of defaults and fluctuations in asset values. However, with the financial system becoming more interconnected and complex, regulatory frameworks are struggling to keep up. There is a pressing need for greater international cooperation to tackle cross-border financial risks and establish uniform global regulations that can prevent regulatory gaps and support fair competition.

The Global Financial Stability Report (2024) highlights the risks posed by entities heavily involved in private credit markets, including insurers affiliated with private equity firms and certain pension funds. The significant growth of assets in less liquid investments by private equity-controlled insurers presents challenges in evaluating the overall risk to financial stability due to data limitations. The potential for systemic risks within the private credit industry is a concern if this asset class continues to expand without proper oversight. To mitigate these risks, regulators are advised to take a proactive regulatory and supervisory approach towards private credit funds, their institutional investors, and leverage providers.

Regulators are increasingly mandating financial institutions to actively manage and disclose climate-related risks. Non-compliance with these requirements may result in regulatory penalties, loss of investor confidence, and financial instability. Financial institutions must incorporate climate risks into their regulatory framework. This includes maintaining sufficient capital buffers and implementing risk management strategies that consider environmental and climate-related risks. Given the complexity of environmental and climate-related financial risks, globally coordinated efforts are necessary. The financial sector must continuously adapt its practices to effectively understand, measure, and mitigate these risks. By doing so, not only will financial stability be safeguarded, but it will also contribute to sustainable economic development.

Continuous monitoring of regulatory frameworks, proactive identification of systemic risks, and active international collaboration are crucial for maintaining global financial stability. The constant changes in the global financial landscape emphasize the necessity of adopting policies and strategies to mitigate potential threats to financial stability.

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TOWARD A NEW ECONOMY: DIGITAL CURRENCY AND INTERNATIONAL DEVELOPMENT

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ABSTRACT

This research paper aims to examine the role of digital currencies in international development. Through a comprehensive analysis of current trends and future prospects, the paper evaluates the potential of digital currencies to revolutionize economic systems by offering technological, economical, and secure benefits. Methods used include analysis, synthesis, comparison, scientific abstraction, and statistical analysis. Results indicate that while first and second-generation crypto assets do not fully meet modern economic requirements, the introduction of Central Bank Digital Currency (CBDC) could offer a viable solution. The paper concludes with recommendations for future research and policy implications

Thanks to the Internet, digitalization is taking an increasing place in our lives to the extent that thanks to Metaverse projects, in which significant funds are currently being invested, we are invited to live in a world of “augmented reality”. Payments, currency, and finance cannot escape this movement, as crypto asset advocates well understand. Based on the current state of the relevant sectors and an analysis of short- and medium-term prospects, this research paper examines long-term issues arising from current events and those that are predictable. The purpose of this scientific article is to review crypto assets and their ability to become a tool of a modern economic digital system that meets all requirements, such as technological, economically profitable, and of course secure, as well as regulated by the state. Methods: analysis, synthesis, comparison, scientific abstraction, analytical grouping, methods of typology and generalization, quantitative statistical analysis, qualitative textual analysis, deduction and induction. During the study, the authors concluded that the existing first and second generation crypto assets do not meet all the requirements of the modern economic system, and also do not have a legal framework in the field of security and market regulation. In this regard, two forms of government intervention are being considered: regulatory in nature and industrial in nature. The production approach considers the development and implementation of the Central Bank Digital Currency (CBDC) at the national and/or international level.

Key words: *digital economy, digital currency, crypto assets, bitcoin, stablecoin, CBDC*

1. INTRODUCTION

Digital currencies have rapidly gained prominence in the financial landscape, driven by advancements in technology and shifts in consumer behavior. Their potential to reshape the global economy is significant, impacting international relations and economic development. This paper explores these dynamics, focusing on the integration of digital currencies into the modern economic system and their implications for future growth. The rapid changes that have occurred in recent years in the field of payments, mainly as a result of changes in consumer behavior and innovations in the public sector, do not prevent the situation in this sector from remaining unsatisfactory and payments from remaining slow compared to what digitalization allows. On the other hand, access to the banking and financial system can be improved, including its functioning, although the public seems to trust it more than other industries in protecting the confidentiality of personal data.

The changes most noticeable to the public, of course, affected domestic retail payments, in particular, the widespread use of remote, contactless and smartphone payments, as well as the launch of applications (ApplePay, GooglePay, PayPal, SamsungPay, etc.) relying on existing systems for settlement.

For comparison, in Brazil, the Central Bank launched the Pix real-time payment system in November 2020, and fifteen months later two thirds of the population made or received transactions through this system. In fact, instant payment systems that appeared back in the early 2000s were first mainly implemented in emerging market countries, especially in Asia: South Korea in 2001, Taiwan and Iceland in 2003, Malaysia and South Africa in 2006, Chile and the United Kingdom in 2008, China and India in 2010. In China, as well as in the Scandinavian countries that adopted them later (Denmark and Sweden), the spread of this payment method was especially rapid, to the point that instant payment via Alipay and WeChat Pay in China or via Swish in Sweden became the payment method in these countries as the most common payment among sellers (Ozili, 2022). The latter are even increasingly refusing to pay in fiat currency, offering them instant payment with the same advantage of immediate settlement with less risk of loss or theft and less time spent managing their cash flows.

Thus, over the past twenty-five years, the payment sector has undergone rapid changes, which, however, have not led to overcoming certain shortcomings or significant changes in the monetary and financial spheres. Private initiatives using a common technological framework came to point this out, but did not receive support because they themselves were not able to meet all the expectations they raised, and could even lead to other difficulties. Thus, a response from the State authorities was required, which, however, in some respects could turn out to be ambiguous.

The purpose of this scientific article is to review crypto assets and their ability to become a full-fledged tool of a modern economic digital system that meets all requirements, such as technological, economically profitable, and of course secure, as well as regulated by the state.

2.METHODS

In addition to the methods mentioned, the study employs qualitative interviews with industry experts and policymakers to gather insights on the practical implications of digital currencies. These interviews provide a nuanced understanding of the challenges and opportunities presented by digital currencies in various economic contexts.

In the process of working on the research, general scientific methods were applied: analysis, synthesis, comparison, scientific abstraction, analytical grouping, methods of typology and generalization, quantitative statistical analysis, qualitative textual analysis, deduction and induction.

3. RESULTS

The study reveals several critical insights into the role of digital currencies in international development. For instance, countries like El Salvador have adopted Bitcoin as legal tender, aiming to boost economic growth and financial inclusion. However, the empirical data suggests mixed results, with challenges in regulatory compliance and market stability. Detailed case studies of Brazil's Pix system and China's Alipay highlight the transformative potential of digital currencies in enhancing payment systems. Nevertheless, the lack of a comprehensive legal framework remains a significant hurdle.

As in the Middle Ages, the vast majority of cross-border payments in terms of volume, whether wholesale or retail payments, are still carried out in accordance with the model of "correspondent banks" (correspondent banking). In this model, the so-called "correspondent" bank manages accounts opened by other so-called "responsible" banks and provides them with internal services and currency exchange, which avoids their representation in the recipient's currency country. However, for reasons that are mainly related to compliance with customer information procedures and the application of anti-money laundering and terrorist financing (LCB/FT) regulations, this model lags far behind the recent period.

Thus, the number of correspondent banks decreased by 20% between 2011 and 2018, despite the fact that the cost of payments increased during this period. This event is worrisome because it may encourage users to switch to parallel, less secure systems and reinforce the well-known shortcomings of correspondent banking. These disadvantages, especially evident in the implementation of small payments, such as remittances from immigrant workers to their countries of origin, are mainly as follows:

- slowness: cross-border payments take significantly longer than domestic payments;
- opacity: it is difficult for the payer to track step by step how his payment procedure is progressing and the remuneration of each intermediary;
- high cost: As of June 2021, according to an assessment conducted by the World Bank based on information received from 48 countries sending money transfers from 105 recipient countries, and for four categories of service providers (banks, money transfer operators such as Western Union or Wise, mobile operators and others), the average cost of one The transfer rate was 6.30%. This cost was even 1.3 percentage points higher than the goal set by the G20 in 2014, but has been steadily declining since 2013, when it was about 8%. The most expensive money transfers were made through banks from South Africa and to sub–Saharan Africa, the cheapest through fully digital operators (3.41%) and between G8 countries, with the exception of Japan as the issuing country (Calle & Eidan, 2020);
- limited accessibility: especially in destination countries for reasons related to both less widespread digital culture and less financial accessibility.

In order to take into account, the requests of the international community, in particular the G20, to partially eliminate these shortcomings, the Swift international messaging service launched the global payment innovation (gpi), by the beginning of 2022, more than 4,200 banks from 141 countries joined it. This initiative, which was initially

aimed primarily at corporate payments, aims to make a payment during the day, allow real-time tracking of the payment status and billing for each payment. It seems that payments using gpi tend to be executed quickly, with an average processing time of less than two hours. However, there is a strong heterogeneity, with some routes, especially to Africa, taking up to two days, in particular due to strict capital controls and the time taken by the receiving institution to make funds available to the recipient (Banna, H., & Alam, 2021).

In general, the picture that is emerging in the field of payments is the lack of use of the opportunities offered by digitalization, especially in terms of instantaneity.

Indeed, as noted in the introduction, digitalization is gaining an increasing share in society, while it marks a step forward in the field of payments, where the opportunities it offers are not being fully exploited. This situation may be all the more unexpected because in the payment sector, developed countries have long been leaders in digitization, as expected, was either with the introduction of Real Time Gross Settlement (RTGS), or, in the case of retail payments, with the computerization of mass transactions on checks, transfers and debit notifications, and also with the distribution of maps.

According to the definition given by the World Bank, Financial accessibility means that individuals and businesses have access to useful and affordable products and services that meet their needs in transactions, savings, lending and insurance. Access to these products and services is important because they make everyday life easier and enable families and businesses to plan their long-term projects as well as cope with unforeseen emergencies. The first step towards financial accessibility is usually to have a transactional account that can be opened through a bank or other intermediaries, such as postal operators, mobile operators – the latter are widely represented in Africa – or microfinance organizations.

According to data released by the World Bank in 2018, 69% of adults worldwide had an account, but almost a third of adults – or 1.7 billion people – did not have a "bank account", that is, some of them have a transactional account, but not in a bank, and thus do not use their account for save money or gain access to a wider range of financial products and services (Borup& Schütte, 2022). Of course, the situation in developing countries is the most difficult. Of course, significant progress has been made in countries that actively pursue digitalization-related policies, such as policies aimed at universal digital identification (an example is the Aadhaar program in India), or that have promoted the introduction of mobile financial services, such as Kenya with M-Pesa. However, it seems that just under half of the population living in developing countries does not have a bank account. On the other hand, the availability of banking services is not a problem in richest countries: in Gupta France, the level of banking services for the adult population is 99%, and therefore it can be assumed that all French adults who want it have a bank account (Gupta, 2021).

Given the difficulties with payments described above, developing economies are thus doubly disadvantaged, since the availability of financial services remains underdeveloped in countries heavily dependent on remittances. Again, in this case, the benefits of digitalization do not seem to be fully exploited.

Thus, the need for high-quality and fast transactions is obvious, and in this regard, market initiatives have emerged from the general technological basis, emphasizing the insufficient use by traditional participants of the banking and financial systems of the

opportunities offered by digitalization. These initiatives are based on the foundation of a common distributed ledger technology and on the blockchain.

These market initiatives took different forms. For the first time, money-oriented cryptocurrency assets, mainly Bitcoin, appeared in early 2009, which did not fulfill their promises because they do not serve, except in cases established by government authorities, as a currency.

Stablecoins, attempts to reconcile Distributed Ledger Technology (DLT) and the provision of a stable value asset, appeared later. Raising funds through the issuance of tokens (initial coin offering or ICO), apparently, was only a help in 2016-2018. Decentralized finance (decentralized finance or DeFi) has since offered a number of peer-to-peer financial services related to crypto assets. Finally, non-interchangeable tokens (non-interchangeable tokens or NFT) have been developing since 2020, and it is too early to say whether they will become effective or whether after the ICO they will cause a new surge of speculative fever (Garratt et al., 2020).

As part of the study, the authors consider it necessary to make a brief overview of the listed crypto assets. Their common technological basis is an electronic register, the so–called electronic file, which can be simultaneously accessed, registered and synchronized by authorized entities, and which develops by chronologically adding up information previously confirmed by all entities. This information is immutable, so it should never be changed or deleted. DLT itself allows you to create and manage a distributed registry through a network of computers ("nodes") that synchronize, manage and protect distributed registries, transaction blocks are added using a verification mechanism, also known as a "consensus mechanism". The latter allows the checking nodes to approve a new block of operations. There are various verification mechanisms, the most well-known of which are currently Proof of work (PoW) and proof of stake (PoS).

Proof of work is the first consensus mechanism to appear on the blockchain, first used by Bitcoin. The verification nodes there are competing to solve a cryptographic problem that requires a lot of "brute force" (the cost of specialized equipment and, above all, energy) and, thus, adding a new block of operations to previously verified ones. Proof of interest is based on linking crypto assets to the verification nodes of the public block chain; thus, it introduces an element of centralization into a priori decentralized organization. Finally, DLT allows you to resort to "smart contracts" (smart contracts or programmable or self-fulfilling contracts), which are computer programs capable of automatically fulfilling the terms of the contract, potentially making the currency "programmable" (Arner et al., 2020).

Blockchain is a form of DLT that allows you to store and exchange crypto assets using a distributed system without the intervention of a trusted third party. The blockchain uses an encryption system instead of a trusted third party, which makes it extremely difficult to fake it, thereby solving the problem of "double spending", that is, a fraudulent action in which the same crypto asset is used simultaneously in several transactions (the exception is the "51% attack", when an attacker or a group of attackers manages to capture most nodes, involved in the verification mechanism, which is very expensive).

Thus, a crypto asset is an element of the intangible heritage, the main part of which belongs to DLT. There are two main forms of blockchains: public and private. In a public blockchain, participants' access to the verification mechanism is not regulated, since all nodes that have the same role a priori, the same rights to read (view) and write

(enter new transactions, therefore, participate in the verification mechanism and the right to allow the addition of a new block), without any dominant node. In a private blockchain, all nodes belong to an organization or group of organizations (consortium) that control access, recording, and consensus.

An authorized blockchain is a private blockchain, access to which is reserved for authorized participants. A crypto asset designed to be monetary, like bitcoin, which is based on its own blockchain technology, is called a coin. We also talk about altcoin to refer to a currency other than Bitcoin. If it is linked to an existing blockchain (for example, Ethereum), the crypto asset is called a token. This does not prevent the fact that in the blockchain, contrary to the usual use of the term, the token most often represents only itself (this always applies to the coin). The exceptions to this lack of external value of coins and tokens are, in principle, tokens issued on time by the ICO, and by their nature, the cryptographic representation of assets within existing categories, such as securities or currency, which are then "tokenized" (Ozili, 2022).

The advantages of the blockchain are that it allows you to quickly, constantly and globally exchange information that has the following properties:

- it is secure through the use of cryptography, the use of a consensus mechanism and the resilience provided by its distributed nature, protecting it from failures at a single point (single point of failure), as can happen in centralized organizations prevailing these days;
- it is transparent, all nodes have access to the same information, although in private or even public blockchains, access to certain information can also be shared to maintain confidentiality.;
- it is unchangeable.

One of the consequences of this is that the blockchain allows you to do without certain operations, such as transactions by agreement, and trusted third parties. In the blockchain, the difference between the concepts of the external interface and the backend, clearing and settlement operations are erased, and the infrastructure offers the opportunity to conduct all these operations, moreover, very quickly, however, taking into account certain arbitration proceedings. In addition, the introduction of this technology allows the creation of new products and players, promoting competition and innovation.

In addition, the term bitcoin simultaneously refers to the system of transferring a crypto asset and a unit of account. As of June 28, 2022, there were more than 20,000 crypto assets totaling about 20,000 outstanding obligations of $950 billion, despite the fact that its share had decreased significantly over the previous ten years, before that it was 100%, while bitcoin still accounted for 42% of this amount, compared to with 16% for Ethereum, 7% for Tether, 6% for USD Coin, 4% for Binance, and 2% for Binance USD, Ripple, Cardano et Solana. For this reason, since it is a kind of "progenitor" of crypto assets, and also because bitcoin has claimed to be a currency from the very beginning, the review here focuses on this crypto asset, and not on altcoins (Dell'Erba, 2021).

In addition to using blockchain, bitcoin, like altcoins, is characterized by a combination of public and private keys that identifies an asset in the absence of an issuer and allows the user to be anonymous or more precisely in order to protect himself using an alias. The absence of an issuer is certainly the characteristic that most distinguishes Bitcoin and altcoins from legal currencies, whether fiat money or bank deposits: thus, first-generation crypto assets are not asset-backed, while fiat money and bank deposits

are asset-backed through cryptocurrency, the balance sheets of their respective issuers (Central Bank and so-called "commercial" banks). This lack of support allows bitcoin to be mostly decentralized, although elements of centralization can be found in its ownership, which is difficult to assess due to the alias that allows the same owner to use different private keys or, conversely, multiple owners can be combined by an exchange under the same name.

Figure 1 - Bitcoin exchange rate dynamics over the past five years

First of all, this makes the bitcoin exchange rate extremely volatile, which is one of the obstacles, perhaps the most important, for the intended monetary use of its developer. Two other disadvantages afflict Bitcoin when doing the work, it was designed to do:

- inelasticity of his proposal: the pace of bitcoin creation is planned to be halved every four years (the so-called halving procedure) with a gradual approach to 21 million in 2140 (as of March 2022, about 19 million units were sold). In addition, units are created only in the form of rewards awarded to "miners" who manage to solve the cryptographic problem first, allowing them to link a new block of transactions into a chain (in case of a conflict when awarding a reward, the length of the received chain is proof), and not based on the value of transactions.
- Changing the creation algorithm would be both difficult and risky: allowing for a further increase in the limit, which until now was considered intangible, this change could lead to a sharp drop in the value of assets- bitcoins – the price of which mainly depends on the deficit;
- slowness of transactions: Bitcoin processes seven transactions per second, and it is believed that it takes an hour for a transaction to become irreversible, i.e. mining six blocks of transactions (the energy costs required to represent a fake blockchain for longer than others would then be colossal).

These difficulties create a problem of "scalability" with overload phenomena accompanied by unstable fluctuations in transaction costs, as a result of which miners request higher fees for processing some transactions before others. Of course, they can be overcome by increasing the speed of transactions by adding sidechains to bitcoin, such as the Lightning network, which allows only calculations on the blockchain to balance transactions made between two participants connected by a "channel" that they created on the network. However, in accordance with the "Buterin triangle", these solutions, in turn, create difficulties, especially due to the introduction of centralization and loss of security, since they resort to offsetting bilateral positions, which creates credit risk, aggravated by the specialization of certain nodes in the redistribution of liquidity, by

analogy with clearing houses grafted to the gross margin system calculations generated by bitcoins (Banna et al., 2020).

Thus, in fact, despite the development of payment services based on crypto assets by major players in the payment industry (for example, PayPal, Visa, Mastercard, Worldline), bitcoins and altcoins are very little used directly in everyday transactions. In addition, their prices are too unstable to be used as reserves of value. In general, they are unsuitable for use in monetary form, since in fact, they mainly serve for four actions:

1. First of all, mainly for speculative investments;
2. For settlement transactions under pseudonyms aimed at protecting confidentiality, but also sometimes financing illegal transactions. Thus, it has been estimated that about a quarter of the volume of bitcoin transactions and almost half of their amount will be related to illegal activities. However, this assessment is already somewhat outdated, and law enforcement agencies have since made progress in tracking transactions on the blockchain. It is estimated that transactions involving illegal addresses will account for only 0.15% of transactions with crypto assets in 2021, while the amounts received by these addresses will amount to $14 billion.

As for this ratio, however, attention should be paid to the fact that most transactions with crypto assets occur between the latter. Considering only transactions involving goods, services and assets other than crypto assets, including legal currencies, would make more sense. In addition, legitimate addresses may also be involved in illegal transactions, which suggests that the $14 billion amount is probably the minimum estimate (Boar et al., 2020);

3. Circumvention of capital controls. However, these workarounds, which also constitute illegal operations, are effective only if goods are bought and resold with crypto assets that are invisible to controllers. They are also ambiguous, since, useful for regulating economic policy, they can contribute to improving social well-being;
4. For cross-border payments, preferably for large amounts, so that transactions are not overly burdened in percentage terms by the high fees themselves (purchase of crypto assets for legal currencies, payment for miner services, resale of crypto assets for legal currencies).

Thus, Bitcoin does not meet all the requirements and needs of the economic system. In this regard, the authors propose to consider the prospect of stablecoins. Stablecoins, which appeared together with Tether in 2014, are crypto assets that strive for a stable value relative to the benchmark, in practice, in almost all cases, to parity with the US dollar. Thus, conceptually, stablecoins are markedly different from first-generation crypto assets. Due to the stability they provide, they allow users to stay in the "digital universe", saving them from having to pay high transaction costs when making purchases and sales for legitimate currencies motivated, for example, by arbitration between crypto assets – there are markets between crypto assets that are not related to stablecoins, but their liquidity often leaves much to be desired. In addition, some cryptocurrency exchanges refuse payments in legal currencies, thereby freeing themselves from compliance with certain regulatory restrictions, while stablecoins, on the contrary, usually make it easy to switch from one exchange to another.

As of June 28, 2022, the total market capitalization of stablecoins traded in dollars amounted to about $150 billion, or 16% of the total market capitalization of all crypto assets. Tether, which strives for parity with the dollar and remained the only stablecoin

until 2018, accounted for more than 40% of the issued amounts, followed by USD Coin (one third), Binance Coin (one tenth) and DAI (about 5%) (George et al., 2021).

After the collapse of the Terra cryptocurrency, which had a capitalization of about thirty billion dollars, as of May 2022, almost all stablecoins are provided with an off-chain reserve, in the sense that the assets that make up it are not crypto assets and, therefore, cannot be stored in the blockchain.

DAI is the only example of a stable coin in the chain, units of which are created by supporting crypto assets. By their nature, off-chain stablecoins are more centralized (users have no idea about redundancy), and on-chain stablecoins have more transparency (users can check on the blockchain whether guarantees really exist).

However, due to the volatility of prices for crypto assets, the disadvantage of off-chain stablecoins from the point of view of users is that they rely on security coefficients exceeding one (150% for DAI), while positions are liquidated in case of non-compliance with the security coefficient, which can cause or increase market destabilization (Bordo, 2021). In any case, issuers of stablecoins mainly rely on market arbitrage to stabilize the exchange rate of the units they issue.

Thus, market participants are expected to buy a stablecoin if it has a rating below par, and that they sell it otherwise, in both cases without the intervention of the issuer, a device that obviously can only work if the parity commitment is trustworthy, hence the reserve is managed wisely and it is transparent, which is not always the case.

Stablecoins are advertised as offering four potential benefits:

- make payments at a low price and in real time, which is certainly a more realistic advantage in their case than in the case of first-generation crypto assets, due to the high price volatility of the latter;
- make the currency programmable. In fact, it would be more correct to say "make means of payment programmable", since stablecoins, strictly speaking, are not a currency, and this is for two reasons: on the one hand, they are not autonomous, like legal currencies, since they are referenced in legal currencies and linked to official currencies; on the other hand they are imperfectly stable with respect to their reference. However, if this last restriction were eliminated and the use of stablecoins in transactions expanded, the outstanding funds held by residents in various referrals could be included in the corresponding monetary aggregates according to their definition (for example, euro stablecoins owned by residents of the eurozone would be included in the monetary aggregates of the eurozone M1, M2 and M3 as well as deposits in euros currently);
- promote the availability of financial services, especially in emerging and developing economies, which could be the case if they were distributed on a large scale and at a low price, but what remains to be demonstrated;
- serve as the preferred tool in Decentralized Finance (DeFi).

By far, this is currently the most common use of stablecoins. Indeed, stablecoins play a role in DeFi similar to that of "safe assets" such as treasury bills or central currency in traditional finance: they can be used as security rights and serve as a liquidity reserve and a safe asset there. The stablecoins in the chain are themselves an example of using DeFi. Thus, stablecoins can currently be considered as an addition to the markets of other crypto assets.

Figure 2 - Stablecoin exchange rate dynamics over the past year

Decentralized finance (DeFi), a set of financial services based on crypto assets DeFi seeks to provide some functions of the traditional financial system in a decentralized way (transactions are carried out peer–to–peer, without involving trusted third parties) and without permission (management in it potentially belongs to users) and relying on blockchain - in particular, Ethereum - and cryptocurrencies.

In the case of DeFi, we are talking exclusively about crypto assets, which still account for only a small fraction of all available assets in the world. Like the stablecoin market, with which it maintains a close relationship, DeFi is an addition to the crypto asset market.

DeFi projects appeared back in 2017, but the industry did not really begin to develop until the summer of 2020. The amount of fixed assets (total value locked) in DeFi applications increased from $2 billion in early July 2020 to more than $100 billion in early 2022, but then fell with the fall in prices for two major crypto assets (Bitcoin and Ethereum). The DeFi architecture is based on a set of "layers" that give the set its three fundamental characteristics: "composability" (various "bricks" belonging to different layers can be combined into a product or service, which makes DeFi a kind of Lego financial constructor for crypto assets); compatibility, this is facilitated by the dominance of the Ethereum protocol as well as opacity for a novice investor, despite the use of blockchain. The markets covered by DeFi are mainly of two types: as of mid-2021, they account for more than 85% of fixed assets (Fuchs, 2022):

- decentralized exchanges: Compared to centralized exchanges, which are still the most widely used in transactions with crypto assets, but involve trust and require storage fees, they have the advantage that users do not need to deposit their assets before sending them to trade. In addition, another advantage is that transactions are performed atomically (both "legs" of trading occur in an indivisible manner and form only one transaction, the blockchain:
- the equivalent of payment for payment-payment-against–payment or PVP-in traditional finance;
- decentralized credit platforms: they allow you to conduct transactions anonymously and earn income from owning stable coins. To guarantee itself, the lender can resort to two options. In the first case, as with transactions through decentralized exchanges, it is compressed atomically. In this case, it is an instant loan (flash loan),

which has not yet been sufficiently developed and is used mainly for the purposes of cross-platform arbitration. In this regard, the low rates on these loans, from the lender's point of view, should not cause illusions: we are talking about operations that almost all "sell out" in a matter of seconds. The second solution is to provide a loan secured by the latter (often stablecoins, but also crypto assets, in particular ether), concluded in a smart contract and issued only after repayment of the loan.

However, DeFi also creates interdependencies between crypto asset markets such as stablecoins (this is especially true when stablecoins are online), as well as with some players in traditional finance who invest in them, such as hedge funds and family offices.

In addition, building most DeFi applications on unauthorized blockchains, which are accessed and transactions are carried out under pseudonyms, opens up opportunities for tax evasion and other illegal practices. The latter point is even more worrisome, since DeFi can lead to a double form of regulatory arbitration. In the first form, if DeFi is not regulated, traditional financial activities can be transferred to Defi through the "tokenization" of the relevant assets. However, since in this case such activities will lose the trust and protection associated with regulations, such a scenario is unlikely. In the second form of regulatory arbitration, as in other types of activities related to crypto assets, the nature of the global DeFi standard would allow its developers to transfer their activities to jurisdictions that would impose the least restrictions on them, perhaps even if they protected users worse or shifted the costs associated with disruptions to the global the financial system. This risk highlights the need for international coordination.

However, this situation could have changed if, despite the fact that the Diem (formerly Libra) project of Meta (formerly Facebook) was terminated due to hostility from regulatory authorities, other global projects for the production of stablecoins appeared. This could include, in particular, the case in the field of wholesale payments, where two projects are known: Utility Settlement Coin (USC), supported by a group of banks and institutional investors (Fnality), and JPMCoin, supported by JPMorgan bank.

While stablecoins may have benefits, they can also pose risks. This is especially true for global stablecoins. Indeed, as noted in the report of the G7 working group on stablecoins, global stablecoins combine two types of risks (Piliyanti, 2019):

- risks characteristic of any stablecoin device, often common to other crypto asset issuance devices: the temptation to invest in risky assets and practice "maturity modification" in order to increase profitability, in which assets have a longer maturity than resources whose owners may require liquidation at any time;
- lack of legal certainty, in particular with regard to the rights that users have;
- deficiencies in management, including risk verification and control;
- business risk, as financial integrity in the frequent absence of LCB/FT checks;
- protection of user transaction data;
- the risks that global stablecoins can create as a result of their size: not only the risks inherent in any stablecoin can be increased in the case of global stablecoins. The first category relates to the conditions of competition (the absence of competition will deprive consumers of the opportunity to fully take advantage of the innovations that stablecoins represent; preventing this risk will require ensuring the interoperability of global stablecoins in general). The second category of risks is associated with consequences for financial stability, the third with consequences for monetary policy.

4. DISCUSSION

The analysis indicates that while digital currencies offer significant benefits, their integration into the global economy requires careful consideration of regulatory and security issues. The potential for CBDCs to address these challenges is promising, but their success depends on international cooperation and the development of standardized regulatory frameworks. Future research should focus on empirical studies that examine the long-term effects of digital currencies on economic stability and growth.

In light of the above, the cryptocurrencies of the first generation Bitcoin, as well as the second generation stablecoins, are not able to meet all the requirements of the market and the state, and therefore government agencies have created or are preparing to create a legal framework that would provide a safe environment for use among the general public. This is due to the fact that any regulation comes with costs that create barriers to entry, protecting existing players, which makes it ambiguous from a competitive point of view.

Another form of government intervention, much stronger than regulation, is aimed at providing an alternative to private production, as in the case of the Central Bank Digital Currency (CBDC) broadcast. Therefore, before intervening, the government should, in principle, make sure that two conditions are met: that private initiative is unable to meet a clearly expressed need (in other words, there must be a "market failure") and that the benefits of public production outweigh any possible disadvantages that it creates.

Two forms of government intervention are consistently considered here: regulatory in nature and industrial in nature.

- the first is to do nothing or even promote crypto assets, as El Salvador and the Central African Republic did by granting bitcoin the status of legal tender. This approach is incompatible with the risks that crypto assets pose at this stage and the risks they may pose in the future, especially for financial stability.;
- the second approach, on the contrary, is to ban activities related to crypto assets, the prohibition of their existence in itself cannot be reasonably considered, given the global availability and absence of an issuer that characterize them. Then the ban may be implicit (exchanges, banks and other financial institutions are prohibited from offering services to individuals and legal entities trading in crypto assets) or explicit (making transactions with crypto assets or owning them is punishable by criminal sanctions). According to the Library of Congress in the United States, the number of countries imposing a ban in one form or another increased from eight to nine months between 2018 and 2021 (Algeria, Bangladesh, China, Egypt, Iraq, Morocco, Oman, Qatar, Tunisia) for an explicit ban and from fifteen to forty-two months for the implied prohibition. Such a purely administrative approach is unfavorable for competition and innovation (Deng et al., 2019).

CBDC can be defined as an element of the monetary base (or central currency), which is exchanged at face value for paper money and reserves, which the Central Bank can independently create or destroy, which is available 24 hours a day every day of the year and which circulates through the digital infrastructure. As with stablecoins, it is useful to distinguish whether it is a wholesale CBDC available only to financial institutions or certain types of duly accredited operators, or a retail MNBC intended for the general public, but which financial institutions can also own.

The motives, methods, and potential consequences of CBDC broadcasting vary from form to form. The reasons are discussed below, the ways and the consequences, which are more relevant in the medium term, since there are still very few CBDCs, none of which are large or issued in advanced economies.

However, at this stage, it should be noted that one retail CBDC provides a substitute for fiat money, as well as deposits, since it, like the last two, can be used in transactions or as a means of saving. But if the substitution for paper money is internal to the Central Bank's balance sheet, without changing their amounts and leaving the banks' balance sheets unchanged, the same does not apply to the replacement of deposits. The latter leads to a loss of resource for banks ("disintermediation") in favor of the central bank (this does not necessarily lead to an increase in the balance sheet of the central bank or a decrease in the balance sheet of banks).

Among the reasons for CBDC broadcasting, regardless of its type, is to always provide a payment instrument that carries neither credit risk (the central bank cannot default) nor liquidity risk (it can always provide more of its currency if there is demand for it). As for the wholesale CBDC, its issuance is sometimes considered unnecessary, since, taking into account reserves, the Central Bank would already provide a tool for settlements on transactions between banks in the central currency.

However, CBDC is precisely a tool that spreads across a digital infrastructure other than the one currently used by the central currency, and reserves cannot be placed on the blockchain: we currently do not have cash in the ledger. Conversely, one Wholesale CBDC would allow financial institutions to conduct end-to-end transactions on the blockchain with assets represented as tokens, including settlements, without using stablecoins, which pose a residual risk. As a result, the use of blockchain will become more attractive to financial institutions and more secure for the system as a whole, since the use of a central currency strengthens financial stability.

Thus, the motive for issuing a wholesale CBDC may be to promote financial innovation and reduce transaction costs through the use of blockchain. The release of a wholesale CBDC can also increase the "dubiousness" of the financial services market by fostering competition by attracting a new provider, which allows financial service users to benefit from the faster efficiency gains provided by this technology.

As for the retail CBDC, we are talking about adapting the provision of cash to the technological context of digitization, which will allow central banks to communicate with the public where, for example, in Sweden, the demand for paper money is falling sharply. In addition, since 2016, the Central Bank of Sweden has been exploring the possibility of issuing retail CBDCs called e-krona. However, he is not sure that there is a public demand for this, since the main thing for him is to have access to technological progress.

The release of a retail CBDC can also help reduce the social costs of retail payment services. These costs are estimated at almost 1% of GDP in the eurozone, half of which is accounted for by cash payments, whether at the level of the central bank, second-tier banks, merchants or the public (Bindseil, 2020).

However, the decrease in the share of cash in trade shows that this cost reduction is already happening spontaneously. In emerging and developing economies, a retail CBDC can also serve the purpose of ensuring the availability of financial services. How-

ever, experience shows in such different examples as M-Pesa in Kenya or Pix in Brazil that other means are available for this purpose.

Thus, it is in the sector that was identified above as the most lagging, cross-border payments, in particular for money transfers, that CBDC could bring the most, but this is not related to the release of a retail CBDC.

Finally, tax reasons may motivate the issuance of a retail CBDC, especially where the use of paper money remains very common, that is, again in emerging market economies or developing countries.

5. CONCLUSION

In conclusion, digital currencies hold the potential to transform international development by offering secure, efficient, and inclusive financial systems. However, realizing this potential requires addressing significant regulatory and security challenges. The study recommends that policymakers prioritize the development of comprehensive legal frameworks and international cooperation to ensure the successful integration of digital currencies into the global economy.

During the study, the authors concluded that the existing crypto assets do not meet all the requirements of the modern economic system, and also do not have a legal framework in the field of security and market regulation.

The main threat is that competition from private players is intensifying with the advent of cryptocurrencies launched by digital giants, whether American or Chinese. After the ambitious launch of its virtual currency, dubbed Libra and then Diem, Facebook eventually abandoned it, but other large private companies continue to explore the possibilities of cryptocurrencies. The risk is that by seizing the means of payment, these companies will receive full information about the payments made and, consequently, about personal data. In addition to the threat to data privacy, there is also the risk of a malfunction of national currencies. Especially at a time when cash is gradually disappearing and payments are increasingly dematerialized. Another important issue is the global competition that central banks are involved in. The main ones compete with each other for imposing their currency on international exchanges, especially against the dollar.

To these numerous threats and questions is added the question of whether a digital currency issued by the central bank can meet the demand and expectations of users. They usually use intangible payment methods (bank cards, bank transfers, phone payments or through interbank systems), and many of them do not necessarily see what else digital currency will bring them.

However, CBDC has several advantages. In the absence of an answer to the question of user acceptance, the creation of, for example, a digital euro will contribute to the relative standardization of means of payment at the international level. If the digital euro became the standard, it would become compatible, which would allow payments and exchanges to be made faster, almost instantly and cheaper. That is, international payment systems would be more efficient and reliable.

Opinions about the contribution of digital technologies to the world of money are still divided (Andolfatto, 2021). Some believe that what is happening now is a marginal phenomenon that will remain so; others, on the contrary, believe that the ongoing evolution forms the basis of the financial systems of tomorrow. Still others hope that digitalization will lead to the improvement of existing payment systems, as well as to the

modernization of interbank payments and payments between individuals. The only certainty at this stage is that whatever option is implemented, the technology must be brought into line with the law.

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ORGANIZATIONAL AND ECONOMIC MECHANISM OF ENERGY SAVING IN AGRICULTURE

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ABSTRACT

Globally, energy needs are increasing and leading to increased energy use on agricultural land. In this regard, in the face of growing environmental problems, it is extremely important to apply farming methods that maximize energy efficiency and save resources. This is the reason for the choice of the topic of the scientific article. The purpose of this study is to analyze possible ways of agroecological transition and develop recommendations on the organizational and economic foundations of energy conservation in agriculture. The article uses the methods of economic research: monographic, abstract-logical, computational-constructive, correlation-regression analysis, deterministic factor analysis, economic and mathematical modeling, etc. Results: in the context of the energy transition, agriculture faces a dual task: to reduce dependence on fossil fuels and provide society, in addition to food, with bioenergy to replace fossil fuels. The reality of this task depends on the ability of agriculture to achieve energy neutrality, that is, to balance external energy consumption with energy recovery from internal sources. This, in turn, depends on the political will of the states and the support of society. Conclusions: the most important principle of agricultural policy should be the search for harmonization of state energy policy and its consequences for the agricultural world with the goals of food production, combating soil artificiality, carbon accumulation in the soil, maintaining biodiversity and public health well-being.

Key words: *energy saving mechanisms, agriculture, agroecology, energy generation and storage, decentralization of energy production*

1. INTRODUCTION

Agriculture was once the main source of energy for pre-industrial societies and practically the only source of mechanical energy before the Industrial Revolution. The task of energy transition requires a new recognition of agriculture as an energy source capable of providing society, in addition to food, with bioenergy to replace fossil fuels. However, current agriculture is heavily dependent on fossil fuels and, therefore, it is far from a renewable energy system.

From the late 1960s to the present day, the role of energy in agri-food systems and, in particular, dependence on fossil fuels have been studied and evaluated with increasing research interest. An analysis of the energy metabolism of agricultural systems can

provide insight into the structural deficit or excess of energy, as well as the complex relationships between energy consumption and productivity (Hryhoriv, 2019).

Agricultural transitions lead to structural changes in the energy exchange and food capacity of agriculture and emphasize the importance of industrial ecology approaches in promising agricultural modeling. The use of external resources makes it possible to eliminate internal productivity constraints and, in the case of fossil fuels, ensure high agricultural productivity due to depleted resources that disrupt the carbon cycle.

In this regard, the task of agriculture is to neutralize energy dependence on external resources through energy recovery from internal sources, which is very little studied in the scientific literature.

Energy neutrality in agriculture means producing the same amount of energy from domestic sources as consumption from external sources to support food production. Energy neutrality is a guarantee of food security in the face of volatile fossil fuel prices and potential shortages in the future, as well as a prerequisite for agriculture to become a clean source of energy for society. Only by achieving energy neutrality can agriculture contribute to bioenergy in the energy transition (Michurina et al., 2024).

Based on this, the relevance of the chosen topic is due to the fact that no study has gone beyond assessing the potential energy self-sufficiency of isolated crops or livestock systems.

Thus, the purpose of this study is to analyze possible ways of agroecological transition and to develop recommendations on the organizational and economic foundations of energy conservation in agriculture on the way to the transition to an environmentally friendly energy transition.

2.METHODS

The general methodological basis of the study was the dialectical method of studying economic phenomena and processes, the most important attributes of which are a systematic approach and system analysis. Within the framework of the system analysis, various techniques, methods and methods of economic research were used: monographic, abstract-logical, computational-constructive, correlation-regression analysis, deterministic factor analysis, economic and mathematical modeling, etc.

3.RESULTS

The renewable energy sector is the subject of numerous studies and therefore represents technological innovations in most energy sectors of the agricultural sector.

However, the key issue in the energy-saving approach in agriculture is the problem of energy storage. Energy storage and, in particular, electricity should be developed taking into account the necessary growth of renewable energy sources, some of which suffer from a lack of intermittency (wind and solar energy). This issue goes beyond the agricultural world. A single “reasonable” energy management by combining variable sources of production, main sources (nuclear) and additional sources (hydraulic, thermal power plants) will not be enough in the case of high rates of introduction of renewable energy sources, although it is desirable (the idea of smart grids) (Melnyk et al., 2018). Similarly, the distribution, that is, the distribution of objects across the territory in different climatic zones, is desirable, but not enough. In any case, the development of these energy sources will require the adaptation of distribution networks.

Since electricity itself cannot be stored, it must be converted into chemical, electrochemical, or mechanical energy. According to Christophe Guth, president of the Na-

tional Alliance for the Coordination of Energy Research (Ancre), "we will have to develop breakthrough innovations in the field of electricity storage in order to support the growth of renewable energy capacity."

There are various storage methods, including STEP, batteries, compressed air and hydrogen. "Power to Gas" technologies allow storing electricity in the form of gas: this involves obtaining water by electrolysis (a water molecule is destroyed by electrical energy using rare metals such as platinum), dihydrogen — or H2, the smallest existing molecule, more often called hydrogen, which can be stored (which can create safety problems), transported, and then used for various purposes: mobility, hydrogen or electricity generation using fuel cells (PAC).

Other energy storage technologies are still at the stage of simple ways: supercapacitors, turbomachines, solid oxide fuel cells ("Solid Oxide fuel cell"), which allows you to consume a wide variety of fuels containing a mixture of hydrogen and carbon (natural gas, coal gas, biogas, etc.), flowing batteries ("Redox Flow"), steam reforming (Grift et al., 2017).

Despite the fact that many projects on environmentally friendly energy-saving technologies exist and are developing, the industry faces a number of obstacles:

1. Adverse macroeconomic costs

Despite ambitious goals for the development of bioenergy, renewable energy production in the agricultural sector remains subject to a number of uncertainties, especially due to a lack of economic profitability. No sector of renewable energy of agricultural origin is currently economically viable without government support. Therefore, their future depends on improving their energy efficiency, raising prices for other types of energy (for example, by increasing the cost of carbon dioxide emissions) or maintaining sufficient incentive support policies. Moreover, if the fact of integrating their externalities, in particular their positive externalities, rather requires public support, their development always remains the subject of demonstrating their real environmental added value, which is still a matter of debate for some sectors, such as biofuels (Timofeev et al., 2017).

Similarly, their macroeconomic costs will be even more adverse if they lead to conflicts over land use and food production. That is why we must remain vigilant about their impact on future food security: the production of photovoltaic electricity on earth and, above all, biofuels, for example, largely consumes agricultural land.

2. Appalling microeconomic costs

At the microeconomic level, renewable energy sources often represent large investments for farmers with uneven and uncertain economic profitability, which is confirmed only after a few years. These microeconomic costs can paralyze and become a serious obstacle to the development of renewable energy sources in the agricultural sector.

The required investments depend on many parameters, but the amounts can be high, while banks are cautious and financial risks are real. The difficulty of accessing financing through bank loans for projects whose profitability is sometimes questionable is an obstacle to the development of renewable energy, and special financing programs implemented by banks could help eliminate this obstacle. Taxation, which is more focused on renewable energy sources, will be an important incentive signal to facilitate farmers' investments in their development.

Thus, direct energy production should indeed be profitable compared to delegating management to energy companies or buying energy on the market, but each project is specific and strongly depends on its context: the nature of the field and energy source, accessibility and proximity to it, the field, access to land, proximity to networks, the nature of the project leader (individual, collective, operator(s), community, agricultural cooperative, etc.), investment potential. As a result, farmers prefer to manage and develop their resources directly in a short-circuit logic, which also allows them to benefit from most of the value produced, not to mention that the longer the transportation of waste, the higher its cost to the farmer and its negative external consequences for society (Yasnolob et al., 2019).

If photovoltaic and wind energy have reached the level of industrial and commercial maturity, with energy companies playing a central role, which also make profits, farmers are often content to lease their land, and farm-scale methane still raises questions in the field of research and development.

3. The volatility of some renewable energy sources, such as wind energy and photovoltaic energy.

The use of renewable energy sources poses the problem of the volatility of some of them, such as wind and solar energy, especially photovoltaic energy. There is also often a time lag between the production of electricity (for example, solar panels operating only during the day) and its consumption to meet needs (for example, the use of electricity at night for lighting) (Maskell et al., 2013).

Synchronizing supply and demand is a technological challenge that takes the form of energy storage, especially electricity generated by wind and photovoltaic solar energy.

4. The technological problem of energy storage

As noted above, since the storage of electricity is impossible, it is necessary to convert it into the form of potential energy of a chemical or mechanical nature. Technological innovation will be necessary to support the growth of renewable energy sources in our energy mix. It should also be noted that energy storage solutions have costs (which can go up to double the cost of the technologies used, for example, in photovoltaic or wind energy).

5. Obstacles related to social acceptability

Public opinion should fully understand the problems of climate change and agro-energy transition, transparently using the most advanced scientific knowledge. The fact that social acceptability is uneven depending on the renewable energy sources under consideration requires the creation of a hierarchy of the most effective solutions that should be brought to the attention and explained to the general public.

6. Administrative complexity

For many renewable energy sources (e.g. methane, solar and photovoltaic), project development is limited by cumbersome administrative procedures. The administrative and legal complexity of creating and implementing projects is subject to significant regulatory constraints. In particular, the investigation procedures were considered excessively long: it takes several years to implement a methanizer project in France (there are cases that lasted more than 5 years!), whereas, for example, in Germany, several months would be enough (Timmons et al., 2014).

The administration should provide feedback on existing files and identify difficulties and difficult places in order to draw conclusions. Simplification of these procedures should continue in any case. An organization that would be an intermediary and universal center for assistance to farmers and procedures related to renewable energy sources could provide such simplification.

This is far from the main obstacle to the development of renewable energy, but reducing administrative and legal complexity would help to rationalize their implementation.

7. Lack of professional training

Training courses that, within the framework of secondary or higher education, consider agricultural operations from an energy point of view are rare. However, training is a major challenge in energy production in the agricultural sector to explore related issues, interactions, enhance and secure income and avoid usage conflicts. It is necessary to educate farmers on these issues as early as possible. Agriculture is being transformed to produce energy, and as Olivier Doher, president of France Gaz Renewables and director of FNSEA explained, "if there are changes in agriculture, there are 'changes in learning'. Francis Clodpierre believes that one of the reasons for the failure of methane projects in France is the lack of training, blaming the presence of only four agricultural universities that offer certification training (Renewables, 2018). Moreover, it should be not just about the training of farmers, but also about all related professions (repairmen, electromechanics, analytical laboratories, etc.). The connection of agricultural secondary schools and professional secondary schools in the field of energy would also be relevant.

Training of energy producing farmers and, in particular, methane farmers seems necessary, since they are most often themselves involved in energy production in this sector.

Other sectors, such as wind power or photovoltaic (PV) energy, seem to require less training for farmers, since the latter's actions are not directly involved in energy production. In this case, special attention could be paid to economic models and the place of renewable energy in the economic balance of the enterprise.

4. DISCUSSION

Although it follows from this study that different energy sources in the agricultural world show opposite results in terms of advantages and disadvantages, especially in terms of social acceptability, yield or, above all, environmental impact, it is important to develop an energy transition in light of the complementarity of energies. There will be no single solution, and several renewable energy sources will have to be mobilized at the same time, among the latter biogas is particularly in need of development.

Within the framework of this study, the authors of the work have made some recommendations on the draft law on agricultural lands, which could become a vector for the reform of the agricultural world in favor of agroecology.

1. This first sentence is general and highly political in nature. As the most important principle, he puts the search for harmonization of state energy policy and its consequences for the agricultural world with the goals of food production, combating soil artificiality, carbon accumulation in the soil, maintaining biodiversity and public health well-being. This reconciliation should make it possible to ensure the priority of food production over other activities in the agricultural world in order to prevent the risks of conflicts of use.

Integrating public health among these priorities aims to articulate the interdependent issues of health, environment, food, agriculture and energy in a transversal and systemic vision. Our largely globalized agriculture and food affect the environment – harm biodiversity, pollution, global warming, soil quality – and shape our gut microbiota and our entire planet's immune system – a factor of resistance or vulnerability to infectious diseases. While our health policy often intervenes at the end of the race, on the care aspect and very rarely on the prevention aspect, although these topics are interdependent. This observation requires thinking about the contribution of agriculture to energy supply in this broad and end-to-end framework in order to avoid the reverse effect 188 and identify possible synergies (Owusu & Asumadu-Sarkodie, 2016).

2. To clarify the national energy strategy in relation to the agricultural world and, more generally, to improve the internal coherence of the State's energy policy in terms of the development of renewable energy sources by strengthening the role of Parliament.

This concern for improving the internal coherence of state energy policy in terms of the development of renewable energy sources, thanks to strategic interministerial management in the logic of the project, is relevant for the agricultural sector, but the authors noted the opportunity for other work, its relevance for carbon storage, disaster management, air pollution, the use of glyphosate or even the regulation of phytosanitary products (IRENA, 2018).

In addition, Parliament's role in defining and monitoring the national energy strategy should be strengthened. Such a provision is going in the right direction, but it will need to ensure that it does not limit Parliament's role to that of a legislator setting broad common goals: Parliament should be able to define renewable energy development goals for each sector, not just by type of energy, namely electricity, heat, fuel and gas. The responsibility for personal protective equipment should lie with Parliament, and the regulatory approach should only be used to establish a fine level of detail, and in no case to establish general guidelines by sector.

3. Support research on energy production in the agricultural sector and encourage the financing of innovative approaches, in particular the addition of an agricultural component to the energy research strategy

True to their role as a bridge between the political world and the world of research, the authors call for this third proposal to support research on energy production in the agricultural sector and encourage the financing of innovative approaches.

Such support requires the mobilization of existing systems to enrich them with an agricultural component. Therefore, a renewable energy research strategy should include an agricultural component.

In addition, the innovative use of ICTs and their applications, especially with the use of artificial intelligence (AI), which allows the creation of intelligent energy networks (smart grids), should be as broad as possible. For this purpose, basic and applied research, as well as R&D, can be mobilized before their dissemination and commercialization (Kvon et al., 2018).

4. Ensure regular and rigorous monitoring of energy production in the agricultural sector, integrating life cycle analysis approaches as much as possible.

Although energy production is not subject to regular monitoring by public authorities, it is proposed to ensure regular and strict monitoring, integrating approaches as much as possible from the point of view of life cycle analysis, which involves the

creation of questionnaires on energy production in the agricultural sector (Korovin et al., 2018). This can be implemented in the form of a general agricultural census and annual agricultural statistics, but at the expense of expanding the scope of the study. Moreover, this data should be publicly available.

5. Promote energy production and consumption in the agricultural sector through incentives to stimulate the attractiveness of business models for farmers, by adapting regulated prices, holding tenders and open windows, using the lever of agricultural taxation and by removing certain regulatory obstacles to energy production and consumption in the agricultural sector. This proposal should be operational and will require the mobilization of the Government and Parliament to stimulate energy production and consumption in the agricultural sector.

First of all, we are talking about the continuation and purposeful expansion of the incentive system, which allows stimulating the attractiveness of business models for farmers by adapting regulated prices, holding tenders and open meetings. For example, certain thresholds for open meters need to be raised, especially with regard to methane and rooftop solar energy 194 in order to facilitate agricultural projects.

It would also be appropriate to consider using the lever of agricultural taxation by increasing the ability of farmers to link income from energy production to the agricultural profit regime.

Finally, certain regulatory barriers to energy production and consumption in the agricultural sector or in nearby areas need to be eliminated, for example, by simplifying administrative and permitting procedures for renewable energy projects in order to encourage the agricultural world to acquire its own energy sources, energy production facilities and facilitate its own consumption. Such development should take place without reducing the requirements related to safety and the environment.

Any government policy should encourage the appropriation of energy production infrastructure by farmers and their groups, not just by energy companies or third-party operators. The fact that the agricultural world is encouraged to purchase its own energy production plants is especially noticeable in the wind and photovoltaic sectors, in which farmers are often content with providing land resources. A similar principle would also make it possible to change the views on these sectors.

Similarly, the sale of energy produced by them is today the dominant economic model for farmers, but it is necessary to promote the development of their own consumption. They should be able to use the energy they produce on farms, for example by using more solar heat pumps and local biogas, and by allowing agricultural machinery to use alcohols and oils produced for the biofuel sector, the use of locally produced biomethane fuels should be allowed.

Living off food production is a source of pride for many farmers, and the same will happen with energy production. In this regard, small wind energy, small hydroelectric power and geothermal energy are suitable solutions for self-consumption on a farm scale.

Without being the subject of an incentive policy, own consumption on the farm remains very limited. Energy production in the agricultural sector can meet the needs of the farms themselves and/or local consumers in the logic of a territorial closed-loop economy. Therefore, it is necessary to promote local consumption at the farm level or in nearby areas, where possible, in “energy communities”. In many cases, especially in the case of methane, wind power or photovoltaic power, connection to gas

and electric grids should remain the main goal, but the incentive for self-consumption and the development of technological solutions adapted to the size of farms will contribute to the production of energy by farmers. It would be possible to introduce a system to stimulate own consumption, even if public policy should continue to give priority to the introduction of biogas or electricity into the grid (Daioglou et al., 2016).

The growth of renewable energy sources, which are local sources of energy, will lead to a transition from a centralized energy system to a more distributed world. This is a transition period full of opportunities, but also risks, so it will need to be supported.

6. The deployment of territorial energy production projects in the agricultural sector within the framework of the territorial planning policy.

The authors recommend a territorial approach to energy production in the agricultural sector, integrated into the policy of regional planning. Therefore, the latter should be enriched by an energy policy of territorial agricultural origin, which does not take into account local peculiarities in territorial projects, and which can reach participation mechanisms, with or without "energy communities".

There is work to be done to rationalize and improve the most effective business models adapted to territories and various agricultural systems. The dissemination of these business models should be carried out through enhanced territorial coordination with the participation of local stakeholders, agricultural chambers and professional organizations representing the agricultural sector.

Partnerships can take many forms, here are some examples:

- a contract for the purchase and sale of thermal energy (hot air or hot water);
- a contract for the purchase and sale of biomass for a collective boiler house;
- a contract for the supply of animal husbandry waste for the mechanization installation and, conversely, waste disposal for the methanizer (in the case of sewage sludge);
- lease of land for wind or photovoltaic installations in exchange for agricultural land development;
- participation in a legal structure and/or a joint project;
- a contract for the sale of vegetable oils for municipal fleets, a contract for the sale of electricity or other network.

Several local players with funding or even common equipment (for example, a centralized boiler room) should participate in the deployment of certain solutions. These solutions increase the acceptability of renewable energy sources for society, especially when crowdfunding provides economic benefits for territories.

These territorial projects can also help to unite the rural and urban world in common views, the first of which is not very dense, but contains resources that allow energy production, including land, while the second is more often a consumer.

7. Adopt an approach to certification of ongoing projects, for example, in the form of labeling "Agroenergetics".

It would be advisable to initiate a certification process for ongoing energy production projects, for example, using labeling. They can exist at the industry level or be the subject of an integrated approach under one name. In this case, the authors propose the labeling "Agroenergy", which will meet the challenges and risks identified in this study. Labeling will be aimed at projects that prevent conflicts of use (agrivoltaism,

sustainable methanization, etc. d.), respect the priority of food production, use life cycle analysis, or even be part of a territorial approach (Springmann et al., 2018).

8. Improve training in energy production in the agricultural sector at the level of initial training (secondary and higher), as well as continuing education, with certain training courses designed to acquire high-level skills, including those related to the installation and operation of power plants

Awareness-raising among farmers, as well as among agricultural technicians and consultants, about the problems of energy production in the agricultural sector should begin at the initial training stage, in secondary and higher education, and then continue in continuing education.

In addition to awareness and dedication, certain training courses should ensure the acquisition of high-level skills, including those related to the assembly and management of power plants. If wind energy and photovoltaic energy are known and widespread, this is often the result of a lack of knowledge about other technological solutions, such as methane, and the mobilization of participants outside the agricultural world (energy specialists and developers), which sometimes push for simple turnkey solutions, but not always beneficial in terms of profits for the agricultural world. Energy production takes a long time, but the workload of farmers varies depending on the sector, and this leaves more or less room for diversification of their activities.

It is likely that training on energy production in the agricultural sector will enable farmers to develop more independent and informed strategies.

9. To protect agricultural lands with the help of a new legislative framework

As we have already seen, agricultural land is not always available, and artificial cultivation of land every year leads to a further reduction in available land resources (Shadrina, 2020). This is one of the obstacles to the development of renewable energy sources, some of which, such as biofuels or terrestrial photovoltaic electricity, consume a lot of land and can cause conflicts of use that harm food crops (plants and animals).

First of all, it should be about bringing these reflections to a proposal for a new legislative framework aimed at better protection of agricultural land. This future bill may also become a vector for the reform of the agricultural world in the sense of a general orientation in favor of agroecology in a transversal and systemic vision of the interdependent issues of health, energy, environment and agriculture.

5. CONCLUSION

As for the key factors that make renewable energy sources a vector of rural development, the authors suggest:

- Integrate energy strategies into the strategy of local economic development so that they meet local potential and needs;
- Integrate renewable energy into broader rural economic supply chains such as agriculture, forestry, traditional industry and green tourism;
- Limit subsidies in both volume and duration and use them only to support renewable energy projects that become economically viable;
- Avoid imposing renewable energy sources on regions that are unlikely to be able to accept them;
- Focus on relatively mature technologies such as biomass heat generation, small hydropower and wind energy;

- Create a unified energy system based on small networks capable of supporting production activities;
- Recognize that renewable energy sources compete with other sectors for resources, especially land;
- Evaluate potential projects based on investment criteria, rather than based on short-term subsidy levels;
- At the local level, gain the support of the population by providing them with clear advantages and involving them in this process.

As for the obstacles, the authors point out that bioenergy is not synonymous with sustainable energy. The sustainability of bioenergy largely depends on how biomass is produced and used. Biomass production and use are not necessarily sustainable, for example, if they have a negative impact on people, the environment or natural resources and may jeopardize the ability of future generations to meet their needs.

Bioenergy is also associated with environmental and socio-economic risks for rural areas. For example, land-use change, intensification of forest management, or intensive cultivation of energy plants can lead to a reduction in biodiversity, soil degradation, water stress, or water pollution. Burning wood biomass can also lead to increased emissions of some harmful air pollutants, and discussions are ongoing about whether this type of biomass is truly carbon neutral.

Finally, the authors emphasize the problem of data scarcity: there is no comprehensive information on the number of projects, the amount of energy produced from renewable sources, or installed capacity. Therefore, it is impossible to quantify the contribution to the introduction of renewable energy sources in rural areas. In the absence of up-to-date and reliable information on renewable energy sources, it is impossible to assess the effectiveness of these measures.

Thus, sustainable agriculture occupies a primary place in the era of intelligent farming or smart farming. In the context of the energy transition, agriculture faces a dual task: to reduce dependence on fossil fuels and provide society, in addition to food, with bioenergy to replace fossil fuels. The reality of this task depends on the ability of agriculture to achieve energy neutrality, that is, to balance external energy consumption with energy recovery from internal sources.

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EMIGRATION AND ITS IMPACT ON THE SENDING COUNTRY. SOCIAL AND ECONOMIC EFFECTS FOR ROMANIA

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ABSTRACT

The topic of emigration and its global impact are significant due to several intertwined economic and social implications. The articles aims to investigate the emigration effects on the sending country, such as the effects of labor force loss, together with transformations in social dynamics and demographic shifts in order to understand and address their complex challenges.The research was conducted based on a survey, which was conducted on a sample size of 535 participants, aged between 18 to 63 years old, of which more than a third were females, and data were processed with statistical methods to emphasize the multifaceted impacts of these trends. Key findings highlight that economically, remittances from the diaspora contribute significantly to household incomes in Romania, offering support to many families and local economies. However, the loss of human capital, particularly skilled workers, imposes a long-term challenge to vital sectors and long-term development. Socially, emigration has led to altered family, resulting in a generation of children alienated from their families, with potential psychological effects. This research offers crucial insights into the complex dynamics of emigration, providing valuable insights for policymakers to address its challenges through strategies mitigating negative outcomes while optimizing the benefits of emigration.

Key words: *Emigration, Economic Implications, Social Dynamics, Remittances*

1. INTRODUCTION

Emigration is the process in which individuals leave their country of origin to settle permanently in another. In a more abstract sense, it is the response to changes in living standards caused by changes in population numbers, development of production and trade, formation of countries, states, nationsm climate change, and wars (Bite, 2020), and it is in fact a phenomenon that has profound consequences for both sending countries (Katseli, 2006) and receiving countries (Weiner, 1990). In recent decades, Romania, like many other nations, has experienced significant levels of emigration, leading to a multitude of social and economic consequences (Bite, 2020). This article aims to

examine the complex relationship between emigration and its impact on Romania, focusing in particular on the social and economic effects on the sending country.

Historically, Romania has been characterized by periods of emigration and immigration, influenced by various political, economic and social factors. However, since its accession to the European Union in 2007, Romania has witnessed a significant increase in emigration, driven mainly by economic disparities, lack of employment opportunities and aspirations for higher living standards abroad (Iftimoaiei, 2018; Iordache&Titan, 2022). The scale of this wave of emigration has generated growing concern among policymakers, researchers and citizens about its repercussions on Romania's social structure and economic development.

From a social perspective, emigration has led to significant demographic changes and changes in the composition of Romania's population. The predominant flow of young people and skilled people has led to demographic imbalances, with implications for the labour market, healthcare system and pension sustainability in the country. In addition, emigration has disrupted family structures and community cohesion, as families are separated and social networks are fragmented, generating emotional tension and social dislocation.

Economically, emigration has both diverse repercussions on Romania. On the one hand, remittances sent by Romanian emigrants represent an important source of income for many households, contributing to poverty reduction and consumption-based economic growth. The long-term consequences of emigration on Romania's economy are complex. The loss of skilled professionals and workforce burnout can hamper productivity, innovation and overall economic competitiveness. In addition, reliance on remittances as the main source of income can perpetuate a cycle of economic vulnerability and hamper investment and domestic development.

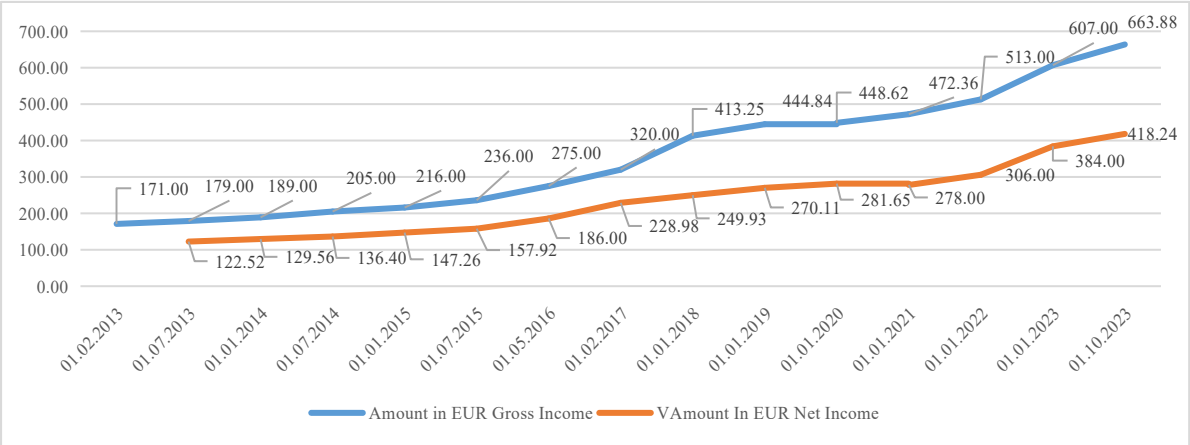
Given these complexities, understanding the social and economic effects of emigration on Romania is crucial for formulating effective policies to address its challenges and capitalize on its opportunities.

2.CAUSES OF EMIGRATION

Romanians left Romania, massively, in intense or less intense flows, as early as 1990, but exile had begun earlier, still under the Ceausescu regime, when people no longer hoped that anything would ever change significantly for the better in Romania. This feeling has remained and determines many Romanians to take the road to emigration. (Chirila, 2017)

The salary represents one of the main reasons for emigration (Savu, 2023)

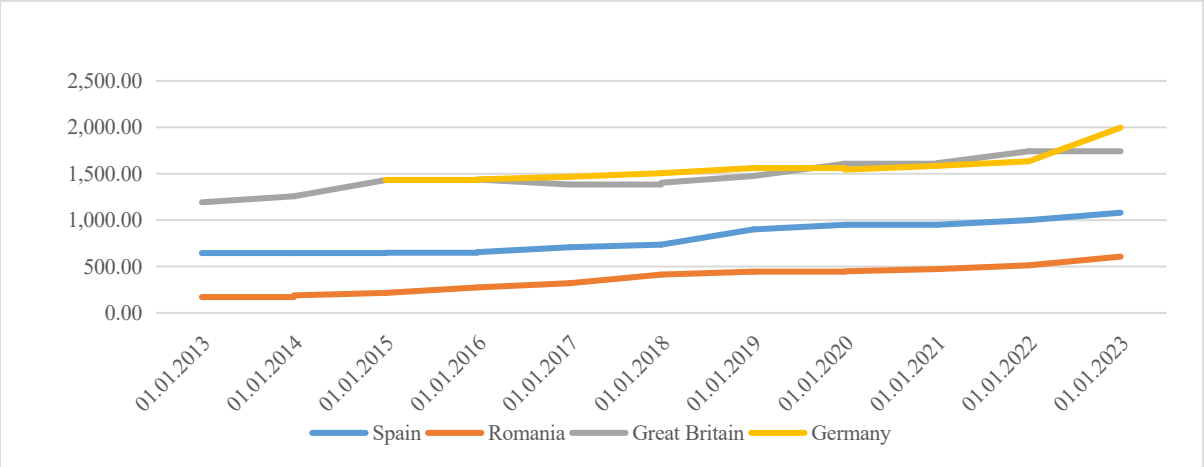
Fig. 1 The evolution of the minimum wage in Romania



Source: https://legislatie.just.ro/

According to the data presented in Fig. 1, the minimum wage in Romania had a steady increase from 2013 to 2023. However, Fig. 2 highlights the fact that the average gross minimum wage in the last 8 years in Romania has been lower by EUR 1127 than the ones in the top 3 countries where the largest communities of Romanians are located (Spain, Germany, Great Britain), which proves that in terms of wages, the Romanian workforce is more motivated to choose emigration to the West. It is worth mentioning that Italy, where the largest community of Romanians is located, does not currently have a minimum wage set at national level and for these reasons, data related to Italy is not processed.

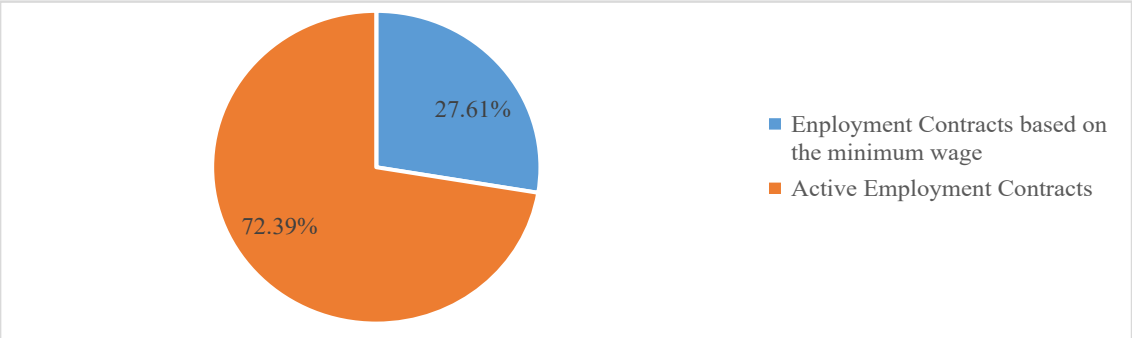
Fig. 2 Gross minimum wage evolution in Romania, Spain, Great Britain and Germany



Sources: Eurostat

According to data from the Ministry of Labor (collected from the REVISAL system), there were an average of 6,725,745 open-ended contracts in 2023. From the processing carried out by the institution managing this base, it is estimated that the number of active employment contracts at the level of the minimum gross wage guaranteed in payment in October 2023 (the time of processing) is approximately 22%, as presented in Fig. 3.

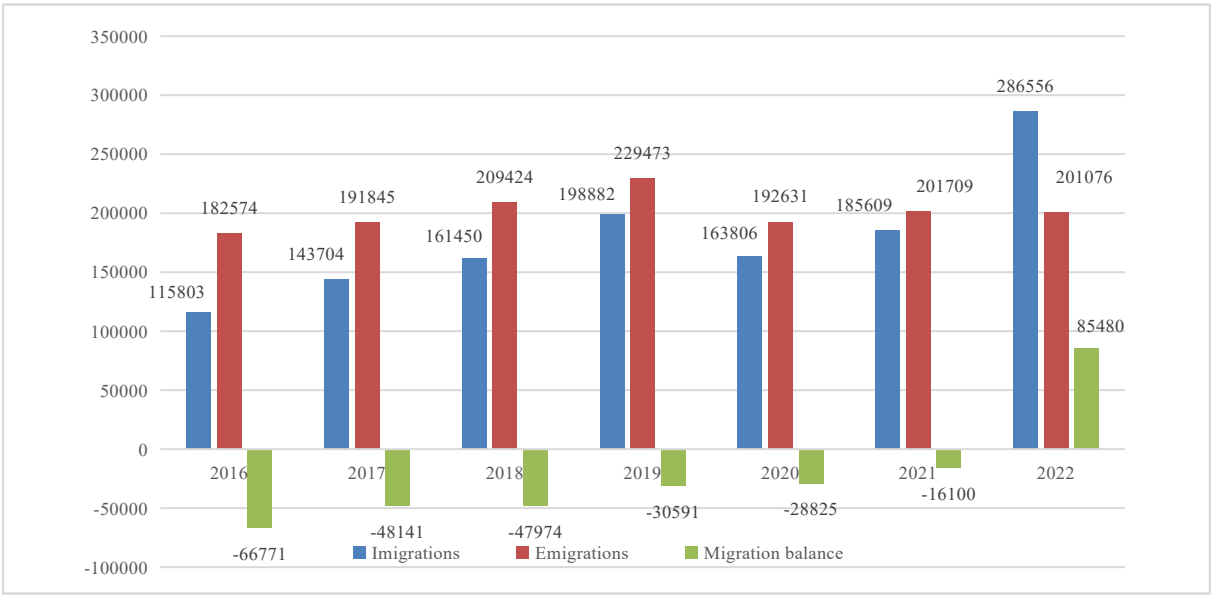
Fig. 3 Share of work contracts classified at the minimum wage in the total active employment contracts, 2023



3.THE SOCIAL AND ECONOMIC IMPACT OF LABOUR EMIGRATION

Level of emmigration. As presented in Fig. 4, an upward trend in emigration is observed between 2016 and 2019. In 2019, the number of temporary emigrants in the reference period wasthe highest, while 2020 is the year with the lowest values related to emigration in the reference period, namely 192,631 departures and in 2021 the lowest migration balance was recorded, the difference between emigrants and immigrants being only 16,100 people.

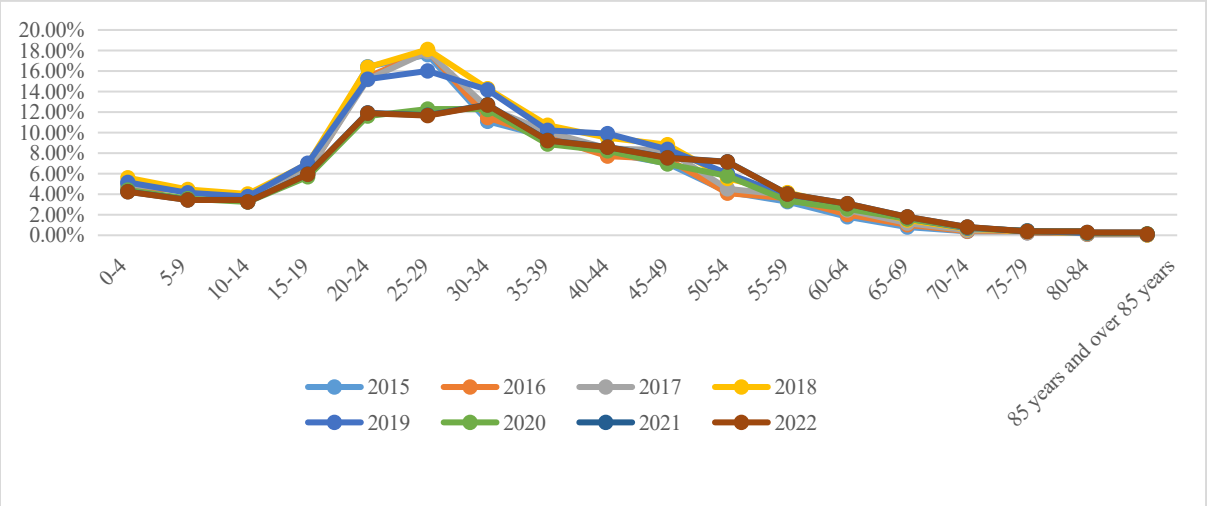
Fig. 4 Level of migration from Romania, 2016-2022



Source: TEMPO Online (insse.ro)

If we analyze the age structure of emigrants (Fig.5), it is noted that the most important share is represented by people in the age group 20-29 years (489.335 people between 2015-2022) and the group 30-39 years (369,568 people between 2015-2022). High migration among young people will result in significant labour market problems in the coming years. Also, the phenomenon of demographic aging is increasing due to changes in the structure of the population.

Fig. 5 Long-term temporary international emigration



Source: TEMPO Online (insse.ro)

The phenomenon of demographic ageing is particularly present in Europe, where there is a natural decline and an upward trend in population ageing (Zastavetska, 2023). Almost 30 years after the political, economic and social changes that marked Europe at the end of the ninth decade and the beginning of the tenth decade in the last century, the economic and social landscape of Central and Eastern European countries - including Romania - has radically changed, and these changes have also left their mark on demographic developments. Two phenomena have contributed to the rapid acceleration of population ageing in these countries - falling birth rates and increasing international migration. (M., 2016)

As presented in Fig. 6, although the population aged up to 14 years had a fairly similar evolution to the population aged over 65, the latter not only represents a higher percentage of the total population but also changes its ancestry trend and begins to evolve much faster than the population aged up to 14 years. These events have as their main consequence the reduction of the working-age population, i.e. the population aged 16-65 years, according to Figure 7.

Fig. 6 Share of population aged 0-14 years and over 65 years in the total resident population in 2016-2023

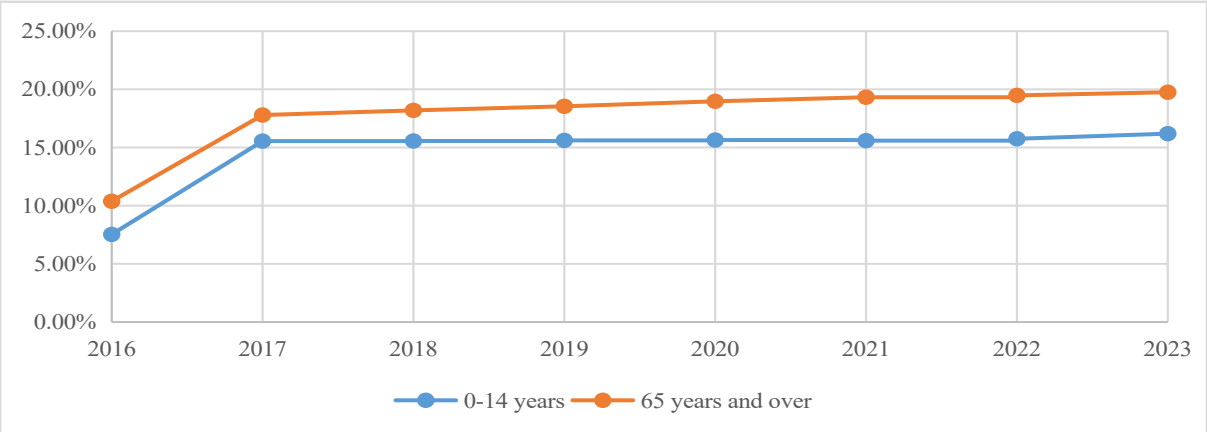
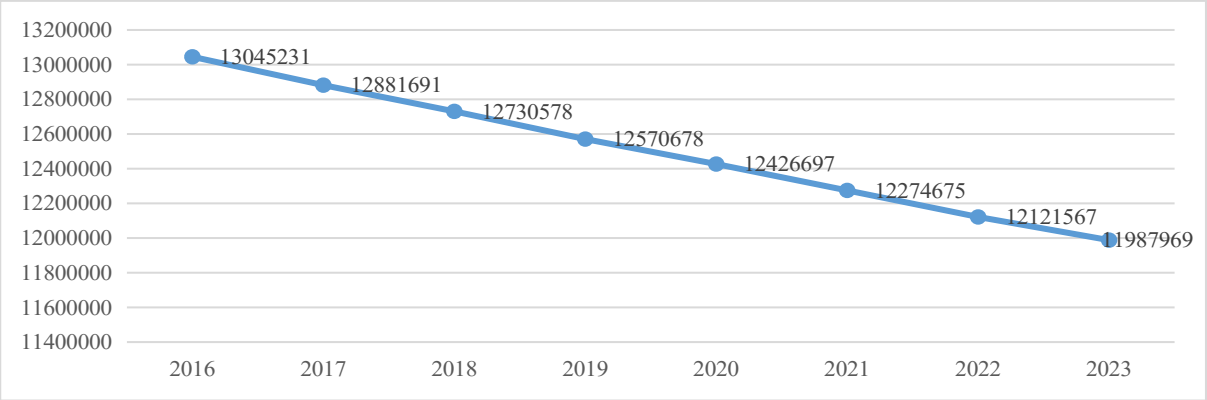


Fig.7 Evolution of the population legally able to work

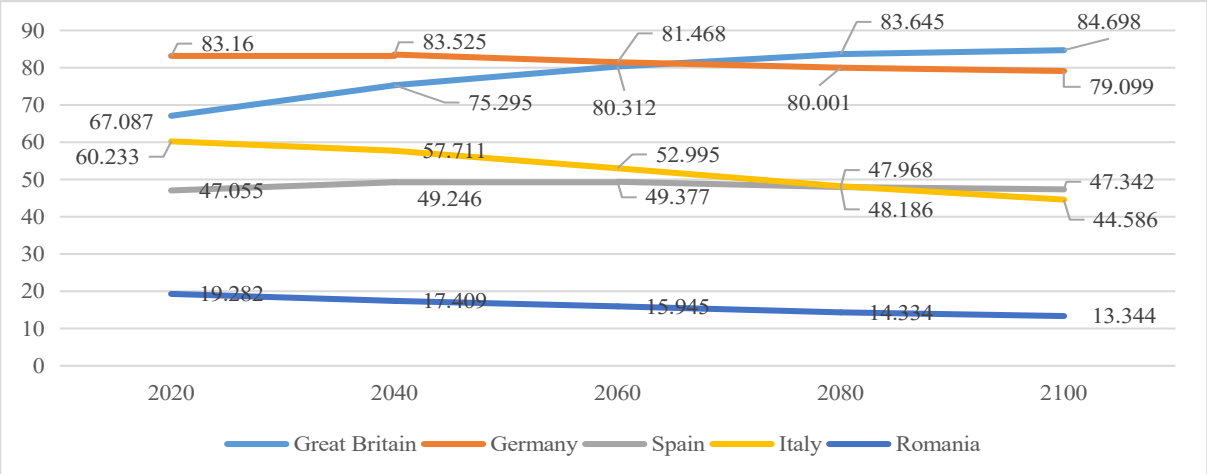


Source: TEMPO Online (insse.ro)

An involution of the population aged between 16 and 64 (active population in terms of work) in Romania between 2016 and 2023 indicates a decrease or reduction in the size of this demographic group during the specified period. A decline in the working population can have profound economic repercussions. It could signal challenges in terms of labor availability, leading to labor shortages in certain sectors and the need to import human resources, as proven by Government Decision 1338/2023 issued by the Romanian Government on setting the quota at 100,000 foreign workers (Non EU) newly admitted to the Romanian labor market in 2024. This could affect economic growth, productivity levels and competitiveness.

Considering population projection at the horizon of 2020, 2040, 2060, 2080, 2100 Fig.8., the following considerations can be made: if in 2020, within the classification by population size, the top countries analyzed were: Germany, the United Kingdom, Italy, Spain and Romania, in 2100 there will be a change. Germany will be overtaken by the United Kingdom by a difference of several hundred thousand people, but the other countries will keep their place. Fig. 8 highlights that all countries have a slight tendency to increase population size, except Italy (which is facing the major problem of demographic ageing), and Romania. In Romania's case, the situation is more complex due to the fact that, besides demographic aging, a phenomenon is on the rise, the active labor population (population aged 15-35) is in full wave of emigration. (Zastavetska, 2023)

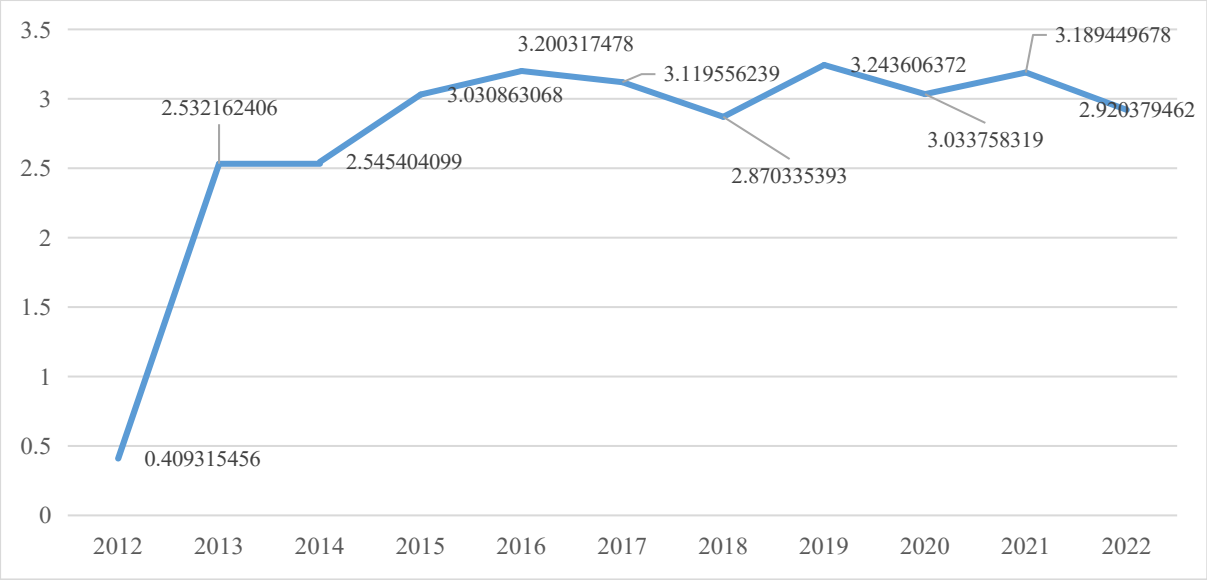
Fig.8 Population projection at the horizon of 2020, 2040, 2060, 2080, 2100



Source: https://ec.europa.eu/eurostat/databrowser/view/tps00002/default/table?lang=en

The migration phenomenon had a positive impact on income inequality in the country through the transfer of capital to Romania in the form of remittances by Romanian emigrants. Remittances also reduced inequality between rural and urban areas. A downward trend, respectively stagnation between 2007-2012 can be noted,then in the following year the value of remittances increases approximately 4.77 times. One possible cause is that the emigration rate of Romanians had an upward trend in 2013 compared to 2012. However, the peak is in 2017, when the total value of remittances represented 3.24% of Romania's GDP in that year, which had a value of approx. 6.3 bn EUR . Fig. 9 puts into evidence an impressive evolution of remittances in Romania, between 2012-2013 their share of GDP increased more than 6 times, from 0.40% to 2.53%, after which a slight upward trend was maintained Fig.9. (Walsmley TL)

Fig. 9 Evolution of remittances (%), 2012-2022



Source: Personal remittances, received (% of GDP) - Romania | Date (worldbank.org)

4.METHODOLOGY

The research was conducted based on a survey among 535 subjects who have an ongoing or had an emigration project to collect data on aspects of their lives.

The self-administrated questionnaire was used as an instrument for data collection. The data were gathered from September- November 2023.

The sample structure according to the socio-demographic characteristics of the respondents is presented in Table nr. 10

Table 1. Description of the sample

Gender	Male	31.65%
	Female	68.35%
Age	Under 20 years	0.19%
	20- 29 years	23.22%
	30- 39 years	39.51%
	40- 49 years	24.16%
	50- 59 years	10.30%
	60 de years and over	2.62%
Environment origin	Urban	65.42%
	Rural	34.58%
Education level	Secondary school studies	4.11%
	Highschool studies	49.53%
	Higher education	46.36%

The types of questions used in the questionnaire inlcuded multiple choice and a 5-point Likert scale (1—very interested, 5—not interested) responses. For the data analysis we used descriptive statistics, respectively, the relative frequencies and average scores.

5. RESULTS

The information presented in Table 2 highlights the distribution of emigrants between different European countries. A significant percentage of 23.4% indicates that England was the main choice of emigrants. Germany ranks second with 14.2%, followed by Cyprus and Denmark, both with close percentages. Italy and Spain also attracted certain proportions of emigrants, while Hungary recorded a lower percentage. The rest of the emigrants went to other countries, accounting for 20.7% of the total. These statistics reflect the different preferences of emigrants in terms of destination countries.

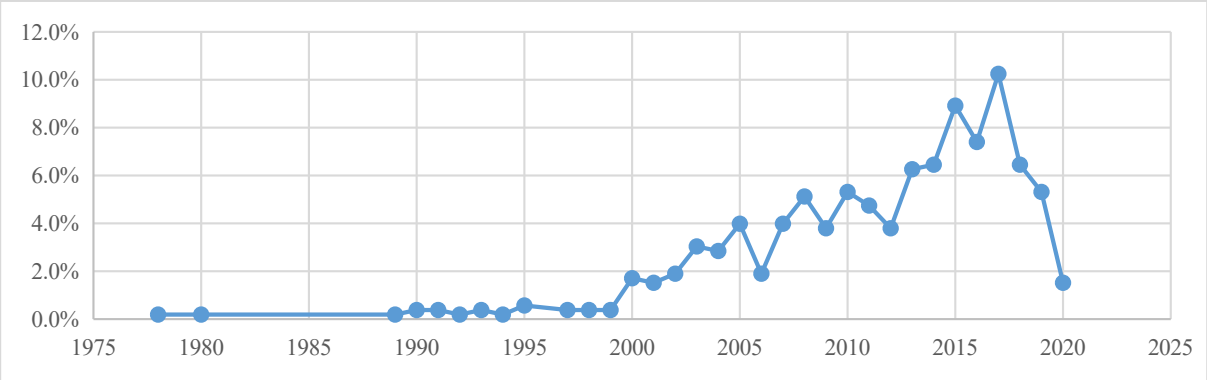
Table 2 Main host countries of the respondents

Nr. Crt	Host countries	% of the total (535 subjects)
1	Great Britain	23.4%
2	Germany	14.2%
3	Cyprus	13.5%
4	Denmark	13.1%
5	Italy	6.9%
6	Spain	5.8%
7	Hungary	2.4%
8	Others 23 countries	20.7%

Fig.10 highlights the evolution of the percentage of emigrant subjects between 1978 and 2020. Between 1978 and 1989, the percentage of departures was very low, stable around 0.2% for each year, indicating a low migration initially. Since 1990, the percentage has increased progressively, reaching values of 0.4% in 1990 and 1991, then 0.2% in 1992 and 1994. An upward trend has become evident since 1995, when the percentage reached 0.6%. Growth continued until around 2008, with annual variations, but with a general upward trend. From 2008 to 2015, the percentage of departures increased significantly, peaking in 2015 (8.9%) and 2017 (10.2%). After these peaks, the percentage began to gradually decrease, registering values of 6.5% in 2018, 5.3%

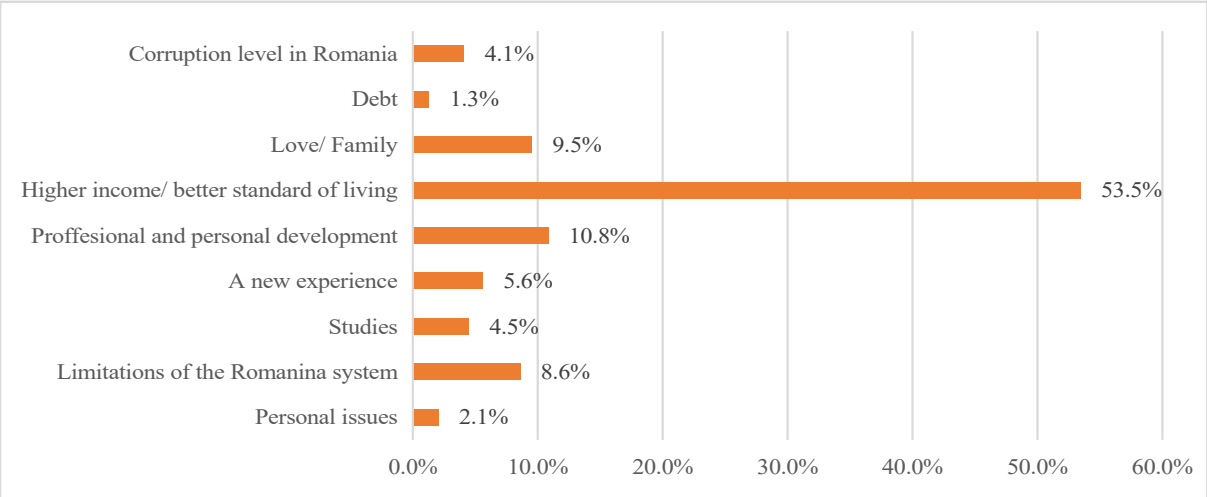
in 2019 and 1.5% in 2020. These data indicate a general trend of emigration growth in recent years, with departures peaks in 2015 and 2017, followed by a slight decrease in recent years.

Fig. 10 Year of departure abroad



The information provided in Fig. 11 outlines a complex picture of the reasons that led to the departure of some Romanians from the country. These reasons include personal problems, with a share of 2.1%, and limitations in Romania, which account for 8.6% of all reasons. Some people chose to go abroad to study abroad (4.5%) or in search of a new experience (5.6%). A significant number were motivated by finding a job or personal development, with a share of 10.8%. However, the highest percentage, at 53.5%, indicates that the desire for higher incomes and a higher standard of living was a major factor for those who emigrated. Reasons related to love and family (9.5%), financial problems or debts (1.3%) and dissatisfaction with corruption (4.1% of the total) were also present. This diversity of reasons highlights the complexity of Romanians' emigration decisions and the importance of economic and family factors in these decisions.

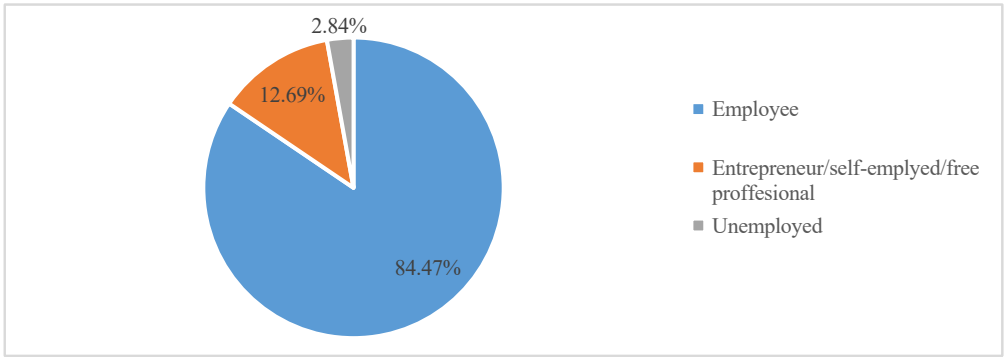
Fig. 11 Reason For Leaving



The information provided in Fig.12 highlights the occupational situation of emigrant subjects, with various categories. Most of them, 84.47% of the total, are employed in the destination country, reflecting an economic stability given by finding a job. The segment of entrepreneurs, self-employed or free professionals accounts for 12.69% of the total, reflecting a level of entrepreneurship and independence among emigrants. A smaller percentage, 2.84%, are in unemployment in the destination country, indicating difficulties in finding a suitable job for these individuals. This analysis suggests that

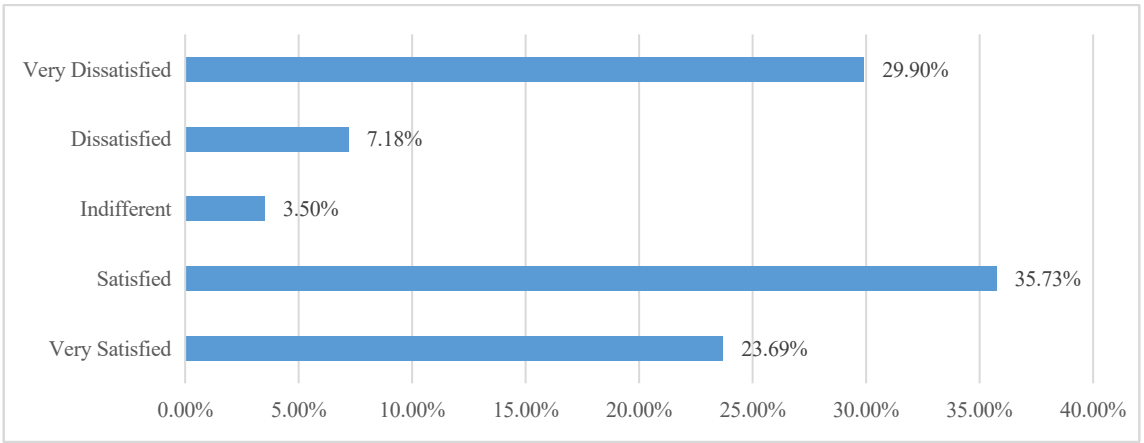
most emigrants have managed to get stable employment abroad, with some opting for entrepreneurship or self-employment. However, a small percentage face unemployment, a sign that some are finding it difficult to integrate into the labour market of the destination country.

Fig. 12 Economical/employment status of the respondent in the host country



The data shown in Fig. 13 reveal a diversity of views on working conditions. A percentage of 23.69%, classified as "Very Satisfied", indicates that a significant segment of the workforce is extremely satisfied, possibly reflecting an optimal working environment and favorable conditions. Most of the responses, 35.73%, fall into the "Satisfied" category, a sign that most employees are satisfied, although not exceptionally. The "Regardless" segment constitutes only 3.50% of the total, suggesting that a small percentage of employees do not feel a significant impact of working conditions on them. The category "Dissatisfied" includes 7.18% of total responses, indicating the presence of dissatisfaction regarding aspects of the work environment. Alarming is the percentage of 29.90% of the answers "Very dissatisfied", pointing out the existence of serious problems or unmet needs in working conditions. These data show a significant variation in satisfaction levels and can serve as a basis for necessary improvements to create a more pleasant and efficient work environment for all employees.

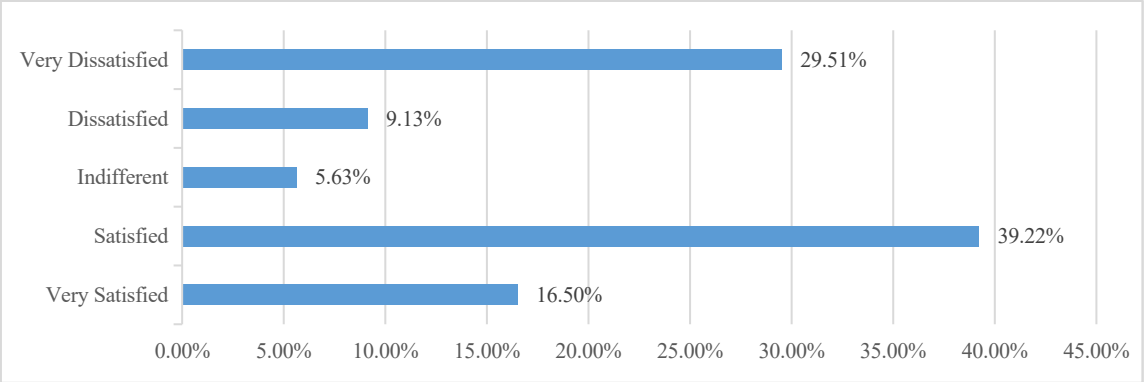
Fig.13 Workplace Conditions



The information provided in Fig. 14 show that employees perceptions of advancement opportunities within the company vary significantly. A percentage of 19.42% of employees are very satisfied ("Very Satisfied"), appreciating the prospects for growth and career progression offered by the company. Another 28.35% of respondents are satisfied ("Satisfied"), believing that there are satisfactory opportunities for their professional development, although they are not extremely enthusiastic. A minority of 7.96% feel indifferent ("Indifferent") to these opportunities, possibly not giving much impor-

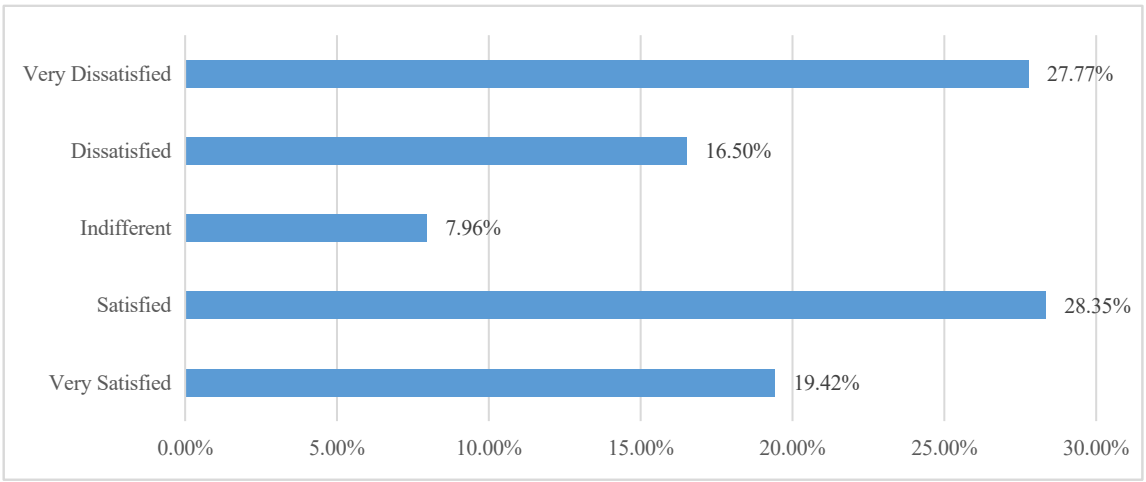
tance to this aspect of the workplace. In contrast, 16.50% of employees are dissatisfied ("Dissatisfied") and 27.77% are extremely dissatisfied ("Very Dissatisfied"), indicating frustration or disappointment with limitations to their professional advancement. This variation in responses emphasizes the importance of continuously analyzing and improving career opportunities and organizational culture to address employee needs and expectations.

Fig. 14 Workplace Daily Tasks and Applications



As for employees' perception of advancement opportunities, information provided in Fig. 15, they provide a detailed insight into their job satisfaction. Of the total responses, 19.42% of employees are classified as "Very Satisfied", indicating a deep appreciation for the chances of career growth and progression offered by the firm. A higher proportion, 28.35%, feel "satisfied", acknowledging the existence of satisfactory opportunities for advancement, even if they are not perceived as exceptional. On the other hand, 7.96% of employees show themselves "Indifferent", suggesting a lack of interest regarding this aspect. A worrying segment of 16.50% of the workforce is "Dissatisfied", and another even higher, 27.77%, identifies as "Very Dissatisfied", both categories expressing frustrations and disappointments related to perceived limitations on their professional advancement. These results highlight a critical need to reassess professional development policies and adapt organizational culture to improve employee satisfaction and foster positive career progression for all team members.

Fig. 15 Wage and Promotion Opportunities



Information from Fig.16 shows the variation in employees perception of the salary level in relation to the work done and can provide essential information for managing

employee satisfaction and for evaluating and improving the organization's salary policies. About 20.39% of employees feel "Very Satisfied", indicating that they consider themselves adequately rewarded for their work. In addition, 33.01% of respondents are "Satisfied", suggesting that although they are not extremely enthusiastic, they perceive their compensation as generally fair. On the other hand, a small percentage, 4.85%, are "Regardless" with little or no interest in this aspect of their job. More worrying is that 13.40% of employees are "Dissatisfied" and 28.35% are "Very Dissatisfied", these categories expressing dissatisfaction and frustration with their salary level, considering that they are not sufficiently rewarded for their efforts. These results highlight the need for closer assessment of pay structures to improve overall employee satisfaction and ensure compensation perceived as fair and motivating.

Fig. 16 Satisfaction for Salary in Relation to the Work Done

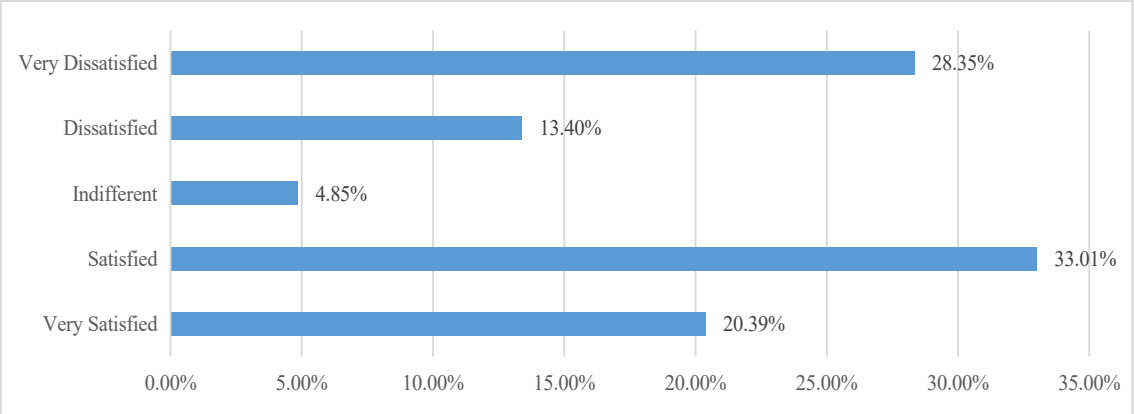
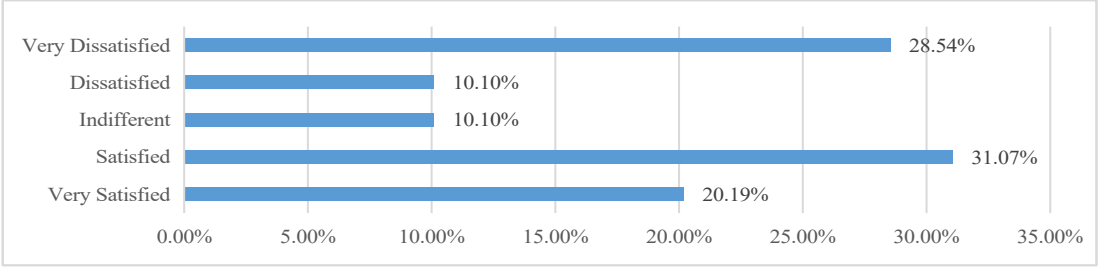


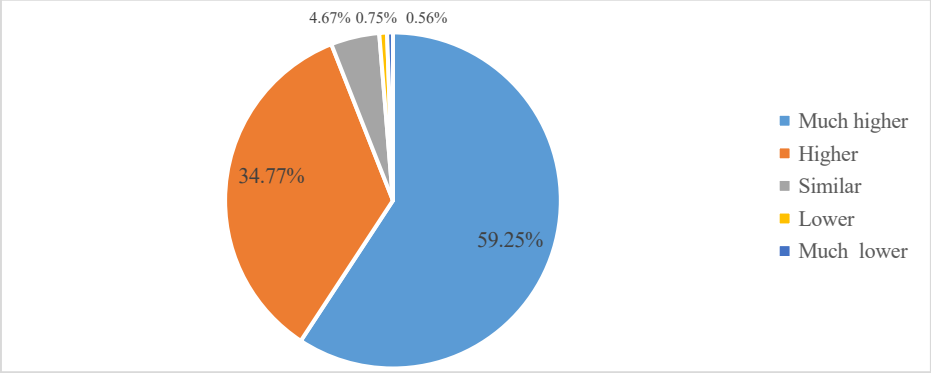
Fig.17 highlights the variation in employees' perception of the management team's receptivity to their proposals and can provide essential information for improving communication and relationships within the organization. The results of an employee satisfaction survey on the receptivity of the management team to their proposals show a significant variation in employee perception. A percentage of 20.19% of respondents are in the "Very Satisfied" category, expressing extreme satisfaction and appreciation for the fact that they are listened to and that their proposals are taken seriously by the company's management. Also, 31.07% are "Satisfied", perceiving that their proposals are taken into account, even if not exceptionally. 10.10% declare themselves "Indifferent", suggesting that they do not pay special attention to how their proposals are received. On the other hand, 10.10% are "Dissatisfied", feeling that their proposals are being ignored, while a significant proportion of 28.54% are "Very Dissatisfied", indicating a deep frustration with the level of involvement and attention paid by management. This feedback provides a clear signal that there is a need to strengthen communication and engagement between employees and management to improve collaboration and overall job satisfaction.

Fig. 17 Management team's responsiveness to the responder's proposals



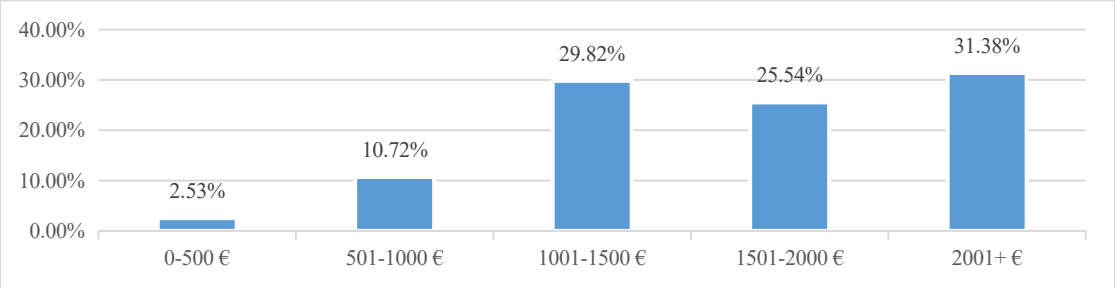
The feedback from emigrants regarding the standard of living in the destination country as shown in Fig. 18 reflects a variety of perceptions and experiences. Most of them, with 59.25% of the answers, consider that their income in the destination country ensures a much higher standard of living than in Romania, indicating a significant improvement in the quality of life after emigration. Another 34.77% perceive a better standard of living in the destination country, even if not significantly higher than in Romania. 4.67% believe that living is similar in the two countries, while only 0.75% feel that their standard of living is lower in the destination country. A minority figure, 0.56 percent, believe living is much lower in the country. These data provide a panorama of the diversity of migrants experiences and how they perceive the changing living environment in the destination country.

Fig. 18 Standard of living, comparison between abroad and Romania



The interviewed emigrants providedinformation about their monthly income levels in the destination country according to Fig. 19, reflecting a diversity in the financial statements. A small percentage, 2.53%, say they earn between € 0 and € 500 monthly, suggesting financial difficulties or very low income. The range of 501-1000 € is reported by 10.72% of respondents, while 29.82% earn between 1001 and 1500 euros monthly, indicating a more comfortable level of their income. Next, 25.54% have income between 1501 and 2000 euros monthly, reflecting a significant part with considerable income. The most frequently reported interval is over 2000 euros monthly, with 31.38% of responses, indicating that this significant proportion of emigrants benefits from substantial incomes, facilitating a comfortable living and a high standard of living. The data illustrates the financial variation of emigrants and reflect the different economic situations encountered in their destination country.

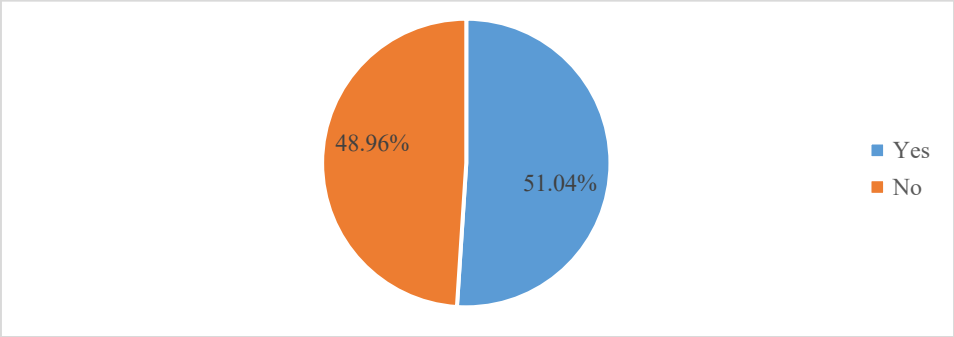
Fig. 19 Salary in the country of emigration



Regarding the option to return to Romania as shown in Fig. 20, it was found that 51.04% of emigrants would be willing to return permanently to Romania. Motivations for this option may vary, including family ties, a desire to return to their roots, or fa-

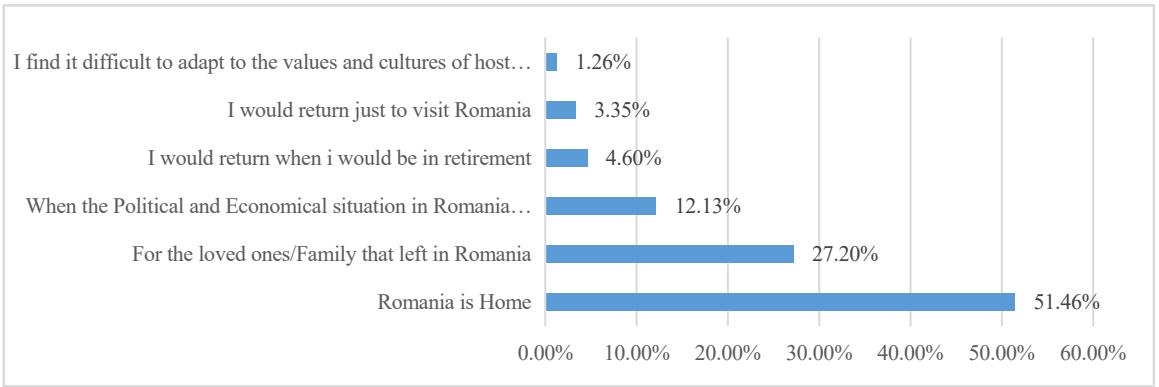
vorable future prospects in the country. At the same time, 48.96% of those interviewed indicated that they would not be interested in returning permanently to Romania. Motivations for this choice may include better career opportunities or higher levels of comfort and stability in destination countries. The data puts into evidence the diversity of perspectives and experiences encountered by emigrants in relation to the possibility of returning to Romania.

Fig.20 Option for coming back to Romania



Regarding the reasons for returning to Romania presented in Fig. 21, most emigrants, representing 51.46% of all responses, perceive Romania as "Home", denoting a strong emotional and cultural connection with their country of origin. A significant percentage, 27.20%, consider returning to Romania to be closer to loved ones or family left there. About 12.13% of respondents expect an improvement in the political and economic situation in Romania before returning. Another reason, having 4.60% of the answers, indicates the intention of some to return to the country in retirement, as an ideal place to relax. There are also those who think about returning only in periodic visits, with 3.35% of responses, without settling down definitively. A small part, 1.26%, consider the recovery due to difficulties in adapting to the values and cultures of host countries. This diversity of reasons underscore the complexity of the emigrants decision to return to Romania and their varied wishes and ties with their country of origin.

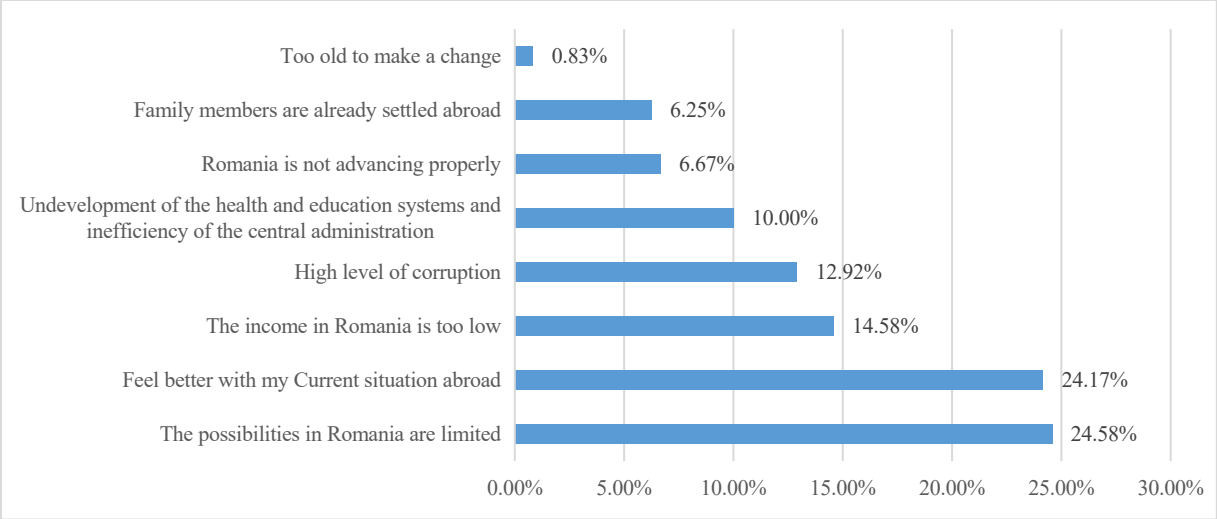
Fig.21 Reasons for Coming Back to Romania



A significant percentage of respondents, namely 24.58%, consider that the possibilities in Romania are limited compared to other places, thus expressing a perceived lack of opportunities in the country. Also, 24.17% of participants say they feel better and are more satisfied with their current situation abroad than they would be in Romania, reflecting a level of comfort and contentment in the foreign environment. Another aspect highlighted is given by 14.58% of respondents, who consider that their income in Romania is too low to allow them a comfortable life. In addition, 12.92% of them are

discouraged by the high level of corruption in the country and perceive that this negative aspect influences their quality of life and future prospects. A concern conveyed by 10.00% of participants refers to the underdevelopment of health and education systems, as well as the inefficiency of the central administration in Romania. This concern reflects the low level of public services and concern about their quality. Also, 6.67% of respondents perceive that Romania is not advancing properly and that there are no prospects for improvement in the near future, thus expressing a lack of perceived progress in the country. Another reason why some respondents, representing 6.25%, do not want to return to Romania is because their family members are already settled abroad, reflecting social and family ties as a determining factor in the decision to return to the country. Finally, 0.83% consider that they are too old to make a change and adapt to life in Romania, thus expressing a reservation about the adjustments and adaptations necessary for a permanent return to Romania. These issues illustrate the varied concerns and complexity of migrants decision to return to their country of origin.

Fig. 24 Reasons for Not Coming Back to Romania



6.CONCLUSIONS

The analysis of the socio-economic impact of population emigration from Romania reveals a complex interaction of factors contributing to significant challenges and changes in the demographic and economic landscape of the country. Several key conclusions can be drawn from this study:

Low wage disparity of the minimum wage: A prominent factor contributing to population emigration is the significant difference in minimum wage levels between Romania and destination countries. The disparity in earning potential leads individuals, especially skilled ones, to seek employment opportunities abroad, where they can achieve higher incomes and improved living standards. Addressing this wage gap is essential to retain talent in the country and promote domestic economic growth.

Dependence on Minimum Income Employment: The prevalence of people employed at or close to minimum income levels highlights broader problems of labor market segmentation and precarious employment in Romania. A significant portion of the workforce depends on minimum-income jobs, which often offer limited prospects for career advancement and financial stability. Improving job quality, promoting skills development and creating an enabling environment for entrepreneurship are crucial to break the cycle of low-wage employment and promote sustainable livelihoods.

Declining Workforce Population: The decline in the number of people in the working population accentuates labour market challenges and underlines the urgency of addressing demographic change. The emigration of working-age individuals contributes to labour shortages, skills shortages and increased dependency ratios, with significant implications for economic productivity, social security systems and long-term sustainable development. Implementing targeted policies to attract and retain skilled workers, promoting labour market participation and investing in education and training is vital to mitigate the adverse effects of labour decline.

Population Ageing Dynamics: In parallel with emigration, Romania is facing demographic ageing, characterized by an increasing proportion of older people to the working-age population. Population ageing presents complex challenges, including increased demands for health services, pressure on pension systems and changes in consumption patterns. Addressing the needs of an ageing population requires comprehensive policies encompassing healthcare provision, social support networks and strategies for active ageing and intergenerational solidarity.

Case study: Data on the destinations of Romanian emigrants highlight the complexity and multifaceted nature of international migration, calling for comprehensive approaches to address the challenges and opportunities associated with migration for both Romania and destination countries. These data provide valuable insights into the dynamics of emigration trends over time, including the fact that the rise of emigration began in the year Romania joined the EU, and enable politicians and researchers to better understand the factors influencing emigration decisions and develop strategies to address the challenges and opportunities associated with migration.

Appreciating their current job: Addressing the discrepancies between job satisfaction and dissatisfaction with salary and promotion opportunities is crucial for talent retention and sustainable development in Romania. Politicians and employers need to focus on initiatives that improve career advancement paths, raise wages and provide professional development opportunities to promote loyalty, mitigate emigration factors and stimulate long-term economic growth. The repatriation of Romanians living abroad requires a multifaceted approach addressing economic, professional, social and infrastructural issues. By implementing policies that provide attractive incentives, support professional development, foster entrepreneurship, improve quality of life and facilitate integration, Romania can effectively encourage diasporas to return home and contribute to the country's development.

Standard of living: Data suggest that most emigrants perceive an improvement in their standard of living after moving abroad, and a significant proportion experience a substantial increase. However, there are also people who report minimal change, as well as a minority who experience a decrease in quality of life. These findings highlight the diverse experiences of emigrants and underline the importance of considering individual circumstances and factors influencing living standards abroad. To address this diversity of experiences and maximize the benefits of emigration for all Romanians, politicians should develop several strategies: Supporting professional integration: Policymakers should implement programs and initiatives that facilitate the professional integration of emigrants in destination countries. This could include programmes for the recognition of qualifications, training courses to adapt to the demands of the foreign labour market and access to resources to build a stable and successful career. Promoting Social Support Measures: Community support networking and providing

information about social services and assistance available in destination countries can help migrants integrate more easily and face the social or emotional challenges of living abroad, Stimulating Investment and Entrepreneurship: Politicians should develop programs and policies that encourage investment and entrepreneurship among migrants, supporting them to use their resources and skills to contribute to economic and social development both in destination countries and in Romania, Increasing International Dialogue and Cooperation: Collaboration between destination country governments and Romania can help create more effective policies and programs to support emigrants and manage migration. Dialogue and exchange of best practices can improve living conditions and opportunities for Romanians living and working abroad.

These strategies could help create a more favourable environment for migrants and maximise the benefits of emigration for the individual and the country.

Motivation for returning to Romania: Romanians wishing to return to Romania express a strong sense of belonging, family ties, economic conditions and retirement plans as motivational factors. To further attract them, the state should focus on improving economic opportunities, strengthening social infrastructure, fostering a positive business environment, addressing political and social issues, and facilitating cultural reintegration and adaptation. These strategies aim to create a welcoming environment that not only attracts returnees, but also supports their successful reintegration and contributes to Romania's development.

Motivation for permanent settlement outside Romania: The reasons why Romanians do not want to return to Romania are varied and reflect concerns about limited opportunities, low incomes, high levels of corruption and underdevelopment of health and education systems. There are also concerns about the perception of lack of progress and personal or family situations influencing the decision to stay abroad. To address these concerns and encourage repatriation, it is important for politicians to develop strategies that address these issues and offer solutions that improve the outlook for life and career in Romania.

In conclusion, emigration is a complex phenomenon with profound repercussions on Romania's society and economy. While offering opportunities for individual mobility and economic progress, emigration also poses challenges in terms of demographic change, social cohesion and economic development. By examining in depth these social and economic effects, this paper aims to bring attention to the complexity of emigration and stimulate further research and policy discourse on this critical issue facing Romania and other sending countries around the world.

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THE ASSESSMENT OF THE ROLE OF SOCIAL INNOVATIONS IN IMPROVING WELFARE IN AZERBAIJAN

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Original Article

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ABSTRACT

The priority of the socio-economic policy in each country is to improve welfare, to better meet the increasing material and moral needs of the population, as well as to ensure social justice and social development. In recent years, the role of social innovations in solving social problems and improving welfare has been increasing in Azerbaijan. Expansion of digitalization, social applications in the social sphere, formation of social entrepreneurship are the examples of it. In this direction, the activity of the Agency for the Sustainable and Operative Social Security (DOST) and ASAN (State Agency for Public Service and Social Innovations) Service Centers are especially commendable. DOST centers offer centralized 159 services, 110 of them have been fully digitized, while others have been partially digitized. The qualitative and quantitative research methods have been used in this study. The aim is to evalute the role of social innovations in improving well-being in Azerbaijan and the possibilities of increasing it will be determined. As a result of the research, it was determined that the application of social innovations in Azerbaijan will have a positive effect on reducing poverty, improving welfare, and overall social development. However, in addition to the mentioned positive trends, the role of social innovations in improving well-being is not sufficient. The results of the research can be used in the implementation of social innovations, and in the improvement of the welfare of state during reforms in Azerbaijan.

Key words: *social innovation, social welfare, social entrepreneurship, living*

1. INTRODUCTION

In recent years, a number of international organizations and governments have combined their efforts to solve social problems in the world. Reducing poverty, improving welfare and quality of life, ensuring social development and social justice, as well as inclusion are among the priorities of the socio-economic policy of both international organizations and governments.

It is no coincidence that the Declaration recognizing the inclusion of social strategy in economic planning was adopted in the «World Conference on Social Development» held with the participating of representatives of 186 countries, including 177 heads of

state in 1995 in Copenhagen. In this Declaration, the countries of the world were called for a fairer distribution of wealth and income. The special session of the UN General Assembly held in Geneva in 2000 gave a new impetus to initiatives to promote social justice and welfare in the global economy.

At the historic UN Summit held in September 2015, member states joined the implementation of the new global Sustainable Development Goals, which include 17 goals and 169 targets for 2016-2030. While technology and innovation are a recognized key facilitator in achieving all related targets, innovation is a specific policy target in its own right (United Nations, 2015).

In order to achieve these goals, governments are constantly trying to innovate their social policies. Of course, the continuous increase of social problems or needs also affects the increase of financial resources to be spent on their solution. It is predicted that the mobilization of entrepreneurs, partners and resources will be achieved by 2030 to reach the social goals set in the "Sustainable Development: 2030" concept. The report on the implementation of the "Sustainable Development: 2030" Agenda shows that more resources are currently required to achieve these Goals than predicted. The report notes that financing needs for the Sustainable Development Goals are about $6 trillion annually or $90 trillion over 15 years. In addition, new social needs are also emerging, the solution of which requires additional financial resources.

Azerbaijan is also undergoing reforms in the direction of achieving the Sustainable Development Goals. The UNO and its partners are working towards achieving the Sustainable Development Goals (SDGs) in Azerbaijan. As a result of this partnership, Azerbaijan prioritized 17 SDGs, 88 targets and 119 indicators covering economic, social and environmental aspects of sustainable development. Our country submitted two Voluntary National Review (VNR) reports in 2017 and 2019. Thus, Azerbaijan was the first country among the Commonwealth Independent States to present two VNRs by 2019 (United Nations Azerbaijan).

In order to achieve the SDGs in Azerbaijan, a number of measures have been taken in recent years in the direction of reducing poverty and improving welfare, State Programs and strategies have been adopted. In recent years, efforts have been made to solve social problems, improve welfare, and ensure social development through the application of social innovations in the world, especially in European countries.

The application of social innovations in Azerbaijan has had a positive effect on reducing poverty, strengthening social protection, improving welfare, and overall social development. Thus, if the poverty level was 49% in 2006, it decreased to 5.5% in 2022 in Azerbaijan. The population's income increased by 3 times, the average monthly salary increased by 2.5 times, the average monthly amount of pensions increased by 3.3 times, and the amount of benefits increased by 4 times in 2023 compared to 2010. However, in addition to the mentioned positive trends, the role of social innovations in improving well-being is not sufficient. In this study, the role of social innovations in improving well-being in Azerbaijan will be evaluated and the possibilities of increasing it will be determined.

2. LITERATURE REVIEW

In recent years, social innovations have played an important role in solving social problems, improving welfare and increasing income in the world. «Social innovation» as a term was the object of discussion in the 60s and 70s of the last century and new views were put forward over time. **Social innovation** is the process of developing and im-

plementing of effective solutions to complex and systematic social and environmental problems for supporting social progress. *A novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals (James, A.P., Jr., Kriss Deiglmeier & Dale T. Miller, 2008).*

In the 70s of the last century, J.Taylor (1970) valued social innovation as a new method of social intervention. K. McGowan, F. Westley, O. Thornbo (2017) note in their research that, researchers focused more on what social innovation is and how it works, leading it from a mere descriptive term to a scientific concept until the 90s. As a continuation of the conducted research, researchers such as D. Cooperrider and V. Pasmore (1991), H. Henderson (1993) put forward the concept of social innovation in the 90s. However, this was not unequivocally accepted by the scientific community. Only from the mid-2000s, social innovations began to be widely used in society, especially in European countries. Since then, social innovation has become more prevalent in scientific articles, policy reports, policy discussions, social sector discussions, and even in business and management journals and moved from formal theory to practice.

Specialists of the «Social Innovation Academy» summarize numerous approaches to the term «social innovation» and distinguish its features:

- Open rather than closed when it comes to knowledge-sharing and the ownership of knowledge
- Multi-disciplinary and more integrated with problem solving than the single-department or single-profession solutions of the past
- *Participative and empowering of citizens and users*
- *Tailored rather than mass-produced*
- *Demand-led rather than supply-driven* (Social Innovation Trends Report, 2020).

Currently, social innovation is viewed as a new product or service aimed at better solving social needs and problems, thereby creating new or improved opportunities for people, and affecting the improvement of well-being.

A favorable supportive environment created for the emergence of social innovation encourages people to create new value and increases inclusion in the country. Currently, business entities are trying to come up with solutions to better meet social needs by creating new services and products with social innovations. Social innovations refer to new social and ecological practices, new processes, new rules, new methods, and their benefits are manifested not only in individuals, but in society as a whole (Social Innovation Index, 2016).

Of course, the specificity of social innovation requires a more serious support mec hanism compared to other business innovations. Because, as in all areas of the eco nomy and social life, new ideas and new solutions proposed or applied in the social sphere are considered risky. From this point of view, it is necessary to support innovative ideas aimed at solving social problems in society, increasing employment and improving people's welfare by the state and private sector. Social innovation lasts long and has a large-scale impact. It can be implemented by both the government and private institutions (Accept Mission, 2021). In recent years, large-scale measures related to the development of social innovations have been implemented and large companies provide social benefits by creating social innovations in the world, especially in European countries.

Social innovations can come from anywhere, designed and implemented by individuals, organizations or institutions from different backgrounds and sectors. Social innovation projects can be: processes (e.g. reorganized care pathways); products (e.g. mobile phone applications); market mechanisms (e.g. social finance instruments); role and behavioral practices (e.g. peer-to- peer services); or new paradigms and policies (Social innovation in health, 2022).

In fact, states, private sector, and public organizations have carried out numerous activities related to solving social problems and improving welfare till today. However, the specificity of social innovations lies in the use of new methods and techniques, new technology in solving social problems. As a result of it, the concept of «digital social innovations» has emerged in recent years. For example, the mobile phone is a product of innovation, but not a social innovation. However, it can be used as a tool to help diagnosing diseases and solving other social problems by incorporating new applications into it. A new application added at this time is considered a digital social innovation.

Social innovation empowers people and creates new patterns of social relationships and cooperation in addition to meeting social needs and solving social problems. Social innovation is a component of social services that are constantly challenged by changes in social conditions and the emergence of new social risks. Currently, social and digital social innovations are widely applied in the fields of education, trade, culture, tourism, etc.

Social innovation is innovative response to social problems and needs that are not successfully addressed or neglected by the state or the market. Social innovation is necessary because many social problems are not appropriate to traditional approaches to solving them. They require new approaches and ingenuity."*Social innovation refers to a new way of doing things, an innovative element in a given context. It represents a breaking away from the usual solutions offered and provides a creative response to social and economic problems that cannot be solved by the market or state. It thus improves individual and collective well-being*" (Social Solidarity Economy).

Participants and new forms of cooperation among them bring together different types of experience, skills, and tangible and intangible assets. Therefore, the main goal of social innovation is to solve complex social problems in innovative ways.

Social innovation as a new response to an unsatisfactory social situation focuses on the well-being of people and communities; defines itself as action and long-term change aimed at improving individuals, areas or businesses. Innovation for inclusive growth is also defined as the development and implementation of new ideas that seek to create opportunities that enhance social and economic well-being for disenfranchised members of society (George, Mcgahan, & Prabhu, 2012).

One of the most common examples of social innovation is social entrepreneurship in recent years. Social entrepreneurship is interpreted as a type of economic activity that works with market rules and aims to develop and finance solutions to social, cultural and environmental problems and ensure the sustainability. The prominence of the social mission (i.e. solving social and environmental problems with innovative ideas) is the main aspect that distinguishes this type of entrepreneurship from others (Development of social entrepreneurship in Azerbaijan, 2022).

Let's also note that the idea of social innovation can be transformed to a social entrepreneurship subject as a startup. In recent years, a large number of startups as it by operating as social entrepreneurship subjects have made a great contribution to soci-

ety. According to K. Kurin (2014), "*while a social entrepreneur focuses on solving a problem through business, a social innovator tries to solve a problem through a number of different means*". Almost all of these have been achieved by using digital technologies. The largest companies of the world also play an important role in this process.

In recent years, the development of ICT, meeting the social needs of the population using new technologies, creating a favorable technological environment for the realization of new ideas, etc. have created a lot of opportunities for the development of social innovations. Many social innovations operate on the basis of modern technologies. The leading technology companies of the world also do important work in the field of social innovation and provide great support for solving social and environmental problems with social innovation.

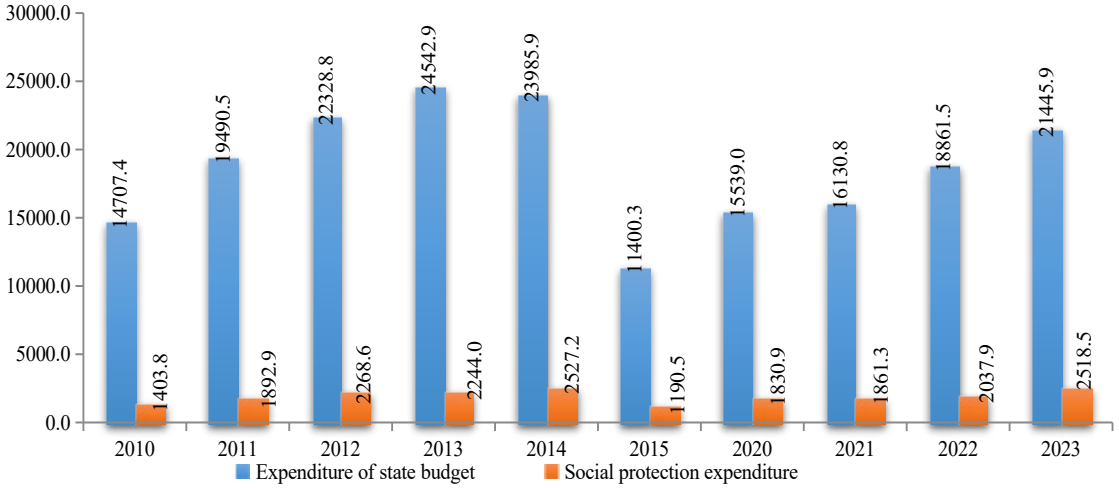
In the 2000s, it was believed that social innovations, that is, by supporting new Start-ups that provide solutions to specific (sometimes targeted) social problems of society, it is possible to achieve a better solution to social problems and to meet the real social needs of the population. In this regard, states and companies have come up with a new approach. Social innovation refers to the design and implementation of new solutions that imply conceptual, process, product, or organizational change, which ultimately aim to improve the welfare and wellbeing of individuals and communities (OECD Social Innovation, 2000). It should be noted that social innovations also contribute to economic development. Innovation and economic growth and welfare are directly related to each other (Ulku, 2004).

Of course, weak and moderate economic growth, non-economic problems (such as pandemic, inter-country and intra-country conflicts), different political interests create obstacles to the realization of sustainable development initiatives. The report states that, the effective mobilization of resources and application of innovative approaches are important for achieving sustainable development in the current economic and political conditions (World Youth Report, 2020). But there is a serious need for sustainable economic development and political stability for this. In fact, the deepening of social problems has a negative impact on the activity of the business sector as well. In this regard, the business sector has increased attention to social innovation in order to identify social needs and increase people's access to social services in recent years. *So, if innovation has direct effects on economic growth* (Galor&Tsiddon, 1997) *and economic growth (or income) has direct effects on SWB* (Frijters, DeNew, Shields, 2004; Stevenson and Wolfers, 2008).

3.THE ASSESSMENT OF WELFARE IN AZERBAIJAN

The socio-economic reforms carried out in Azerbaijan in recent years and the implementation of the adopted state programs have had a positive effect on the welfare of the population. Thus, the poverty rate has been significantly reduced, social protection has been strengthened and income has increased in the country. The improvement of the welfare was primarily caused by the increase in the amount of funds allocated from the state budget. Thus, the expense of the state budget increased 1.5 times and social protection expenditure increased 1.8 times in Azerbaijan in the last 14 years (2010-2023) (Diagram 1).

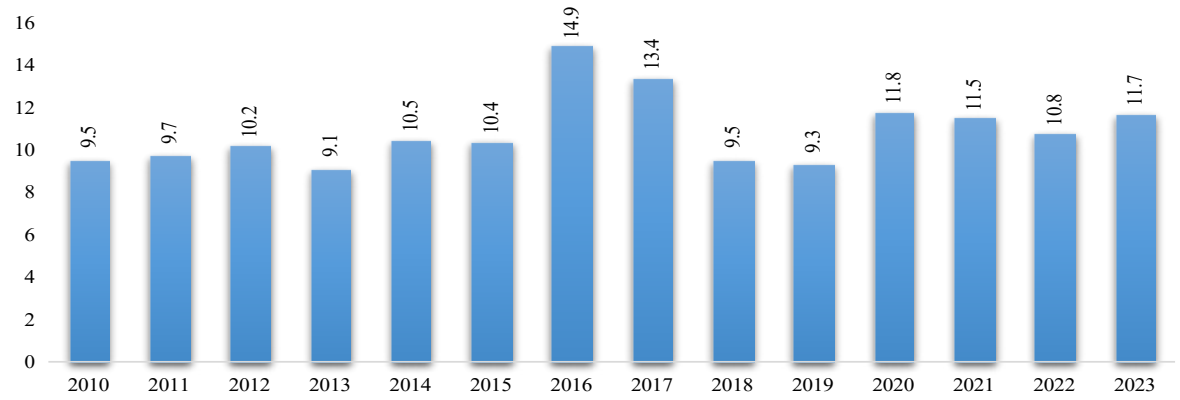
Diagram 1. State budget expenditure and social protection expenditure, million USD



Source: The State Statistical Committee of the Republic of Azerbaijan. Official web site: https://stat.gov.az/source/finance/?lang=en

There was an increase in the share of social protection expenditure to state budget expenditure in recent years. Thus, the share of social expenses in the budget was 9.5% in 2010, and this indicator was 11.7% in 2023 (Diagram 2).

Diagram 2. The share of social protection expenditure in state budget expenditure, %, (2001-2022)

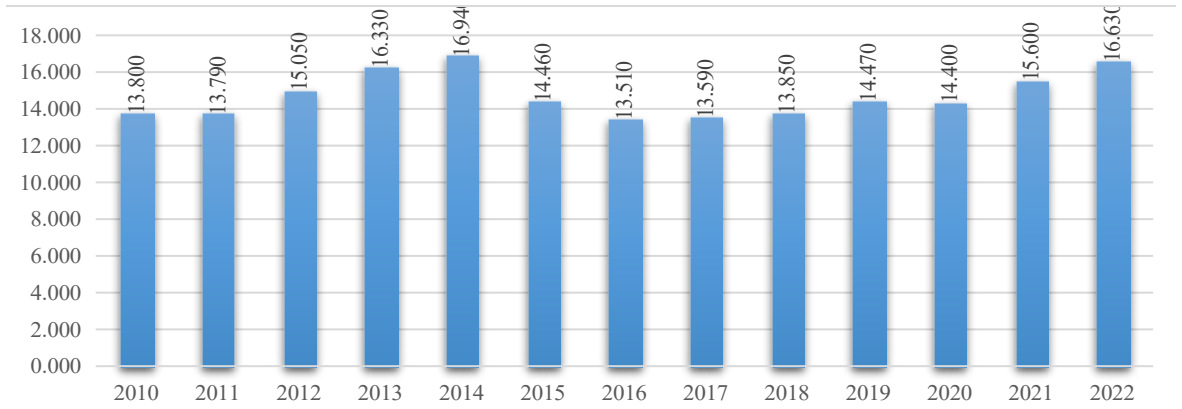


Source: The State Statistical Committee of the Republic of Azerbaijan. Official web site: https://stat.gov.az/source/finance/?lang=en

The increase of state social expense has led to an increase of the salaries of employees in budget organizations, pensions, benefits and allowances and etc. As it is known, there is a high inverse correlation between social spending and poverty. It means that, if the public social spending increases, the poverty rate decreases. As a result of increasing public social spending, the poverty rate has significantly reduced (from 49% in 2001 to 5.5% in 2022) in Azerbaijan.

As it is known, one of the most important indicators characterizing welfare is the GNI per capita. There was an increase in the GNI per capita in recent years (Diagram 4).

Diagram 4. GNI per capita, PPP (current international $) - Azerbaijan

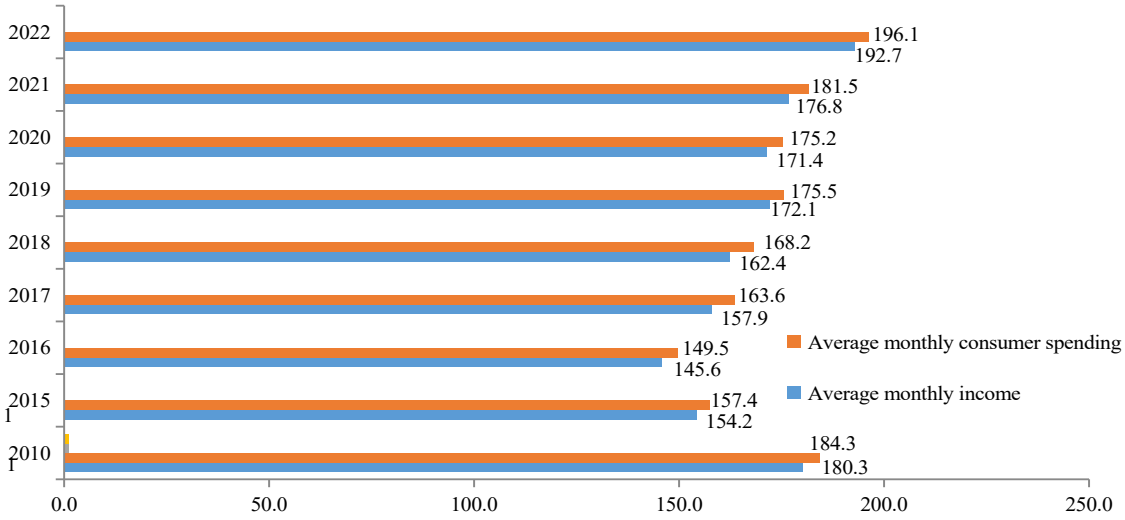


Source: World Development Indicators database, World Bank. https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD?locations=AZ

Thus, the GNI per capita increased by 20.5 percent in 2022 compared to 2010.

One of the most effective ways to study the income situation of the population is the investigation of households. In 2010-2022, household income and consumption spending increased (Diagram 5).

Diagram 5. Monthly household income and consumption spending in Azerbaijan, USD (2010-2022)



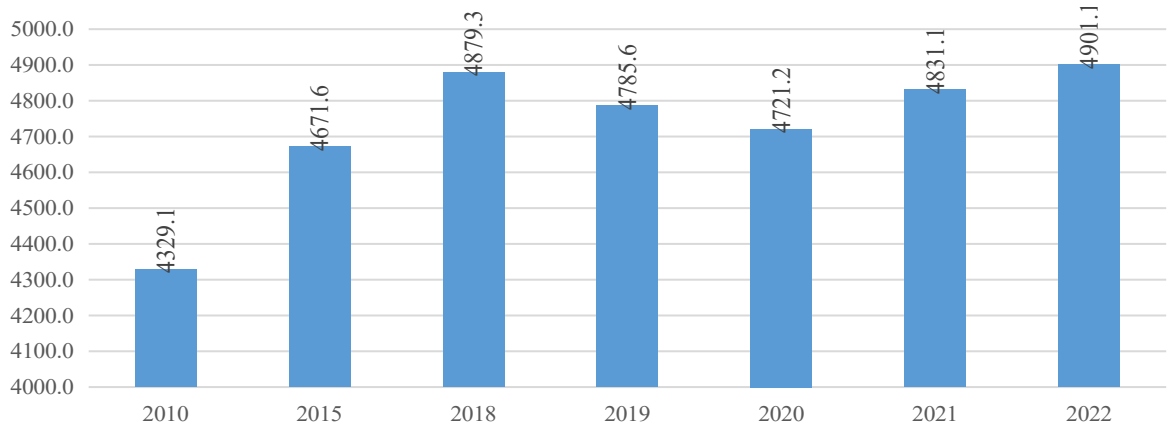
Source: The State Statistical Committee of the Republic of Azerbaijan. Official web site: https://www.stat.gov.az/source/budget_households/?lang=en

Thus, household income increased by 6.9% and spending by 6.4% in the corresponding period. However, as can be seen from the diagram, household expense exceeded their income.

The share of income from wage increased from 11.6% in 2010 to 70.5% in 2022 in the structure of household income and it is a positive situation in terms of increasing the employment rate of the population.

As can be seen from the analysis of the structure of household income, the income from employment has risen in recent years, which is an indicator of the increase in the employment rate in Azerbaijan. If the number of employed people in Azerbaijan was 4329.1 thousand people in 2010, it increased to 4901.1 thousand people in 2022 (Diagram 6).

Diagram 6. Distribution of employed people by economic activities, thousand people

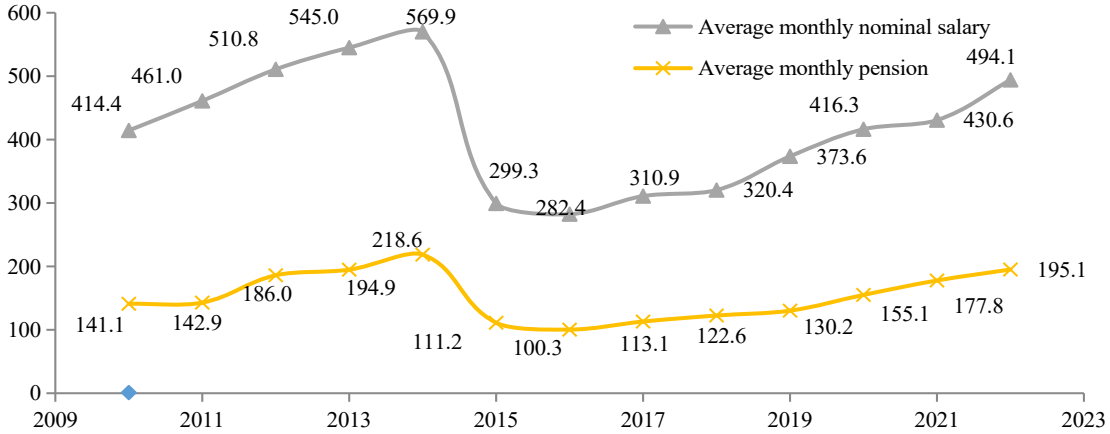


Source: The State Statistical Committee of the Republic of Azerbaijan.

Official web site: https://www.stat.gov.az/source/labour/?lang=en

The reason of the increase in the employment rate of the population is the development of the business sector, as well as the expansion of the self-employment programs implemented by the state. The expansion of employment opportunities also led to an increase in the average monthly salary (Diagram 7).

Diagram 7. Average monthly nominal salary and average monthly pension, USD



Source: The State Statistical Committee of the Republic of Azerbaijan. Official web site: http://www.stat.gov.az

The average monthly nominal salary has increased by 19.2% in 2022 compared to 2010.

The welfare of pensioners, who are vulnerable people has relatively improved in recent years in Azerbaijan. Thus, the average monthly pension increased by 38.3% in 2022 compared to 2010.

It is true that although an increase was observed in the indicators characterizing the welfare, it was not sufficient in terms of improving the quality of people`s life. Thus, the indicators of welfare in Azerbaijan are lower than those of a number of developed and developing countries.

Although funds allocated to social protection from the budget have increased in recent years in Azerbaijan, the share of social expenditure in budget expenditure is much lower than the corresponding indicator of both developed and developing countries. So,

while this indicator fluctuates between 30-40% in developed and developing countries, it constitutes 10% in Azerbaijan.

While per capita income was 192.7 USD in Azerbaijan, it was 7,958 USD in Switzerland, 6,398 USD in the United States, 2,466 USD in Slovenia, and 1,821 USD in Latvia in 2022 (World Data, 2022).

The situation of the average annual salary is similar. Thus, the average annual salary was 63,681 international dollar in Luxembourg, 65,836 international dollar in the United States, and 46,481 international dollar in France in 2019. The average annual salary was 17932 international dollar in the corresponding year in Azerbaijan.

The amount of the minimum wage, which plays an important role in the formation of the average monthly wage, is very low in Azerbaijan. In recent years, the minimum wage has also been increased in accordance with the socio-economic development in the country. However, despite of this increase, the ratio of the minimum wage to the average monthly salary is not appropriate to the international standards. So, this indicator was 41,1% in 2022. According to the European Social Charter, to which Azerbaijan has joined, the minimum wage must be 60% of the average monthly salary (European Social Charter, 2024).

In addition, the minimum wage for 1 working hour is 13.6 in international dollar in Australia and Luxembourg, 13.5 international dollar in Germany and France, 7.3 international dollar in the United States and approximately 5.69 international dollar in our country now. It should be noted that according to the ILO Convention, *«the minimum hourly wage should not be less than 3 dollars»* (Huseynov, 2013). *The 1-month norm of the minimum wage in Azerbaijan equals to 6 hours in France, 6 hours 25 minutes in Belgium, 7 hours in Netherlands, 7 hours 30 minutes in the United States and 7 hours 45 minutes in Canada* (Ibadoglu, 2017).

It is known that, the unemployment benefits are given to people who are unemployed. Although, the amount of unemployed benefits has been increased in recent years in Azerbaijan, it is still low compared to developed countries. Thus, the unemployment benefit is 91.7% of the average monthly salary in Sweden, 90.0% in Denmark and 60.0% in Belgium. This indicator constitutes 47.5% in Azerbaijan (Labor market, 2017).

One of the main components of the social policy of each state is the improvement of the welfare of disabled people from low-income population groups and their integration into society. The European Social Charter, ratified by Azerbaijan, states that *«disabled people have the rights of independence, social integration and participation in public life»* (European Social Charter, 1999). Although 56% of disabled people are able to work, approximately 8.3% of them work in Azerbaijan. This indicator is 40% in Europe, 60% in Australia, 80% in China. However, expanding the employment opportunities of disabled people not only strengthens the social protection of people who needs special care, but also it can lead to positive results such as their closer integration into society, efficient management of state budget expenditure and etc.

It is possible to solve some of the existing problems (ensuring the employment of vulnerable groups of the population, including disabled people, their integration into society, improving the welfare, etc.) through the application of social innovations. One of the obvious examples of such social innovations is social entrepreneurship.

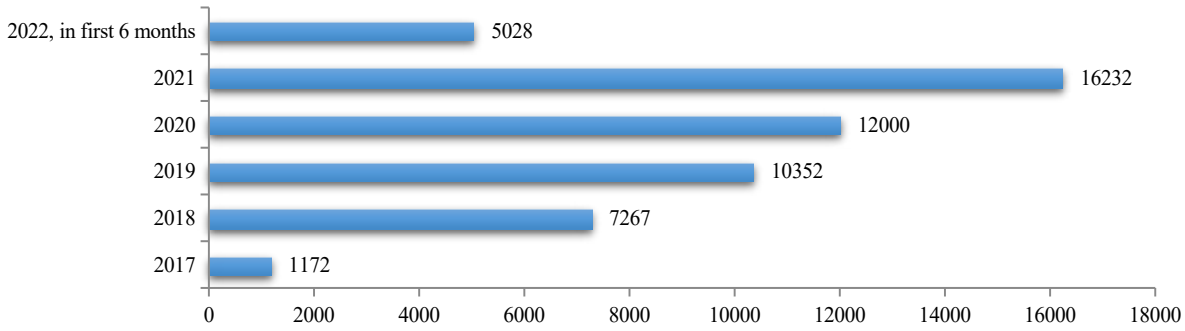
4.THE ROLE OF SOCIAL ENTREPRENEURSHIP IN IMPROVING WELFARE

One of the methods used to reduce poverty and improve welfare is the development of social entrepreneurship in the world. Social entrepreneurship serves to increase income and inclusion, form social capital and etc. by applying innovations in solving social problems. According to Azmat, «*the development trend of social entrepreneurship is aimed at reducing poverty by creating new work places, new job opportunities, forming social capital in the world and it develops innovative initiatives in a new institutional form in society*» (Azmat, 2013). Social entrepreneurship also plays an important role in easing the social burden of the state by helping to provide the people (who are unemployed, but wish to work) with job (Defourny & Shin-Yang, 2011).

Social enterprises, which are the organizational-legal form of social entrepreneurship, and their income have increased rapidly in recent years. New data suggests that over 10 million social enterprises generate an estimated 2 trillion USD in annual revenues globally – more than, for example, the apparel or telecommunications industries (World Economic Forum, 2024).

Social entrepreneurship, which is widespread in the world as a new innovative solution for reducing the unemployment and poverty rate and improving welfare, is almost new for Azerbaijan. Self-employment is valued as social entrepreneurship in our country. It should be noted that the self-employment program is new for our country, it is applied in order to abandon the passive social protection measures of the unemployed and transformation to active forms. According to the information of the State Employment Agency, 5,028 people were involved in the self-employment program in the first six months of 2022, and 52,051 people were involved in the self-employment program in 2017-2022. The number of people involved in self-employment programs increased approximately 14 times in 2021 compared to 2017 (MLSPPRA, 2022)

Diagram 8. The number of people involved in the self-employment program



Source: Azerbaijan Public Employment Agency. Official web site: https://dma.gov.az/fealiyyet/statistics

As the self-employment program creates favorable opportunities for those who want to start micro and small business activities, the Small and Medium Business Development Agency (KOBIA) closely cooperates with the State Employment Agency of the Ministry of Labor and Social Protection of the Population in this direction, provides support at various stages of the program since 2019. In 2019-2020, about 400 citizens used the services of KOBIA to join the self-employment program (Small and Medium Business Development Agency of the Republic of Azerbaijan, 2022a).

As can be seen from the statistics, the number of people working as social entrepreneurs is very small in our country. There are several reasons of it. The legislative framework is not developed in this field in Azerbaijan. Although there are certain provisions regarding social enterprises in the current legislation in Azerbaijan, they are not capable of fully regulating social entrepreneurship. There is no special law on social entrepreneurship and its organizational-legal form-social enterprises. The lack of an appropriate regulatory and legal framework also complicates the work of entrepreneurs who want to work in this field.

In general, the level of awareness about this topic among the population is low. The results of our survey among 100 experts regarding the study of the current situation of social entrepreneurship in Azerbaijan are noteworthy. So, 54.5% of people who answered the question of «How do you assess the situation related to social entrepreneurship in Azerbaijan?» considered the situation «unsatisfactory», 36.4% «satisfactory». 9.1% of the respondents chose the «other» version. 59.6% of people who answered the question of «What are the factors that hinder the development of social entrepreneurship in Azerbaijan?» cited «lack of information», 47.5% as «lack of funds», 36.4% as «insufficient legislative framework» and 27.3% as «unfavorable business environment». According to the results of the survey, the respondents considered necessary to take a number of measures for the development of social entrepreneurship in Azerbaijan. Thus, 67.3% of the respondents considered «education among the population», 54.5% «state support», 44.6% «credit availability», 41.6% «improvement of the legislative framework», 33.7% considered «simplification of import-export procedures» necessary (Abdullayeva, 2022).

Although the situation regarding social innovation is not satisfactory, the development potential of social entrepreneurship is great in Azerbaijan. The development of this type of entrepreneurship will reduce the poverty rate, increase the employment rate, improve the welfare, reduce the social burden of the state (even if it increases social expenditure in the short term) in the long term, increase economic growth and inclusion. In order to develop social entrepreneurship in our country, the level of awareness among the population should be increased and the existing legislative framework should be improved. At the same time, the government should develop a stimulating mechanism for the development of social entrepreneurship.

5. DOST CENTERS IN AZERBAIJAN- AS AN EXAMPLE OF SOCIAL INNOVATION

«DOST» centers are an obvious example of social innovation in Azerbaijan. These centers operate under the «DOST» Agency. «DOST» Agency was established according to the Decree No. 229 (2018) of the President of the Republic of Azerbaijan dated on August 9, 2018 with the aim of improving the quality of services provided to citizens in the fields of employment, labor, social protection and security, increasing transparency, implementing innovative solutions and accelerating the transition to electronic services, as well as preventing procrastination and increasing citizen satisfaction. «DOST Work Center», «DOST Inclusive Development and Creativity Center», «DOST Digital Innovation Center», «DOST Infrastructure Center», «DOST Call Center 142» also operate under the authority of «DOST» Agency.

«DOST» Centers currently operating in Azerbaijan provide 159 types of services (12 directions in total) as determining disability, labor pensions, social benefits, targeted state social assistance, ensuring self-employment, providing social services to the el-

derly and etc. There were 2163129 applications to «DOST» centers from 09.05.2019 to 31.03.2024. The average number of monthly applications is more than 50,000.

The services provided by DOST centers have a number of advantages (protection of transparency, ensuring operational efficiency, etc.). One of these advantages is the high level of digitalization. DOST centers offer centralized 159 services, 110 of them have been fully digitized, while others have been partially digitized.

Although it has been a short time since its establishment, DOST centers play an important role in providing social security services and increasing the level of satisfaction among the people. In order to study the activity of DOST centers and the level of satisfaction among the citizens we conducted structured interview with Director of Department of International Relations, Programs and Projects of DOST Center No. 1. During this interview the following questions were asked and answered:

1. **What the issue was addressed by the establishment of the Agency for Sustainable and Operative Social Provision?**

Prior to the introduction of reforms in the provision of social services, the system was a complex and non-adaptive structure. Most of the processes were not optimized to facilitate their delivery, and in some cases even consisted of 10-15 participating instances, with which citizens had to contact in-person. This, in turn, led to massive discontent and a lack of transparency. The systems for evaluating the effectiveness and monitoring, as well as the recitation of opinions and complaints from citizens were not properly implemented and were of a nominal nature. At the same time previous governance model led to an irrational expenditure of allocated budget by government for the delivery of social services. The considerable part of the financial flow didn't reach to the strategic goals of the improving the well-being of citizens. To respond the problem, First Lady has led the initiative and MLSPP developed the "DOST Concept" in aim to provide the population of Azerbaijan with smooth access to State Social Protection Services by deploying state-of-the-art IT solutions, through a network of Citizen Service Centers.

2. **Which types of social service are provided in the centers of the DOST Agency?**

The Ministry of Labor and Social Protection of the Population provides 175 services in the fields of social protection, employment and labor relations, of which (Issuance of references, Labour relations, Disability, Employment, Labour pensions and social benefits, Assignment of targeted state social assistance, Grants of the President of the Republic of Azerbaijan, Individual registration of the insured State compulsory personal insurance payments, Social Services, Adoption, Functional services, Social Protection of martyrs' family members, military servants injured at the war and people with war-related disability) are delivered by the centers of the DOST Agency.

3. **The history of establishment of the DOST Agency and its centers is very short. However, the satisfaction level of citizens involved in monitoring in the centers of the DOST Agency (2024) is 98.1%. How do you achieve it?**

Before the establishment of DOST Single-Entry-Point Model, experience of around 15 countries have been researched and analyzed. The innovativeness of the DOST approach is that the multidirectional services have been brought together and their integration has been ensured. Thus, the application of unified approach to the provision of all services related to the MOLSPP's activities has been achieved. Therefore, a mature

service chain has been established by providing communication between front, middle, and back-offices, Call Center 142, information systems and beneficiaries. Based on the standards and administration maintained by the middle-offices the received application by the front-offices is transferred to the back-offices through information systems. Provision of services is realizing on the basis of data concentrated in CEIS. Communication and provision of the results to citizens upon the processed application are realized through e-sosial.az web portal as well as Call Center 142.

4. What were the main objectives of the plan or strategy to resolve the issue or challenge?

The main objectives of the Strategy of the DOST Agency in the delivery of social services are listed as below:

- Expansion of infrastructure of DOST Centers and branches in order to improve the well-being of the population, increase public care for vulnerable groups by implementation of innovative solutions;
- Optimization of services provision on the model of "single-window" for increase rate of citizens' satisfaction;
- Institutional development and strengthening the effectiveness of corporative management;
- Apply strategies and take actions toward the Digital transformation, development of ITC infrastructure for establishment of efficient e-governance;
- Development of community relations and awareness on social services and expand international cooperation;
- Ensure effective M&E system.

To improve level of operations and services provision to the citizens, DOST Agency applied to ISSA Recognition program in August, 2021 and at the present moment the necessary work has been done to introduce new, as well as to optimize existing processes in accordance to the guidelines specified in "Workbook on the Service Quality Guideline".

6.THE ASSESSMENT OF THE CURRENT SITUATION OF STARTUPS IN AZERBAIJAN

The role of innovations, as well as social innovation is increasing in economic development in modern age. In fact, more than 80% of economic growth comes from innovation and application of new knowledge. Social innovation can bring greater value to public services by catering more effectively and holistically to the needs of populations (Porumboiu, 2021).

Startups play an important role in creating social innovations. Social innovation startups are driving positive change and making a significant impact on the world. Through their innovative ideas, these startups are addressing social, environmental, and economic challenges in unique and impactful ways (Faster Capital, 2024a). These innovative ventures use entrepreneurial approaches to tackle pressing issues such as poverty, inequality, climate change, and access to education and healthcare (Faster Capital, 2024b)

Social innovation startups, which play an important role in solving social, economic and environmental problems and economic development in the world, are newly created in Azerbaijan. In general, the level of innovation development in our country is not satisfactory. In 2023, according to the Global Innovation Index, Azerbaijan ranked

89th among 132 countries (Global Innovation Index, 2023), which is inconsistent with the innovative development potential of our country.

A number of reforms are being carried out by the government in order to develop innovative economic development and startups in Azerbaijan. The Innovation and Digital Development Agency was established according to the Decree of the President of the Republic of Azerbaijan dated October 11, 2021. The Innovation and Digital Development Agency (IDDA) serves to organize activities in the field of digital transformation, to form a local innovation environment, and to strengthen the ecosystem in the country (IDDA, 2021a).The agency is trying to create new opportunities for establishing startups (IDDA, 2023c).

In addition to the Innovation and Digital Development Agency, a number of state institutions (Small and Medium Business Development Agency of the Republic of Azerbaijan (KOBIA), Innoland Incubation and Acceleration Center operating under the State Agency for Public Service and Social Innovations under the President of the Republic of Azerbaijan, Azerbaijan Investment Company, The Entrepreneurship Development Fund of the Ministry of Economy of the Republic of Azerbaijan) also support the creation and development of startups in Azerbaijan.

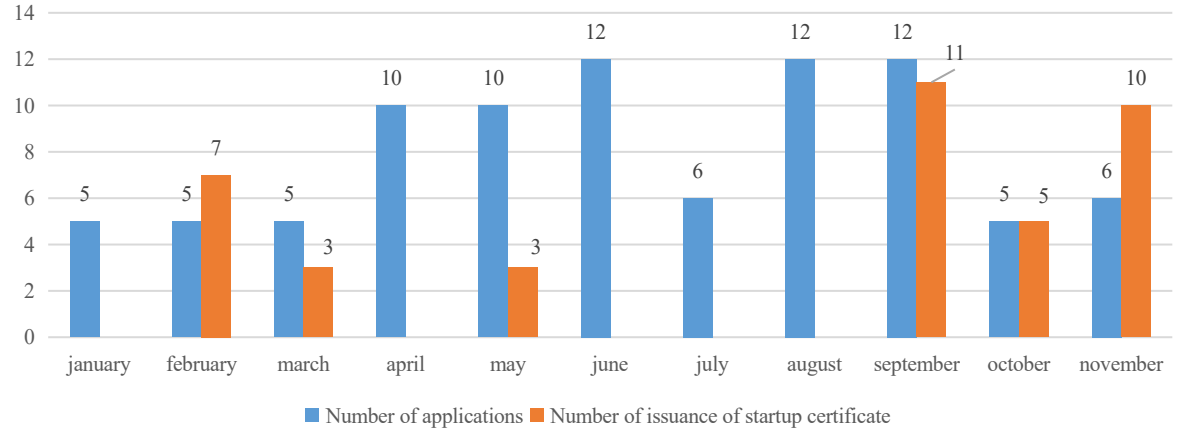
Some preferential financial mechanisms like grants, loans, subsidies and etc. allocated by the state can be shown as the first measure of support for startups. Unlike other loans, such loans are given to startups for a long time and at a low interest rate. In addition, it helps to find investors who will provide financial support for startups. Some of the aforementioned institutions in Azerbaijan (KOBIA, Innoland Incubation and Acceleration Center) offer these supports (Valiyeva, 2020).

It should be noted that the «Caucasus Ventures» venture fund was established in 2023 in Azerbaijan. The main goal of establishing the fund is to create favorable conditions for the development of Azerbaijan's innovation ecosystem, to encourage the formation of investment culture in the country and to attract the attention of foreign startups and investors to the local market (IDDA, 2023b).

As mentioned, one of the state institutions that help in the creation and expansion of the activities of startups in Azerbaijan is KOBIA. The agency was established by the Decree of the President of the Republic of Azerbaijan dated December 28, 2017 (SMBDA, 2022a). As it can be seen, the activity history of the Agency is also new. The agency started issuing start-up certificates from 2021. From May 2021 to December 1, 2023, the Agency received a total of 252 applications for the issuance of a «Startup» certificate, and 120 entrepreneurs were issued a «Startup» certificate (SMBDA, 2022b). Currently, the number of «Startup» certificates issued by KOBIA to micro and small business entities is 130 (Fed, 2024).

The diagram below shows the number of applicants and issuances of the «Startup» certificate from KOBIA during the 11 months of 2023 (Diagram 9).

Diagram 9. The number of applications for the «Startup» certificate and certificate issuances in 2023



Source: Small and Medium Business Development Agency of the Republic of Azerbaijan. Official web site: https://smb.gov.az/storage/HESABAT2023.pdf

During 11 months of 2023, 45 «Startup» certificates were issued by KOBIA.

In January - March 2024, more than 99 thousand services were provided to entrepreneurs in SMB houses. 52 public and private institutions in SMB houses provide more than 300 «G2B» and «B2B» services, which are necessary for entrepreneurial activity. The level of satisfaction of entrepreneurs with the services provided in SMB houses is 98% (SMBDA, 2022d). As it can be seen, despite the fact that they have been established for a short time, the level of satisfaction with the activity of SMB houses that provide new, innovative solutions is high.

It is gratifying that the number of start-ups in Azerbaijan is increasing year by year. Men are more active than women are in creating startups. Thus, 13.1% of startup entrepreneurs are women and 86.9% are men in Azerbaijan. According to statistical data, people in the 20-24 age group have a high share among startup entrepreneurs.

Education, e-commerce, security, social networks, media and advertisement, entertainment, transport and logistics, finance, design, art, tourism, etc. are dominated among the fields in which startups operate in Azerbaijan (Taxes, 2021). In 2022, 492,300 USD were invested in startups and 2,255,014 USD were got (Huseynzade, 2023).

The start-up ecosystem of Azerbaijan is young and small. Nevertheless, some of them could enter the world market. The most successful event of the ecosystem is the "exit" of the Nextsale startup at the beginning of 2022. The benefits provided by the **Ministry of Digital Development and Transport** to residents of Technopark, the Technest scholarship program, the "Startup" certificate issued by KOBIA are measures to support the ecosystem (Huseynzade, 2023). It should be noted that according to the Article 102.1.31 of the Tax Code of the Republic of Azerbaijan, *"startups that are micro or small business entities and operate as individual entrepreneurs are exempted from income tax for a period of 3 years from the date of receiving a "Startup" certificate"* (Tax Code of the Republic of Azerbaijan, 2000).

However, the work done and the reforms carried out in the direction of the creation and development of startups are not enough. Unfortunately, investors are not very interested in startup projects in the country (Nuruyev, 2021). Startups do not play a significant role in improving welfare, including providing employment in Azerbaijan. Most of the established startups are not able to expand their activities and become a

company later. According to statistical data, 9 out of 10 startups fail in the first year and cease their activity. There are 5 main reasons of failing of startups in Azerbaijan: disregarding the opinions of customers, wrong marketing strategy, lack of a business model, not being actual of the idea, wrong choice of team (Milli, 2020).

There is need special centers for startups to implement their projects successfully in Azerbaijan. It is necessary to coordinate the activities of relevant institutions in this field in order to eliminate these problems. A number of services such as education, experience sharing, financing, technical and marketing support should be provided to startups at the initial stage in Azerbaijan in order to encourage the growth of startups in our country both within the country and abroad.

7. CONCLUSION

Thus, as a result of the conducted research, it became clear that, numerous reforms have been carried out regarding the improvement of the welfare in recent years in Azerbaijan. There have been some improvements in welfare, income of population, the amount of the minimum wage, average monthly nominal salary and the employment rate have increased, the poverty rate has reduced as a result of the reforms. But the role of social innovation has not been sufficient in this process. Social entrepreneurship, which provides innovative approaches to solving social problems, has not developed in Azerbaijan; it is currently in its infancy. There are very few social innovation startups. Although serious reforms have been carried out by the state for the creation and development of start-ups from the legal, organizational or financial aspects it is impossible to say the same thing about social entrepreneurship.

It is necessary to increase the role of social innovation in the improvement of welfare in Azerbaijan. It should be noted that the opportunities for using social innovation are also great in Azerbaijan. It is possible to increase the role of social innovations in improving the welfare by solving a number of organizational and legal issues (formation of the non-existent legal framework and improvement of existing ones, raising the level of digitalization, etc.) in Azerbaijan.

In order to develop social entrepreneurship in Azerbaijan, the level of awareness among the population should be increased and the existing legislative framework should be improved. In addition to these, the government should develop a stimulating mechanism.

Startups need special centers to implement their projects successfully in Azerbaijan. These centers would help ensure access to funding of startups.

It is necessary to coordinate the activities of relevant institutions in this field regarding the creation and expansion of the activities of startups. In addition to supporting the creation of startups, this would help to solve the problems that arise during their activities, thus increase their chances of becoming a company.

The implementation of the mentioned will increase the role of social innovation in improving welfare and expanding employment opportunities in Azerbaijan.

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ECONOMIC OPPORTUNITIES AND RISKS OF INTRODUCING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Artificial intelligence (AI) refers to a set of techniques that enable machines to imitate human intelligence. Its development is a technological revolution, which, like previous technological revolutions, can cause serious economic shocks. Although the work to quantify the effects of AI is still exploratory, it provides some insight. The purpose of the study is to study the impact of artificial intelligence on the economy, identify the main trends and assess the prospects for the development of this connection. Research Problem: Artificial intelligence can bring significant benefits to the economy, but it can also cause uneven distribution of benefits and create new economic problems. Research methods: analysis, statistics, correlation method, factorial, logical, generalization, systematization, comparative methods. Results and conclusions: The long-term impact of AI on aggregate employment fits within the theoretical framework of creative destruction. According to the IMF, 60% of jobs in advanced economies could be highly impacted by AI: 27% of jobs will be highly complementary and, therefore, are able to benefit from AI, while it could replace 33% of jobs. Moreover, from a global point of view, one of the key risks in the development of AI can be considered the possibility of an increase in the technological gap between the least developed countries and the most advanced economies of the world.

Key words: *artificial intelligence, economic development, labor market, opportunities, risks*

1. INTRODUCTION

Historically, the birth certificate of artificial intelligence corresponds to a two-month program of meetings with 10 speakers, organized at Dartmouth College (Hanover, New Hampshire, USA) in the summer of 1956, in particular on the initiative of two young researchers who, in different entries, subsequently strongly marked the development of the discipline : John McCarthy and Marvin Minsky (Eloundou et al., 2022), the first to advocate a purely logical view of the representation of knowledge; the second of which favors the use of structured representations (called “frameworks”) of situation stereotypes that can include different types of information.

It was on the occasion of these meetings that the phrase “artificial intelligence” (championed by McCarthy) was first systematically used to refer to the new search field. However, it was far from unanimous among the researchers present; some see it only

as complex information processing; this was notably the case of Alan Newell (1927-1992) and Herbert Simon (1916-2001), who were also particularly influential for the development of AI (Corrado et al., 2021).

A study of the economic impact of artificial intelligence depending on the level of economic development shows and confirms the existence of heterogeneity of consequences. As a result, advanced economies that are leaders in the adoption of artificial intelligence are most affected by structural changes in job and wage structures. These mutations may be associated with several of the effects presented in the manuscript, providing support for a postulate that does not take into account that artificial intelligence is creating new jobs for humans, but it also does not address in detail the speed at which these effects may occur, nor the type of use computers.

At the macroeconomic level, it is too early to empirically determine the impact on growth, but early microeconomic research suggests significant positive impacts of some specific AI applications on individual worker productivity. In this position, these benefits fall particularly heavily on the least productive workers, causing them to fall behind the more productive ones. On the other hand, the measured impact of AI on business productivity is currently small. This can be explained by the still limited and uneven adoption within companies, stronger for large digital technology companies.

The theoretical impact of AI on employment is unclear. In the short term, they will depend on the speed of AI deployment, the transition from certain professions to additional tasks, and the reallocation of the workforce towards growing professions. On the other hand, early empirical assessments agree that the tasks and occupations affected by AI will not be the same as those affected by previous technological revolutions. AI will be more relevant to skilled trades due to its ability to take on abstract and non-routine tasks, while previous waves of mechanization and computerization concerned unskilled and mid-level jobs, respectively.

These various findings call for strengthening training in science in primary and secondary schools and artificial intelligence in higher education, targeting continuing education in transforming professions, and removing certain barriers to the spread of artificial intelligence, in particular through competition policies tailored to its features.

As with advances, theoretical delineation of the socio-economic implications of artificial intelligence will be the subject of this article to determine the distribution of various theoretical findings in the context of the impact on macroeconomics and human resources, and on society as a whole.

The purpose of the study is to study the impact of artificial intelligence on the economy, identify the main trends and assess the prospects for the development of this connection. Research Problem: Artificial intelligence can bring significant benefits to the economy, but it can also cause uneven distribution of benefits and create new economic problems.

2.METHODS

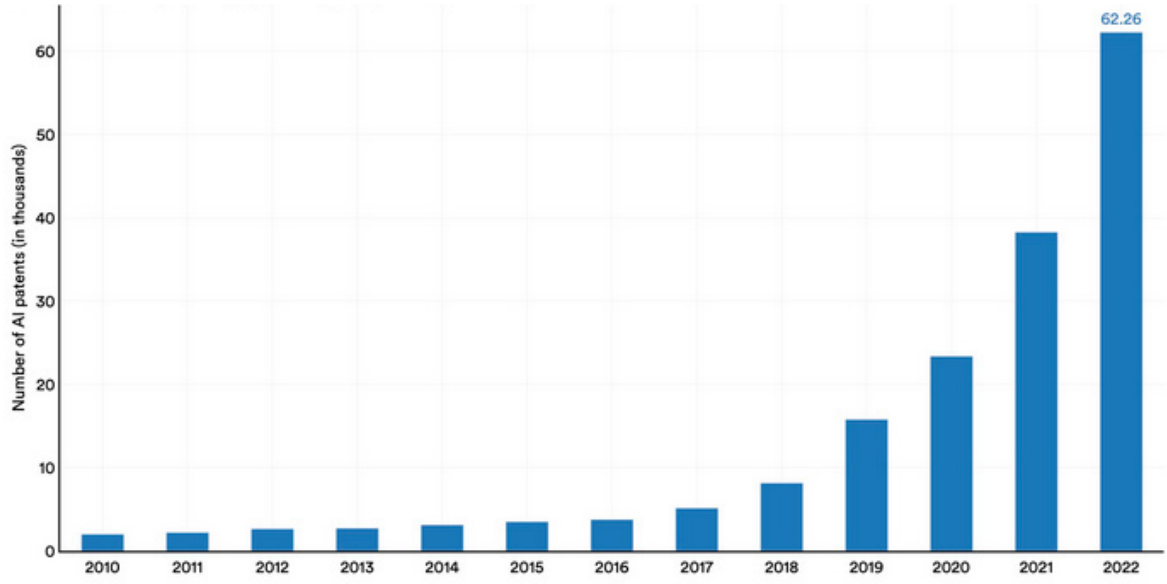
The methodological basis of the work is represented by the basic provisions of the dialectical method of cognition, which allows us to reflect the relationship between theory and practice. The work uses general scientific research methods: analysis, statistics, correlation method, factorial, logical, generalization, systematization, comparative methods. Quantitative, qualitative and econometric analyzes were also carried out.

3. RESULTS

Since their inception in the 1950s, artificial intelligence (AI) systems have performed an increasingly diverse range of tasks, some with levels of performance comparable to or even superior to humans. Over the past ten years, advances in artificial intelligence research and computing infrastructure have accelerated and enabled the emergence of various types of models that represent significant technological advances, including so-called basic artificial intelligence models. These are general-purpose models that can then be specialized to perform a variety of tasks, like the general purpose technology (GPT) models known to the general public after the success of ChatGPT. So-called generative fundamental models, in particular, are capable of generating text, visual or audio content in response to an operational request (Besiroglu et al., 2022).

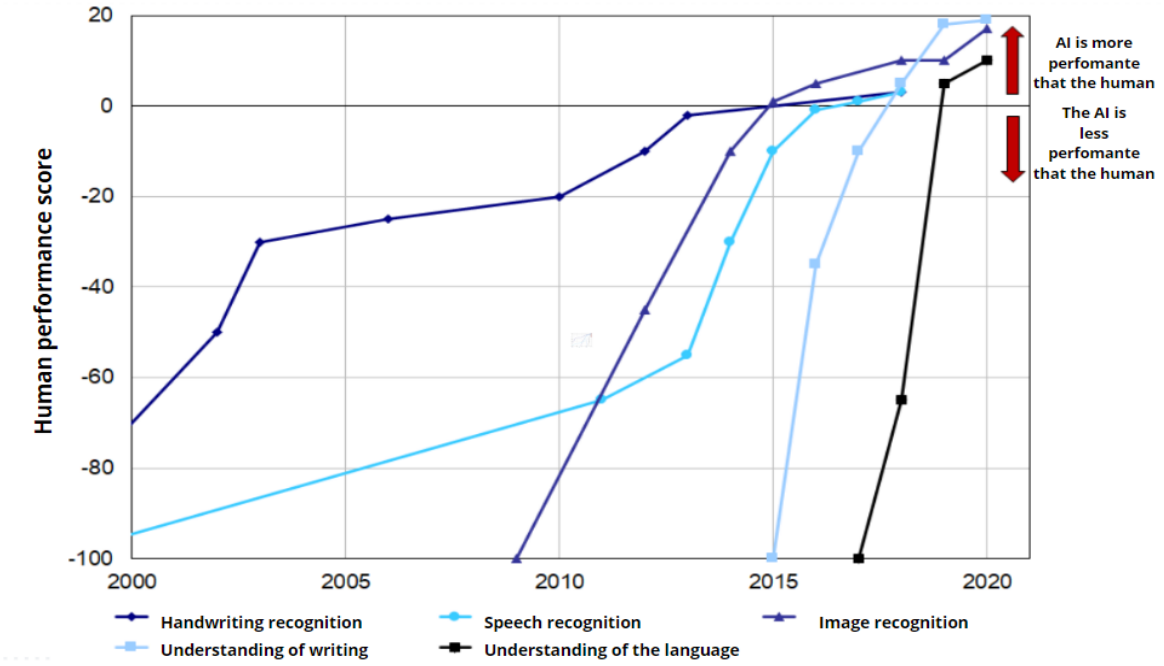
Artificial intelligence can lead to significant improvements in productivity and increased production of goods and services. It is considered by the OECD (2023a) to be a GPT, meaning it can have a significant impact on society and work through its application to many occupations and industries. While earlier technological development tools included, for example, the steam engine, electricity or information and communication technologies (ICT), artificial intelligence (AI) is now leading to long-term growth in overall productivity through innovation in products, processes or organizations (e.g. computer assisted production).

Figure 1. Number of AI patents granted, 2010-2022



AI also differs from waves of previous innovations in that it allows for increased productivity in the production of ideas. AI models, especially so-called "core" ones, accelerate the innovation process because they are able to extract patterns from extremely large and complex databases (e.g., text, audio, image) (Figure 2). For example, artificial intelligence models are used to speed up the discovery of new drugs. These models can also speed up the research process by making it easier to generate research propositions. Thus, AI models can change the nature of the innovation process in certain fields and constitute an "invention of the method of invention".

Figure 2. Capabilities of artificial intelligence systems for language and image recognition

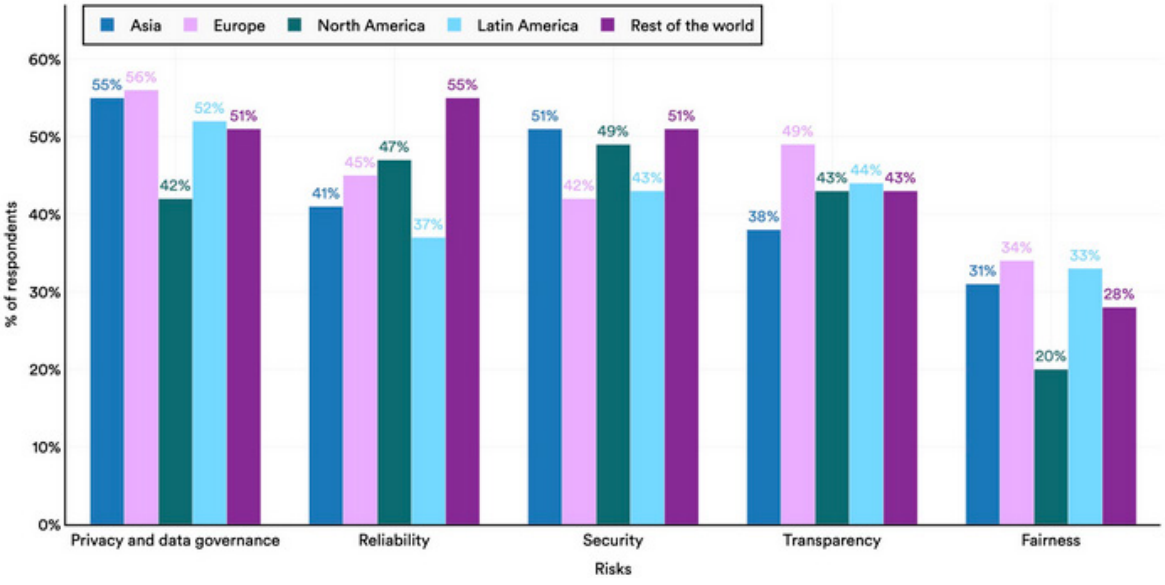


Source: OECD (2023a)

Existing empirical work has not found a statistically significant effect of AI on growth. There may be different explanations for this:

- AI remains relatively poorly integrated into manufacturing processes, with strong differences between sectors. Until the recent development of basic models, the adoption of technologies related to artificial intelligence seemed to have even reached its limit. On the other hand, AI development is uneven across companies, with profits concentrated in companies that are early adopters of these technologies.
- The benefits associated with AI will still not exceed the initial costs associated with its implementation. As with previous projects, AI requires reorganization of companies, reconfiguration of work methods and skills, as well as additional investment, which has a delayed impact on productivity. Thus, the effect of AI will follow as follows: J-shaped curve on a macroeconomic scale.

Figure 3. Revelance of selected responsible AI risks for organizations by region



Several preliminary studies have attempted to quantify the potential impact of widespread AI adoption on GDP. Pending the democratization of fundamental models, some studies estimate that this could lead to an increase in global activity of about $13,000 billion, implying an additional average GDP growth of about 1.2 points per year between 2018 and 2030 (Venturini, 2022).

A more recent study found that generative AI alone could increase annual productivity growth in the United States by nearly 1.5 percentage points over the 10-year period following its widespread adoption. By comparison, annual labor productivity growth in the United States was 1.3 points over the period 2005-2018. And 0.8 points for the period 2010-2018. These estimates often depend on very strong and forward-looking assumptions (e.g., a chronicle of analytics investment and mass adoption that is relatively rapid and with limited friction), which weakens their conclusions (Goldman Sachs, 2023).

In addition, the selected methodologies do not always allow for complete macroeconomic closure, since they are based on extrapolation of microeconomic results. On the other hand, some features of AI may have mixed effects on innovation. On the one hand, by facilitating imitation and copying of products and technologies (for example, reverse engineering of existing products and services), AI can promote technology diffusion and increase competition, ultimately increasing the conditions of the innovation race. On the other hand, such ease of copying can discourage innovation, reducing its potential benefits.

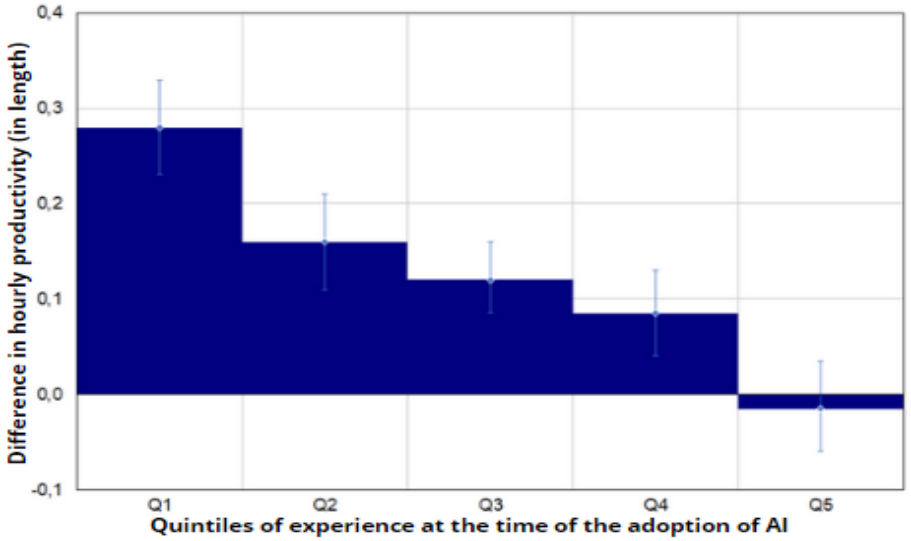
Thus, AI adoption appears to have a modest (statistically insignificant) effect on performance, which can be explained by the temporal shifting of effects and the joint adoption of multiple technologies preventing AI adoption from being specifically imputed. There is also selection bias, with the largest and most productive companies being the most likely to adopt AI. These larger companies also have more resources to deploy assets that complement AI, allowing them to extract maximum benefit from it.

The first empirical microeconomic studies focusing on specific use cases highlight the large individual productivity gains associated with adoption and use and, in particular, the fundamental patterns. For example, in the IT field, a programming assistant powered by artificial intelligence technologies could improve coding productivity by 55%. With the development of next-generation artificial intelligence models, this finding could be extended to many other industries. Thus, for basic writing jobs (e.g., applying for grants, writing essays), professionals using an AI-based conversational agent will see an average productivity increase of 37%. These benefits are likely to be concentrated on the least productive workers, leading to a narrowing of the productivity gap between workers.

For example, implementing artificial intelligence technology that helps taxi drivers find customers by suggesting routes improves the productivity of the least productive but not the most productive drivers, reducing the productivity gap between the two groups by 14%. The customer service advisory profession has seen an average productivity increase of 14% for advisors with access to conversational agents, largely focused on less experienced workers. The artificial intelligence model used in this way allows the transfer of tacit knowledge from more experienced workers to other workers, which reduces the productivity gap due to the initial deficit of experience of the latter compared to the former (Figure 4). This catch-up effect is also evident in more skilled

professions: for example, the use of AI by consultants at a consulting firm to perform (Brynjolfsson et al., 2021).

Figure 4: Impact of AI on the productivity of US client advisors based on their initial productivity



Source: OECD (2023b)

4.DISCUSSION

Increasing productivity, reducing human errors, making faster decisions, predicting customer preferences and maximizing sales are among the main benefits of automation, cognitive technologies and data analysis using artificial intelligence algorithms.

Artificial intelligence technologies are likely to provide new market opportunities and competitive advantage. Savvy organizations are investing and conducting technical validation studies to determine whether they can benefit from AI. AI technologies will require a different set of skills and new thinking to develop solutions to problems that we cannot solve with current technology. It's not about individual technologies, but the merging of multiple cutting-edge technologies with innovative approaches to solving problems that can have a significant impact on business and society.

As AI moves from science fiction to edge technologies that change the world, there is an urgent need to systematically develop and implement AI to see its real impact in the next generation of industrial systems, namely Industry 4.0.

The emergence of artificial intelligence and its integration into enterprise systems reflects the growing maturity of largest companies. As the customs around AI become more intense and diverse, its cumulative impact on AI will change the economy to a greater extent than all other technologies before it, including the Internet.

With AI as a new factor of production, there is an opportunity to increase growth through various channels. First, unlike traditional automation solutions, AI-based innovations automate complex physical tasks that require adaptability and flexibility, and AI is capable of self-learning. Existing labor and capital can then be used much more efficiently as AI allows workers to focus on what they do best: imagination, creativity and innovation (Acemoglu et al., 2022).

Finally, one of the least discussed benefits of AI is its ability to drive innovation as it spreads throughout the economy. It should be noted that the theoretical advances con-

tradict the conventional wisdom that high AI technologies will improve people's lives and create new jobs and skills, since huge industrial applications will do little to help poor countries that cannot compete in a world that is much more more technically advanced than they actually are. This would help make poorer countries, and especially third world countries, even less financially stable, leaving them with little except the production of cheap raw materials and agricultural products, given that they are completely unable to compete in a society based on high levels of computer science and connections.

On the other hand, at the global level, financial sectors have begun to use artificial intelligence throughout the banking value chain to increase their revenues, reduce their costs, improve their productivity and better understand their strategy. Financial industries around the world are already implementing elements of artificial intelligence technologies, including software robots to streamline and automate processes that use AI to enable interactions that enable banks to increase their reach to non-bank individuals and improve their profitability. This requires understanding artificial intelligence technologies and then analyzing the bank's existing operating model (including business processes, talent development models, existing systems, data assets and markets) to determine how to maximize profits. Artificial intelligence can improve communication with staff and clients, analyzing data in multiple different places to look for patterns or connections that prevent a human from finding and answering investment-related questions in real time using natural language.

Regarding the impact of AI on the labor market, estimates of the overall impact of AI on employment are few, but they suggest that the effect remains limited for now, without heralding any major changes. The OECD notes that empirical studies using differences in the impact of AI between countries or between local labor markets do not show a statistically significant decline in aggregate employment. Likewise, recent surveys of workers and businesses or case studies of companies that have adopted AI show little change in employment. However, one study suggests that AI adoption may be associated with increased employment and income in sectors where companies have adopted AI. These results have only limited predictive coverage in an environment where AI adoption is still limited, although growing markedly, and where its impact is still too small relative to the size of the labor market to be seen in employment models beyond hiring in the field of AI development.

The workforce dedicated to artificial intelligence in OECD countries is still relatively low (less than 0.3% of employment in 2019), but it is growing rapidly: its share of employment has almost tripled in less than a decade. The number of AI-related jobs grew rapidly between 2010 and 2018, accelerating around 2015-2016.

Companies implementing and distributing artificial intelligence systems are changing the types of skills required, both extensive (new skills) and intensive (a higher level of the same skill than before). As companies invest in AI, they tend to grow their workforces more specialized in science, technology, engineering and mathematics (STEM) fields. Workers with such skills are indeed especially useful for data analysis and computing, which rely on scientific knowledge or critical thinking.

Some AI skills are inherent to certain jobs (IT professionals, CIOs, data scientists, etc.), but in OECD (2023b) countries the demand for AI skills has spread to a wider range of jobs, and this faster than demand for mid-level skills between 2012 and 2019. The high demand for specialized skills in artificial intelligence is driven in part by the creation of

new jobs in the field of artificial intelligence itself. As a result, and without any assumption of future changes, although highly skilled workers are more exposed to the impact of AI, at the moment some of them, paradoxically, would have better job prospects since the introduction of AI.

The long-term impact of AI on aggregate employment fits within the theoretical framework of creative destruction. According to the IMF, 60% of jobs in advanced economies could be highly impacted by AI: 27% of jobs would be highly complementary and therefore most are able to benefit from AI, while it could replace 33% of jobs (Cazzaniga et al., 2024).

According to the International Labor Organization, in developed countries, the number of jobs with the potential to be improved by AI (13.4%) is much higher than the number of jobs with the potential to be replaced by AI (5.1%). Other estimates, more specifically related to the emergence of basic models, are that if 80% of American workers could see at least 10% of their jobs replaced, only 19% of them could see that share reaching at least 50%, and, therefore, will face a significant risk of replacement (Ojiyi et al., 2023). However, these results should be interpreted with caution. Indeed, the approach adopted does not take into account either the evolution curve of AI or the changing costs of its development for business, while these two elements largely determine the long-term impact of the technology on employment.

Thus, if 36% of US jobs (excluding agriculture) have at least one of their tasks exposed to computer vision, only 8% overall (or 23% of posted jobs) are likely to see their companies effectively automate this task. This low automation rate is the result of implementation and development costs that are still too high to be cost-effective (Hang & Chen, 2022).

In the long term, the impact of AI on aggregate labor demand will depend on mechanisms similar to those observed during previous technological revolutions, in particular the efficiency and timing of the Schumpeterian mechanism of "creative destruction."

New general-purpose technologies destroy jobs in some sectors only to create them in others over decades. The net effect on total employment depends on the balance between the two opposing forces. On the one hand, the demand for labor for certain tasks or professions (where capital can replace the labor factor) decreases. On the other hand, new technologies provide gains in productivity (by replacing labor with more efficient capital or by increasing the return on capital already used) and income, which increase the demand for labor. The latter also increases due to the emergence of new tasks or professions, where the employment factor remains relevant.

In the very long run, after adjusting employment and wages across sectors, there would be no reason for AI to have a significant impact on labor supply or equilibrium unemployment except indirectly. Some research suggests, for example, that AI will improve advice to job seekers distant from the labor market, which could help reduce persistent unemployment and improve productivity.

Overall, the impact on aggregate employment is uncertain and variable, depending on the rate of adjustment in relative wages and workers' compensation between old and new jobs, and the magnitude of each effect varies over time—likely following a J-shaped curve.

Unlike previous revolutions, artificial intelligence may have a greater impact on the most skilled occupations. Previous technological revolutions of the 20th century were at the origins of technological progress biased against the most skilled workers, which

could increase economic inequality. Mechanization at the beginning of the 20th century, and then robotization at the end of the century, thus disfavored unskilled manual workers, while skilled industry professionals and managers benefited. Computerization, for its part, has led to a polarization of the labor market, particularly harming semi-skilled workers engaged in everyday cognitive tasks and benefiting more skilled workers, for whom demand has surged, while unskilled workers performing non-standard manual tasks have suffered. insignificant (Noy & Zhang, 2023).

Unlike these earlier revolutions, the introduction of AI will pose a greater threat to the most skilled occupations (college graduates with high wages) as they will replace some highly skilled workers in tasks that require advanced skills. This is because AI is capable of taking on abstract and extra-software cognitive tasks and therefore expanding the range of tasks that can be replaced (e.g. translation, reporting, etc.). However, at the same time, these professions may be most likely to benefit from the productivity gains achieved through AI adoption. On the one hand, they contain the majority of jobs that are most complementary to AI (Green &. Lamby, 2023). On the other hand, the most skilled workers have a greater ability than others to exercise mobility to move from endangered to growing jobs.

Low-skilled occupations will also be affected, but to a lesser extent. Among the skilled trades, not all need to be affected to the same extent. For example, companies may further reduce their workforce in writing and programming-oriented occupations as they are more at risk of being replaced by generative models.

In addition to different expected effects depending on skill level, the OECD suggests that employers are more likely to identify older workers as likely to be adversely affected by AI developments. These workers tend to be more skeptical of AI technologies, making them less likely to adapt to changes and participate in training programs.

Finally, the industry approach shows that information processing industries exhibit high exposure to fundamental patterns in their tasks, while manufacturing and agriculture exhibit much lower exposure to fundamental patterns.

By changing the nature of the tasks workers perform, AI can have a direct impact on their satisfaction or their sense of dignity and pride in their work. According to initial research, surveyed employees and companies in the manufacturing and financial sectors are positive about the impact of AI on their working conditions. When looking at a set of indicators related to working conditions (job satisfaction, physical health, mental health, fairness in management practices), AI users are four times more likely to say that AI has improved their productivity and working conditions than to say that it has made them worse.

It looks like AI will allow workers to focus on the tasks they prefer, especially those involving customer contact or creativity. However, other studies provide further insight into this finding: some workers exposed to AI are reported to be less satisfied with their lives and their jobs, and more concerned about their job security and their personal economic situation. There are twice as many people who are concerned that AI will lead to lower wages in their industry than those who hope for a rise. However, no significant impact of AI was found on workers' mental health, anxiety or depression.

In this regard, government agencies have a role to play in promoting AI in society and ensuring its impact to optimize its economic potential. A significant part of artificial intelligence training activities can be carried out at the initial stage of training. Primary and secondary education should indeed provide basic knowledge of mathematics and

computer science useful for understanding AI in order to use it, while specialized skills in AI require vocational and higher education. In addition to data science skills, developing and deploying AI models requires technical skills in computing and data management. In addition, training that combines AI with other disciplines (e.g., healthcare, law) is needed to apply AI methods to various scientific and industrial fields and to support research (Borgonovi et al.,2023).

Finally, developing social-behavioral skills (e.g., collaboration, critical thinking, coping) in the school environment is necessary to benefit from the productivity gains associated with AI adoption. The impact of AI on employment will also depend on the adaptation of lifelong learning policies to new needs to facilitate labor reallocation. This includes people whose employment may be changed or even threatened by this technology shock, as well as those who may acquire new skills in the occupations created by this shock. Training policies can facilitate the occupational mobility of workers at risk of displacement into more complementary sectors.

Thus, in addition to the need for increased time spent on vocational training due to the introduction of new technologies, the way training itself may change in practice, relying more on work situations, which seems particularly suitable for the use of AI.

5. CONCLUSION

On a theoretical level and due to the inclination of artificial intelligence towards economic and social dimensions, it is identified at the level of several structures such as the market, business and even the human component; this can be felt at the level of economic sectors (financial, agriculture, industry) (Bughin,2023; Manca, 2023). These consequences are classified as positive if they are related to business and the market, and classified as negative if the topic is considered in connection with the human component.

With this in mind, this article fits into a perspective that attempts to highlight the current and potential economic impacts of AI adoption on the human component in companies, as well as in the financial services industry and society at large.

This analysis found that in all professions studied, a larger percentage of their activities are at risk of augmentation by AI. While some activities will potentially be replaced, according to this analysis, most activities within the financial services profession will benefit more from AI. Thus, access to better tools will enable professionals to be more effective in their respective professions.

The adoption of AI in the financial services sector is currently in its infancy and its impact on labor demand is therefore marginal, but in the medium to long term AI is set to increase demand for certain types of jobs. The authors also highlight that the existing workforce, especially mathematicians, statisticians, and computer scientists, must undergo additional training to gain the skills needed to use artificial intelligence solutions in financial services.

Thus, the development of information and communications technology (ICT) is an example of a new technology whose diffusion and potential for productivity improvements may have been limited by a relatively concentrated competitive situation. Historically, ICT has benefited primarily a small number of so-called “superstar” companies that have been able to develop structuring digital platforms, as well as accumulate capital, data, and attract top talent. These elements could create significant barriers to entry,

limiting other companies' access to technology and innovation. Similarly, AI can help increase industrial concentration and the rise of business "superstars".

The most effective AI models are currently developed primarily by or in partnership with a few large digital companies. These large companies have indeed made significant progress in accessing the resources needed to develop these AI models (e.g., computing power, data, skilled labor) and benefit from their vertical integration across the value chain. These resources can create barriers to entry, particularly limiting the diffusion of technology and the associated economic benefits that will then accrue only to these large companies.

Faced with these risks, the mobilization of competition policy instruments (e.g. abuse of dominance, concentration controls) will therefore play a critical role in anticipating, identifying and addressing at the best time competitive, behavioral or structural problems that may arise in the future. However, the emerging and evolving nature of the market, as well as the economic benefits to consumers associated with network effects and economies of scale, complicate cost-benefit analysis.

Thus, public authorities will have to face a trade-off between immediate benefits for consumers and long-term dynamics of innovation.

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DIGITALIZATION OF THE EUROPEAN GREEN DEAL (EGD) AND SUSTAINABLE DEVELOPMENT GOALS (SDG) - A FACTOR IN EMPOWERING SUSTAINABLE LOCAL PROJECTS: A REVIEW OF LITERATURE AND POTENTIAL ACHIEVEMENTS

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ABSTRACT
The Sustainable Development Goals and the European Green Deal are calls to action for countries around the world, and especially for the member states of the European Union, to address and practically solve many common problems. When discussing the European Green Deal (EGD) in particular, these problems are predominantly ecological in nature. The goal of decarbonization is closely linked to the structure of the economy, and to properly implement the provisions of greening the economy, proper education is necessary. For mass education, the use of IoT is a step towards the digitalization of education, project and other networking, as well as harmonious innovations on the path to sustainability. To highlight the importance and interdependence of these areas, the paper presents a systematic review of the literature on these fields.

Key words: *sustainable development, European Green Deal, IoT, education, eco-entrepreneurship*

1. INTRODUCTION

The phenomenon within social development, called the "ecological model" of human development, was first defined by Bronfenbrenner (1979). The Sustainable Development Goals (SDGs) are by definition global: "a call to action to end poverty, protect the planet" and promote peace and prosperity for all inhabitants by 2030 (UN Serbia). The SDGs are presented as a global call for action to preserve and protect the environment, climate, prevent poverty (UN Serbia). They were adopted by the European Commission in 2019 (Smol et al., 2020) and represent a tool for strategic economic growth and development of countries. ESD is considered an opportunity for the development of a circular economy, the use of clean and reduction of dirty industries, and a financial future for all development projects where waste becomes a valuable renewable resource (Smol et al., 2020).

Sustainable development is projected as a "new ideal", and education that will be directed towards it gets its strongest platform with the publication of the "Report of the United Nations World Commission on Environment and Development", entitled "Our Common Future" (Orlović Lovren, 2021). In this Report, submitted to the UN as early as 1987, the most famous definition of sustainable development, formulated by the Brundtland Commission, was published for the first time (Orlović Lovren, 2021).

Online education during the current Covid-19 pandemic has become a counterpart to traditional education (Ljujić, 2021). However, the process of transition from traditional to online education is complex, and there may be difficulties in realizing this process (Ljujić, 2021). The essence of higher quality environmental education is reflected in the contribution to the entire community, not the individual. This highlights the importance of knowing the environment and the human being in the central place (Marouli, 2021).

Digitalized education has been recognized as effective through access to learning and networking, and it also has application results. The concept of mobile learning (M-learning) provides three integrated distance learning models aimed at contributing to the Sustainable Development Goals: collective partnership, quality education and improving access to education (Kim, 2020). In order to achieve global networking, especially of young people in higher education, global academic networks are proposed to complement the missing data on the topic of sustainable development goals, as proposed by Solís et al. (2018). Sustainable use of the Internet is important for networking young people because it enables easy interaction via social networks that young people regularly use (Hasim and Salman, 2010).

2. METHODS

The method of content analysis of literature and synthesis, as well as comparative analysis of available empirical data from selected areas which are topics of the paper, was used in the work

3. RESULTS

3.1. SUSTAINABLE DEVELOPMENT GOALS

The 2030 Agenda was adopted by the United Nations General Assembly in September 2015 (Bennich et al., 2020). It encompasses 17 SDGs, 169 associated targets, and more than 230 indicators that indicate the progress and development of these goals (UN, 2018). The Sustainable Development Goals are characterized by universality, making them applicable to all nations and stakeholders around the world regardless of their economic and sustainability status (Bennich et al., 2020). The roadmap with detailed sustainable development goals set a turning point for the development of countries at every stage of development or need for its implementation (Pradhan et al., 2017). All SDGs function as a set of interdependent elements contributing to the global security and operational system (Pradhan et al., 2017). Implementing the SDGs requires more tools and science-based analysis for implementation, making them complex and ambitious to achieve (Griggs et al., 2017). Policy makers are currently facing challenges for implementation and making progress in economic, social and environmental sustainability globally (Griggs et al., 2017).

There are seventeen core SDGs that address economic, social and environmental issues present in all countries, identified by the United Nations (Kraak et al., 2018). All SDGs are tangible and can be observed geospatially (Kraak et al., 2018). Maps have been created that enable analysis and practical application (MacEachren, 2004). Each set of goals consists of indicators and targets that are analyzed and show progress in the observed country on which those goals are analyzed (Kraak et al., 2018). Data for all countries is transparent, so as to be of general benefit, indicating countries' desire for economic progress and government transparency (Zuiderwijk & Janssen, 2014). Software that can be used to assist in implementation and status analysis (Software

as a Service (SaaS)) is available to everyone, making the implementation and analysis easier (Kraak et al., 2018). The United Nations (UN, 2018) in its Resolution adopted at the General Assembly, adopted the 2030 Agenda for Sustainable Development which has a people focus, is transformative and universal, while the goals are comprehensive, cannot be separate and have three dimensions of sustainability: economic, environmental and social (UN, 2018).

It is impossible to track the global situation at every moment, so the United Nations has created three groups of indicators to make it simpler (Kraak et al., 2018). They have 3 tiers:

- The first tier has a clearly established methodology for which appropriate standards have been developed. Data is monitored and generated for 50% of the observed countries and populations where the indicator is measurable;
- The second tier of indicators has an international methodology for which standards have been set. For this tier there is a challenge because countries do not regularly generate such data;
- The third tier has no internationally established methodology or standards. Space has been left for this tier to be developed and implemented in the future (Kraak et al., 2018; UN, 2018).

In United Nations Resolution 68/261 (UN, 2014), agencies processing data in each country individually are obliged to ensure the credibility of statistical data, and 17 SDGs have been created, which individually state:

- Goal 1. End poverty in all its forms everywhere,
- Goal 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture,
- Goal 3. Ensure healthy lives and promote well-being for all at all ages,
- Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all,
- Goal 5. Achieve gender equality and empower all women and girls,
- Goal 6. Ensure availability and sustainable management of water and sanitation for all,
- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all,
- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all,
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation,
- Goal 10. Reduce inequality within and among countries,
- Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable,
- Goal 12. Ensure sustainable consumption and production patterns,
- Goal 13. Take urgent action to combat climate change and its impacts,
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development,

- Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss,
- Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels,
- Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.

3.2.THE EUROPEAN GREEN DEAL

In December 2019, at the COP25 (The Conference of the Parties) session, the European Green Deal (EGD) was presented (European Commission, 2019). This deal is a plan for climate neutrality of the European Union and a set of policy initiatives for climate neutrality (Kougias et al., 2021). In October 2020, the European Parliament called for a reduction of the carbon footprint (greenhouse gases (GHG)) by 60% by 2030, with the possibility of postponing the deadline to 2040 (European Parliament, 2020). Quantitative analyses on these issues are particularly carried out by the European Commission's Directorate-General, whose results are used for policy-making scenarios (Hainsch et al., 2022). The EGD is a tool for the strategic economic growth and development of countries, and was adopted by the European Commission in 2019 (Smol et al., 2020). It is considered an opportunity for the development of a circular economy, the development of clean and reduction of dirty industries, and a sustainable financial future for all development projects where waste becomes a valuable renewable resource (Smol et al., 2020). To address political turbulence within the institutions of the European Union, climate change strategies and the Green Deal are the right choice (Schoenefeld, 2021). That the Green Deal and the Paris Agreement are planetary significant actions is also shown by the fact that the current US President (probably Congress at the President's proposal) has allocated a budget of $2 billion for green investments through the scientific postulates of investing in infrastructure, the energy sector, housing, all kinds of innovation, food production and environmental justice (Peters et al., 2020).

The overarching principle of the Green Deal is to ensure social inclusiveness and promote decarbonization, all in the aim of economic and industrial progress through a transformation that should be politically and financially sustainable (Claeyrs et al., 2019). However, there are challenges in implementing the Green Deal, such as economic and political challenges in repaying bank loans intended solely for this purpose (Dowson et al., 2012). The implementation of the Green Deal is mostly about the positive consequences for the environment and the health of the inhabitants, where the most prevalent sources of danger are emissions of harmful gases, which concern all countries of the European Union, their inhabitants and the harmful consequences they leave on the environment and health of the inhabitants (Haines & Scheelbeek, 2020). It remains unknown whether the current implementation and promotion of eco-standards by many companies is just "greenwashing" (eco-manipulation) and an opportunity to increase profits, or an expression of a lack of financial resources and inability to perceive the financial benefits of green investments (Pettifor et al., 2015). Utilizing the opportunities provided by the green agenda, the company strengthens its ESG positions (Князева & Бойко, 2023).

3.3. THE EUROPEAN ENVIRONMENT AGENCY (EEA) HAS HIGHLIGHTED 12 MAJOR KEY ENVIRONMENTAL ISSUES:

1. Climate change, caused by an increase in the concentration of CO2 in the atmosphere, exceeding pre-industrial times by 50%. Between 1990 and 2018, EU greenhouse gas emissions decreased by 23%, while the economy grew by 61%;
2. Stratospheric ozone depletion caused by the release of chemicals known as chloro and bromofluorocarbons, which are used as refrigerants, industrial cleaning agents, foaming agents and other fire extinguishers;
3. Loss of biodiversity in European ecosystems, which have more than 2,500 habitat types and around 215,000 species, of which 90% are invertebrates, and almost every European country is facing endemic species;
4. Major accidents causing serious environmental damage;
5. Acidification resulting from the combustion of fossil fuels and sulfur and emissions of nitrogen dioxide into the atmosphere where gases react with water vapor to form sulfuric or nitric acid, reaching the ground through rain and, after deposition, leading to a number of undesirable changes in terrestrial and aquatic ecosystems;
6. Tropospheric ozone and other photochemical oxidants exceeding ozone air quality guidelines in many European regions;
7. Freshwater resource management is an issue in many parts of Europe. Water losses in distribution systems, water pollution and degradation of water habitats are among the major challenges;
8. Forest degradation, resulting from air pollution, seriously threatens the sustainability of forest resources in central and eastern regions, and raises the risk of fires in southern Europe;
9. Threats to coastal zones are a problem in many parts of Europe. Physical changes to the coast, such as construction and erosion, and water pollution threaten coastal habitats;
10. Waste generation and management caused by a steady increase in the amount of waste and its toxic components;
11. Urban stress is an issue in many European cities. Poor air quality, excessive noise and traffic congestion are some of the factors contributing to urban stress;

Chemical risk associated with excessive chemical loading. More than 10 million chemical compounds have been identified, of which about 100,000 are produced commercially (European Environment Agency, 2020; Communication..., 2019).

The EGD plans to introduce sustainability as the main theme in all European Union policies. The ways in which this will be realized (according to the European Green Deal, 2018, pages 16-21) are:

1. “Ensuring green finance and investment and enabling a fair transition”,
2. “Greening national budgets and sending appropriate price signals”,
3. “Mobilizing research resources and supporting innovation”,
4. “Activating education and training”,
5. Green Oath: “Do No Harm”.

In order to mitigate the damage incurred and provide prevention (European Green Deal, 2018), the solution is to make all European Union policies and actions compatible, which provides assurance for a successful and proper transition. Rosenow and Eyre

(2016) predict low energy savings as a result of the implementation of the Green Deal and the delegation of responsibility of companies dealing with energy. The concerted European steps to prevent decarbonization include social inclusion, green business and green investment, through green business in industries, and other socio-economic aspects (Leonard et al., 2021). Investing in renewable energy sources and energy efficiency is challenging for the poor population (Guertler, 2012). However, the long-term profitability of these investments indicates that the financial part of the Green Deal should be flexible in order for the project to be successfully implemented (Guertler, 2012). The Green Deal could significantly mitigate the crisis and transition through lower prevalence of harmful particle (carbon) emissions through the modernization of industries that should implement decarbonization (Elkerbout et al., 2020). This also requires a solution for the successful operation of enterprises, but what is common to post-pandemic recovery and reducing pollution and the greenhouse effect are small steps towards long-term improvement and financial investment (Elkerbout et al., 2020). By adopting the European Green Deal, the European Commission has created a tool needed to strengthen strategic economic growth and encourage the development of a circular economy, which might provide a bright future for projects aimed at green development (Gajović et al., 2023).

Residents of the United Kingdom, which has incorporated the implementation of the Green Deal into its legislation, in most cases see the opportunity to apply for this package of programs as savings, energy conservation in their homes, and financial savings (Marchand et al., 2015). The authors (Dobbs et al., 2021) gave suggestions for adaptation in such adversities, not calling them a crisis, but only a need for adjustment and a change in the management and implementation of the provisions of the Green Deal. In these new situations, with the constant need to create new, more innovative approaches to work, pressures from environmental activists are particularly challenging (Dobbs et al., 2021). The creators of the Green Deal have excluded the importance of the benefits that forests have on quality of life and the environment and have given suggestions on how to bridge the missed steps (Aggestam et al., 2021). The observed shortcoming is communication between stakeholders, data availability, financial expenditures, goals and policies, but also the knowledge of participants in the communication process (Aggestam et al., 2021). The Green Deal proposes actions for energy saving, conservation of natural resources, which also conceals hidden costs, so investment is more valuable than it appears (Booth and Choudhary, 2013). A special marketing connection is needed to work on improving communication in the development of technical and other skills that arouse local interest, with personal recommendations from users, citizens (Gillich et al., 2017). Savings measures are overestimated, subsidies need to be increased due to the exclusion of funds needed for the installation of items for warmer homes, and then also the global social benefit such as the reduction of harmful gas emissions (Booth and Choudhary, 2013).

3.4. THE SITUATION IN THE EU

In the countries of the European Union, two principles are applied in waste treatment through a combined performance indicator consisting of landfill, incineration, recycling, and then composting (Castillo-Giménez et al., 2019), and the best results are achieved by Austria, Germany and Denmark. By updating the global statistical database on e-waste, it shows that the world produced 53.6 million tons of e-waste in 2019, and that e-waste generation will increase to 74.7 million tons by 2030, which is a significant increase (Forti et al., 2020).

The authors Hainsch et al. (2022) provided an overview of scenarios, research projects and other significant European Union scenarios, which are presented below:

1) European Commission scenarios,
   a) Energy Roadmap 2050 scenarios,
   b) Clean Energy for all Europeans package,
   c) A clean planet for all scenarios;
2) Related EU research projects;
3) Other European scenario studies (Table 19);
4) The openENTRANCE scenario definition approach and quantification.

The REEEM project is based on studying the "role of technologies in an energy-efficient economy [through] model-based analysis of policy measures and transformation pathways to a sustainable energy system" (REEEM, 2019; Hainsch et al., 2022).

Stakeholders, including market actors, consumers and decision-makers, are contained in a set of priorities and focused on six dimensions:

1) Economic,
2) Political,
3) Environmental,
4) Global factors,
5) Social,
6) Technological.

The REFLEX project - "Analysis of the European Energy System" - analyzes two main scenarios based on the PRIMES 2016 scenario, which is part of the European Commission's Clean Energy Package (Capros et al. 2016; Hainsch et al., 2022). This project contains scenarios with a lower level of ambition when it comes to decarbonization (Herbst et al., 2016; Hainsch et al., 2022). The goal of achieving net-zero GHG emissions by 2050 has been established, which has led to the development of studies on the technical feasibility of such projects along with the socio-economic impacts they have on society (Hainsch et al., 2022).

3.5. EXAMPLES OF GOOD PRACTICE OF NATIONAL PROJECT MODELS FROM THE ENVIRONMENT

Capital investments were made in: regional operational programs, infrastructure, environment, education and other forms of growth. From 2014 to 2020, Poland invested 77.6 billion euros (Breznitz & Ornston, 2017). Another overview of the structure indicates the budgets used for various research and innovation activities as strategic goals: enterprise research and development, enterprise research and development capacities, generally innovative enterprises and for research potential capacities, technical assistance (Breznitz & Ornston, 2017).

Human capital is the most important bottleneck for obtaining funds for development projects, research and innovation (Breznitz & Ornston, 2017), and an economic problem (VAT loss) may also arise when university resource potentials (knowledge) are used and funds are obtained from the European Union. The authors (Inamorato dos Santos et al., 2023) emphasize the importance of digital education, which is also highlighted by the Council of the European Union as lifelong learning, development of other competencies, which is also cited as a learning model in all European policy docu-

ments. The basic model (DigComp framework) was introduced by the scientist Ferrari in 2013, and the European Commission has developed it into three additional models currently in use:

1. DigComp for Consumers (2016),
2. DigCompOrg (2017),
3. DigCompEdu (2017),
4. DigComp 2.2 (2022),

cited according to the research (Inamorato dos Santos et al., 2023).

It should be noted that the development of educational policies in the field of education, along with all accompanying regulations, encourages the development of digital technologies and the opportunities they provide (Spante et al., 2018). This is justified by the level at which the Council of the European Union supports the development of competencies for digitalization, online learning and lifelong learning (European Union, 2018).

3.6. POTENTIALS FOR INNOVATIVE ECO-ENTREPRENEURSHIP OF YOUTH AT THE LOCAL LEVEL

Researchers used the "Triple Bottom Line Conception" method and found that young people as residents of local communities can significantly contribute to sustainable development through their entrepreneurial projects by applying this concept (Dalibozhko and Krakovetskaya, 2018). In the report on the Covid-19 pandemic, the Organization for Economic Co-operation and Development (OECD, 2021) states that the so-called Global Youth Report concludes that Public Administration is the center of building trust for younger generations. Space should be given for the development of a platform aimed at transforming youth leadership for the circular economy, which prepares users for new skills and jobs, thereby empowering young entrepreneurs for the circular economy (Liu, 2020).

4.DISCUSSION

4.1. INTERNET OF THINGS (IOT)

Improving business operations and new business opportunities are also noticeable in the industry, while digital transformations call for a new system of decision-making and management (Feroz et al., 2021). Digital transformation strategies encompass organizational, production, and process transformations (Matt et al., 2015). Radical transformations are characterized by the implementation of new technologies that provide new values and functions (Feroz et al., 2021). The Internet of Things (IoT) enables inter-object communication and data collection (Raiwani, 2013). Data collection is subject to various areas, project solutions, businesses, but can also be used for private communication. The special importance of IoT is in the industry where it is focused on end-users by enabling rapid interaction through networks that have a great impact on the individual, consumer or participant in the business process (Raiwani, 2013). This author also states that IoT can improve the quality of business when it comes to workers, the industry of business owners, but also the quality of life of individuals. The application of digital transformations is applied in industry, data analysis, cloud computing, IoT and other stimuli for digital progress (Feroz et al., 2021).

IoT can make a great contribution to consumers, producers, businesses, governments and every country individually (Tu et al., 2017). One of the advantages provided by

IoT is the transparency of requested information, communication, and comparative access to data (Raiwani, 2013). This author recognizes that the future development of IoT will contribute to the optimization of information that is useful for, or already part of, society and business entities. The Internet of Things (IoT) enables access to various dimensions of the physical world. It integrates data, characteristics, environmental content, and everything together into a knowledge base (Piccolo et al., 2022). Such a knowledge base represents a quality foundation for further development or access for other experts. Experts receive ready data, project solutions that can be applied in various projects, national, scientific or other problems depending on the scope. Ali et al. (2017) highlighted the possibility of application in education.

4.2. POTENTIALS OF IOT APPLICATION IN DIGITAL EDUCATION IN LINE WITH SDGS AND EGD

Education on improving and protecting the environment has been recognized as an important issue globally, where IoT stands out as a quality way of communication (Tu et al., 2017). Flexible curricula implemented through digital content, learning through courses specifically designed for each group, are topics that higher education institutions should focus on (Benavides et al., 2020). Learning through games finds application. The support in the development of a gamified way of learning presented by Subhash and Cudney (2018) provides an enthusiastic look at the application in higher education. Such application has been proven possible in various formats designed for pupils and students. The authors Subhash and Cudney (2018) note that Spain is the leading country in this area of developing learning through gamification of scientific research. Platforms designed in this form represent precisely a form of machine learning and the Internet of Things (IoT). The authors Ramlowat and Pattanayak (2019) emphasized that with the emergence of IoT, communication has been enabled on individual relationships between people, machines, but also on the human-machine relationship.

The development of education itself has been enhanced through the encouragement of a rapid reaction of educational systems to new circumstances caused by the Covid-19 pandemic. Ali et al. (2017) presented an IoT platform model that can be used for education in the field of medicine. They named the platform model "IoT-based Flipped Learning Platform (IoTFLiP)". Ramlowat and Pattanayak (2019) pointed out the importance of implementing IoT in several different educational models. IoT is a key tool for green consumer education with the application of green marketing (Tu et al., 2017). Information technologies, IoT provide efficiency and quality in education, speed of communication and cost savings, while on the map of Green Information and Communication Activities, three segments can be observed: Computing, Infrastructure, and Manufacturing.

4.3. APPLICATION OF IOT IN EDUCATION FOR THE PUBLIC SECTOR AND INDUSTRY

A study conducted by Feroz et al. (2021) can assist decision-makers in all sectors, especially the public sector.

Some of the recommendations given by Bashir et al. (2019) for the application of the Arduino platform specifically are:

- integrating it into educational courses,
- improving users' understanding of the interface and skills,

- mapping courses (curricula or project assignments),
- developing critical thinking, group learning, and collaborative problem-solving among university students,
- providing a solid foundation for the development and review of project activities,
- learning pathways and solution creation supporting education,
- accessibility, overview and monitoring, functionality,
- independent work, and more.

4.4. CREATING ENVIRONMENTALLY SUSTAINABLE PRACTICES

The creation of environmentally sustainable practices can be stabilized and developed with the help of IoT and artificial intelligence, integrating them into business models to address pollution and resource degradation (Demartini et al., 2019). Environmentally sustainable practices should be included in digital transformation systems, which should not be expected to bring immediate improvements but rather serve as a stimulus for progress, enhancement, and development (Feroz et al., 2021).

Improvement processes should focus on:

- sustainable practices,
- created through strategic processes,
- digital transformations,
- ensuring that all points are oriented towards environmental sustainability (Feroz et al., 2021).

The digitization of workplaces contributes to environmental protection and sustainability (Song et al., 2018). To properly implement these points and create final solutions, it is essential to answer the following questions: which digital business strategies needed by the organization should be included in environmentally sustainable digital transformations, how can environmentally sustainable practices be implemented in them, and what are the driving forces for sustainable digital transformation (Feroz et al., 2021)?

Although there are various controversial theories about artificial intelligence (AI), as well as positive integrative comments, AI has significant benefits for society, industry, and public administration, particularly through data provisioning and analysis, and mobile technologies (Vial, 2019). The application of IoT is particularly effective in Industry 4.0 (Rodríguez-Calderón & Belmonte-Izquierdo, 2021). The application of the Internet of Things (IoT) is realistic for measuring various factors in smart city systems: the content and quality of air, water, and soil, which can be significant for relevant institutions, scientific organizations, and the education of professional profiles (Dutta et al., 2017; Stojkoska & Trivodaliev, 2017; Piccolo et al., 2022; Shah & Mishra, 2016; Silva et al., 2013). Piccolo et al. (2022) highlight the key features of education about the Sustainable Development Goals (ESD-Education for Sustainable Development): problem-oriented, collaborative, interdisciplinary, equipping students with the necessary knowledge to be informed and to take action for a sustainable society, shifting the focus from traditional teaching models to concrete learning.

What is most important, and relates to the learning models addressed in educational models, is that Education for Sustainable Development (ESD) bridges informal and formal learning, as highlighted by Piccolo et al. (2022). ESD, or education oriented towards the Sustainable Development Goals, represents precisely the link in creating

models for knowledge acquisition, necessary learning, and includes pedagogy that is crucial for working with students and yielding results (Leicht et al., 2018). The potential of applying the Internet of Things (IoT) has also been recognized for engineering education through courses, especially in mechatronics (Rodríguez-Calderón & Belmonte-Izquierdo, 2021). This form of education is possible from the first to the final years of study and for graduates.

There are challenges in implementing IoT in education where textbooks are transformed into smart books (Moreira et al., 2018). The application of such data is possible in various technologies and projects. The main challenge is related to the need for constant data updating (Moreira et al., 2018). Involving students could simplify the necessary updating, considering that the end users are interested parties at the local or national level, and the solution creators in the case developed in this dissertation are students. IoT is also used for environmental sustainability in companies and generally, while (according to Feroz et al., 2021) there is also a lack of studies related to mapping in general environmental sustainability.

4.5. THE FUTURE OF "DO IT YOURSELF" SUSTAINABLE PROJECTS FOR STUDENTS AND IOT

There is significant potential in relation to the SDGs, education about them, and "Do It Yourself" (DIY) projects and technologies (Piccolo et al., 2022). The application of IoT is feasible in the development of projects linked to sustainable development goals, promoting engineering knowledge (Oliva-Maza et al., 2019). Oliva-Maza et al. (2019) recommend the development of such projects where young students are the focus, encouraging innovation among faculty, and resulting in increased productivity and regular student attendance. There is potential for the use of IoT in DIY projects where users employ interfaces with sensors, various other connected objects, and related technologies, allowing them to learn through practical examples, perform measurements, manage data, and more (Ramlowat & Pattanayak, 2019).

A new paradigm empowers students and individuals to educate themselves in line with the SDGs – ESD (Education for Sustainable Development), aiming first to empower them to think and act according to the SDGs (Piccolo et al., 2022). A game has been developed to educate elementary and high school students about water quality and its environmental impact (Tziortzioti et al., 2018). Gamification (using video game formats) is possible for energy-saving topics through education and competitions (Mylonas et al., 2021).

Engaging students in environmental protection projects focused on air quality, where they are directly involved through campaigns and voluntary activities in the United States, has shown good results (Chen et al., 2020). Some authors (Bashir et al., 2019) have provided recommendations for using the Arduino platform and the solutions created within it for students from their first year of studies, by including it in courses, developing independence, and recognizing that this platform represents an excellent map and tool for motivating learning and thinking. The technical capabilities of IoT are important, considering that the open-source Arduino platform plays a significant role in electrical engineering projects (Piccolo et al., 2022).

Authors Rodríguez-Calderón & Belmonte-Izquierdo (2021) presented the "IoT Maker Lab" platform, which serves as a workshop for idea development, demonstrating the practical results of such applications. The Arduino platform not only aids in the development of engineering skills but also offers a new learning model that is accessible and

easily mastered regardless of the users' level of expertise (Bashir et al., 2019). Smart Water Management Systems, PlantVillage, and Peter Ma's innovative application for identifying waterborne diseases are proof that the application of digital technologies in the field of environmental sustainability is possible (Goralski & Tan, 2020). Artificial intelligence can be applied to enhance environmental sustainability, creating solutions for improvement and protection of the environment through the use of IoT data (Balogun et al., 2020).

Feroz et al. (2021) confirmed that an IoT model exists to assist decision-makers in public, private enterprises, and other stakeholders in creating sustainability strategies and environmental impacts. The Internet of Things (IoT) can connect all areas of an individual's life, such as protection, healthcare, safety, recycling, and processes occurring in the environment and its protection (Ramlowat & Pattanayak, 2019). The recommendation is for management systems to focus on digitalization changes, board discussions, and process improvements, which brings numerous benefits for managerial duties and decision-making (Feroz et al., 2021). Research results on the quality and principles of the Arduino platform, its effectiveness, indicate efficiency, sparking interest, and user results that have led to the awarding of project solutions developed using this platform (Bashir et al., 2019).

5. CONCLUSION

In the realm of the new economy, digitalization and innovation stand as pillars shaping the future landscape of economic and social development. These paradigms not only revolutionize traditional industries but also foster the emergence of new economic models driven by connectivity and sustainability. Embracing digital education through projects aimed at empowering EGD (European Green Deal) and SDG (Sustainable Development Goals) is key to economic resilience and fostering sustainable growth and eco-entrepreneurship among young people. By equipping youth with digital skills aligned with the SDGs, we pave the way for a more inclusive, circular, and environmentally conscious economy. Integrating EGD, SDG, and IoT (Internet of Things) within our educational frameworks not only enhances economic empowerment but also nurtures a culture of innovation and sustainability. Through IoT-enabled solutions, young entrepreneurs can create impactful ventures addressing urgent social and environmental challenges. As we move towards a digitally driven economy, the synergy between education, entrepreneurship, and sustainable development becomes imperative. By leveraging digital tools and technologies, we empower youth to become agents of change, driving economic growth while ensuring environmental stewardship. The future of our economy lies in embracing new paradigms that prioritize connectivity, innovation, and sustainability. Investing in digital education that encompasses EGD, SDG, and IoT lays the foundation for a resilient and prosperous economy that promotes economic advancement and environmental care.

While the potential is immense, it is important to note that there are still few practical results and empirical studies on this topic, as both SDG and EGD are relatively new concepts and their operationalization is just beginning, particularly in Southeastern European countries. Numerous new solutions through social organization practices, software solutions, and green platforms are expected. Therefore, this paper primarily applied a comparative analysis of theoretical solutions and literature sources. Given that the Green Deal is a product of the EU's green and development policies, and SDG is also a political platform for the desired integral development of the UN, theory is

currently a bit ahead of practice in this field, strategically aiming to promote sustainable development and green transition. Hence, more comprehensive research works on this topic are anticipated following this one.

Note:The literature review used in this paper is a result of the author's doctoral dissertation, which is in the final stages of publication.

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THE INFLUENCE OF PERSONNEL COSTS ON THE PROFITABILITY OF THE CROATIAN ¬¬ HOTEL INDUSTRY

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ABSTRACT

In the 1980s, Croatia recorded about 8 million arrivals and 53 million overnight stays, which dropped to 2.5 million arrivals and 10-11 million overnight stays in the 1990s. Since then, tourism has steadily increased, reaching 17.78 million arrivals and 90 million overnight stays in 2022. Tourism's contribution to GDP more than doubled, spurring investments and improving accommodations. However, competition has pressured revenues, while costs have risen due to higher wages, interest rates, private accommodation growth, emigration, and inflation.

This paper investigates the impact of personnel costs on hotel industry profitability from 1993 to 2022, focusing on the recent exponential rise in personnel costs. These rising costs threaten profitability due to labour shortages, continuous labour imports, declining productivity, and increasing input prices. Using data from 6,127 hotel companies obtained from FINA, analyzed with the two-step system robust GMM method, the study found that a 1% increase in net salary costs results in a 3.7% decrease in gross profit margin.

The analysis highlights the dual impact of increased tourism demand: while it boosts economic growth and investments, it also creates significant cost pressures. Understanding these dynamics is crucial for formulating strategies to maintain profitability in Croatia's hotel industry amidst growing competition and economic challenges.

Key words: *personnel costs, profit margin, hotel industry, tourism, Croatia*

1. INTRODUCTION

Despite high seasonality in the past decade, the hotel industry in Croatia has achieved significant revenues and a high rate of profitability. Thus far, the strengthening of competition, especially in the segment of micro-enterprises and small renters, is putting a pressure on existing hotels. In order to maintain their market shares, hotel companies have launched significant investment cycles and raised the quality of their offerings, requiring substantial financial resources. Consequently, borrowing costs in their balance sheets have continuously increased.

Before the onset of the COVID pandemic, Croatian hoteliers were faced with a growing demand, which continued even after the pandemic, and in spite of a rise in a domestic and foreign competition. On the other hand, challenges for profit management are evident in the inflationary pressures present from 2020 onwards, labour shortages, the high share of labour costs in total costs, and rising capital costs on the financial market.

The aim of this research is to provide the empirical evidence on the impact of labour costs on the performance of companies in the hotel and accommodation industry classified as I5510 in the European Tourism Industry classification. Specifically, the goal is to examine the impact of labour costs on company profitability from 1993 to 2022 to identify the significance of these costs on the profitability of the hotel industry in Croatia over the past thirty years.

After the introductory part, the remaining parts of the paper are structured as follows. The second section provides an overview of existing theories and a literature review. The third section contains an assessment of trends in the competitiveness of Croatian hoteliers. The fourth section details the data and methodology used in the research, including the GMM model and empirical findings. The final section presents the conclusion.

2. THEORETICAL BACKGROUND OF DETERMINANTS OF PROFITABILITY IN THE HOTEL INDUSTRY

According to neoclassical economic theory, profit is the difference between total revenues and total costs. Profit growth can be achieved either by reducing costs while maintaining revenues, by increasing revenues with constant costs, or by ensuring revenue growth outpaces cost increases. Revenues can be increased by either boosting the number of nights at a constant price, maintaining the number of nights but raising the price, or a combination of both, as revenue is the product of price and service quantity. Given the high seasonality of Croatia's hotel industry, revenues can be increased by extending hotel occupancy days.

The demand for tourism depends on tourists' income levels, the business cycle phase of their home countries, their preferences, the price of the tourist product in Croatia and competitor countries (including substitute prices and exchange rates), domestic price levels (relevant for out-of-board consumption), and marketing activities. Other factors include the cleanliness of the sea, climate, historical sites, and other attractions.

Profitability determinants can be divided into macro and micro factors. Macro factors include the country's attractiveness as a tourist destination, domestic price levels, exchange rates, substitute prices, and international price levels. Micro factors include accommodation quality and entity costs. Key determinants of firm costs are workforce availability and quality, labour market flexibility, capital costs, tax policy, domestic and international price levels (particularly if input dependence is high), among others. Tourism has a high multiplier effect, including the export market for domestic agriculture, furniture, construction, textiles, and other industries. Croatian tourism, highly dependent on imports, is increasingly involving the local community, particularly in reducing import dependence on agricultural products.

Dritsakis (2004) found that tourism significantly contributes to long-term economic growth in Greece and that greater economic growth fosters tourism industry development. Quality improvements can increase tourist product prices, depending on competition levels. Denny and Van Reenan (1993) found that market share and concentration positively affect UK firms' profit margins, indicating that greater monopoly power

leads to higher profit margins. The entry of private accommodation and small renters reduces hoteliers' profit margins. Investment levels, tourist product quality, price levels, liquidity, and labour productivity are key profitability determinants. Company size is a minor determinant, while sector competition and participant numbers are more influential (Škuflić & Mlinarić, 2015).

Business costs include personnel, material, capital, and other costs. These costs tend to remain stable or decrease if output is unchanged or increases more slowly than output. Labour shortages and increased demand result in higher wages, while importing less productive labour increases personnel costs and reduces profits. Inflationary pressures post-COVID have driven wage growth. Banks' variable interest rate loans impact capital costs, especially when interest rates rise to curb inflation and due to expansion and maintenance costs.

The debt-to-assets ratio (total liabilities divided by total assets) yields mixed results. Higher borrowing during investment cycles can improve competitive positioning and revenue growth, indicating a positive relationship. Conversely, a higher debt share increases financial and total costs, reducing profit, suggesting a negative relationship. Various studies have reported differing results regarding this debt relationship (Burja, 2011; El-Sayed Ebaid, 2009; Dimitrič et al., 2019; Goddard et al., 2015).

The relationship between a company's capital structure and profitability has been widely studied. Some experts found a positive relationship (Margaritis & Psillaki, 2007), while others reported a negative relationship (Alarussi & Alhaderi, 2018; Habibniya et al., 2022). Tobin's q, the ratio of the market value of a company's shares to the net replacement cost of its capital after taxation, relates to capital costs. A low q value suggests insufficient profitability to encourage capital investment, while a high q value incentivises new capital accumulation (Sargent, 1987).

In recent years, input costs have risen due to inflationary pressures. FINA data for the hotel industry (55.10) from 1992 to 2022 show that personnel costs have fluctuated, increasing significantly by 24.4% in 2021 and 36.6% in 2022, a substantial shock for businesses. Material costs increased even more during these years, by 52.2% and 47.7%, respectively. Personnel costs' share of total expenditures ranged from 0.2 in 1993 to 0.29 in 1999, falling below 0.2 from 2000 onwards and rising to 1.8 in 2021. Material costs' share averaged 0.45 to 0.5 from 1996 until the COVID pandemic, increasing to 1.1 and 5.6 in 2021 and 2022, respectively. Depreciation varied from 0.13 to 0.15. Cost shocks are evident.

This paper investigates the impact of personnel costs on hotel industry profitability to establish future profit trends under continued inflationary pressures. The relationship between labour costs and profitability varies by industry and company type. Higher labour usage does not necessarily reduce profitability. Sethuraman (2000) found that increased employee workloads can lead to errors and quality issues. Ton (2009) determined that workforce growth positively impacts profit margins, while labour costs significantly affect profitability. In manufacturing, personnel costs have a long-term relationship with productivity, and increased personnel costs do not necessarily lower profitability, as shown in European Union companies (Stundziene & Baliute, 2022). Anderson et al. (1997) found that higher customer satisfaction is associated with higher labour productivity for goods-producing firms but lower productivity for service firms, indicating a trade-off between customer satisfaction and productivity in services. Rust et al. (2002) showed that companies focusing on revenue growth outperform those

focusing on cost reduction. Additionally, the theories of the firm state that goals can include increasing company value or manager benefits, not just profit growth, which this paper does not consider.

3. ANALYSIS OF THE COMPETITIVENESS OF CROATIAN TOURIST HOTEL COMPANIES IN THE CONTEXT OF DEVELOPMENT TRENDS IN EUROPE AND THE WORLD

Tourism has seen continuous global growth with minor declines (e.g., in 1995 and 2009) for over seven decades. This growth persisted until the COVID-19 pandemic in 2020, which caused a drastic drop in overnight stays from 1.462 billion to 406.6 million, reverting to 1989 levels. In the decade preceding the pandemic, global tourism growth averaged 3-7% annually, though growth rates varied by region. Post-pandemic, as economies reopened and normalcy resumed, travel, considered a luxury good, regained popularity, with numbers gradually returning to pre-crisis levels. By 2023, 88% of 2019 levels had been reached (UNWTO, 2024).

The restrictions imposed to curb the virus's spread severely impacted tourism and related activities, highlighting the vulnerability of economies heavily dependent on this sector. In 2019, before the pandemic, tourism contributed significantly to the GDP of several countries: Croatia (11%), Portugal (8%), Spain (7%), Italy (6%), and Austria (5%), while the EU average was around 4.5% (Eurostat, 2024). In terms of employment, Croatia's tourism sector accounted for 6% of total employment in 2021, placing it mid-range among OECD countries, and lower than Italy (8.8%) and Spain (12%) (OECD, 2024).

As a country highly dependent on tourism, Croatia must maintain and ideally increase its market share in a competitive environment. Despite growing travel demand, competition has intensified, with tourist companies investing in accommodation capacities and improving quality, while lower air transport prices have made destinations more competitive.

By 2022, the world had approximately 115 million accommodation units, with EU countries accounting for 28.9 million beds (Eurostat, 2024). Key EU tourist destinations include Italy and France (35% of all available units), followed by Spain and Germany. Croatia represents about 3.9% of European tourism. Focusing on beds in hotels, resorts, and campsites, Croatia's share increased from 12% in 2011 to 17% in 2022, indicating enhanced accommodation capacity and competitiveness. Croatia's market share in terms of overnight stays grew from 12.4% in 2012 to 18.4% in 2019, slightly declining to around 17.8% in 2022 (author's calculation based on Eurostat data). This slower post-pandemic recovery may signal a potential loss of competitive position, pending a full tourism sector recovery to pre-crisis levels.

Since 2000, Croatia's tourism revenue has surged from approximately 3 billion euros to nearly 15 billion euros in 2023, with revenue per tourist increasing from 445 to 749 euros. Compared to the EU average of 670 euros per capita in 2023, Croatia's revenue indicates its competitive stature in the EU market, with nearly 20 million tourist arrivals and over 90 million overnight stays.

Tourism's high multiplier effect benefits Croatia's agriculture and supporting industries such as construction, wood, and furniture production, essential for hotel investments and renovations. However, this positive impact might diminish if these supporting industries are underdeveloped or lack international competitiveness. Additionally,

tourism brings challenges such as traffic congestion, inadequate infrastructure, and environmental pollution, necessitating a sustainable development model for the sector.

4. RESEARCH METHODOLOGY AND RESULTS

This analysis uses annual data of 6,127 companies from the hotel industry that operated in the period from 1993 to 2021 in the Republic of Croatia. The data was obtained from the database of the Financial Agency (FINA), which collects company's business information, enabling detailed insights into the performance and financial position of companies. Companies are required to submit financial reports such as profit and loss account and balance of payments to FINA. In order to examine the influence of the cost of net wages on the profitability of the company, the statistical software STATA 17 was used. The dependent variable is the gross profit margin, which represents the ratio of profit before interest and tax to the total revenue of the company. We measured staff costs with the net salary variable. Net wages represent the cost of the company's staff, which does not include income tax or other contributions to wages. According to the literature review, the following variables were used as control variables: cost of materials, indebtedness factor, total asset turnover and labour productivity. Most variables are in logarithmic form to ensure their stationarity. The variables cost of net salaries and cost of materials were first deflated with the producer price index, and then logarithmized. The producer price index has been available since 1995 on the website of the Central Bureau of Statistics. Due to the impossibility of viewing the producer price index before 1995, the time series was reduced to data available after 1995. The results of the descriptive statistics of the variables are available in Table 1.

Table 1. Descriptive statistics

Variable	Number of observations	Arithmetic mean	Standard deviation	Minimum value	Maximum value
Gross profit margin	35,456	2.238	0.282	-6,089	2,398
Cost of net salaries	46,095	7,399	5.120	2.303	19,512
Cost of materials	46,095	10.602	3,921	2.303	20,059
Indebtedness	32,743	2,771	1.301	-5,811	14.184
Labour productivity	23,268	10,310	1,395	2.303	15,632
Total asset turnover	46,380	2.394	0.415	2.303	16,037

Source: FINA. Author's calculation

Data in Table 1 indicate an unbalanced panel of data, which is a limitation of this analysis. The results of the autocorrelation analysis of the variables in the model indicate the presence of first-order autocorrelation. The bi-variate correlation analysis of the variables in the model is given in Table 2.

Table 2. Correlation coefficients

	1	2	3	4	5	6
1. Gross profit margin	1					
2. Cost of net salaries	0.134*	1				
3. Cost of materials	0.103*	0.709*	1			
4. Indebtedness	0.095*	0.049*	0.083*	1		
5. Work productivity	0.066*	0.042*	0.427*	-0.042*	1	
6. Total asset turnover	0.038*	0.738*	0.027*	-0.041*	-0.079	1

Source: FINA. Author's calculation

Note: Statistical significance: *<0.05

After the correlation analysis of the variables was conducted, the multicollinearity of the variables in the model was tested using the centered VIF. The VIF analysis showed that the centered VIF of the variable is less than 5, which indicates the absence of multicollinearity. Heteroskedasticity of squared residual deviations was tested with the Breusch-Pagan-Godfrey test. The analysis indicated the existence of heteroskedasticity. The data were primarily analyzed using the panel analysis model of fixed and random effects, whereby the Hausman test proved that the model of panel analysis of fixed effects is adequate.

The parameter estimates of this model include the assumption of weak exogeneity of the variables, the dependent variable with a time lag is used in the analysis (Sarafidis & Wansbeek, 2012). Models that include a time lag, such as a fixed-effects panel analysis model, can give inconsistent parameter estimates in cases where N $\rightarrow \infty$ and T is defined and smaller than N, as in the case of the data that is the subject of this analysis (N = 6,127 , T = 29). One of the most commonly used estimation approaches is the use of a dynamic model that includes instrumental variables and the generalized method of moments, as described in works such as Arellano and Bond (1991). This method replaces the expected sample value with the mean value and minimizes the squared distance function to achieve consistent parameter estimates in the model. The generalized method of moments (GMM) further differentiates the dependent variable (Arellano and Bover, 1995; Blundell and Bond, 1998). Systemic GMM estimation can be biased due to the transformation of variables, the number of instrumental variables and the weighting matrix. The Hansen restriction test is used to accurately specify the model. The model also assumes that errors are not correlated between firms, but are within firms in the observed time period. In order to solve the latter problem, time *dummy* variables are included in the estimation. In this paper, in addition to the analysis of the panel model of fixed effects, the system robust two-phase GMM model (Roodman, 2009) given by the following equations is used:

$$y_{it} = \alpha y_{i,t-1} + x'^{i,t-1}\beta + \varepsilon_{it}$$

$$\varepsilon_{it} = \mu_i + \nu_{it}$$

$$E(\mu_i)=E(\nu_{it}) = E(\mu_i \nu_{it}) = 0$$

$$i = 1,2,\ldots N \quad t=1,2,\ldots T \qquad (1)$$

where the model is estimated in log-linear form:

$$\log y_{it} = \beta_1 + \alpha log\, y_{it-1} + \beta_2\, log\, x'_{i,t-1} + \varepsilon_{it}$$

$$i = 1,2,\ldots N \quad t=1,2,\ldots T \qquad (2)$$

where is the value of the dependent variable, the value of the dependent variable with a time lag of a year, is the vector of independent variables, β is the vector of the estimated parameters of the independent variables, is the indicator of an individual company in the year , where the error of residual deviations has two orthogonal components, the one with the fixed effect , those idiosyncratic shocks,

This paper analyzes data on the impact of net salary costs on company profitability measured by gross margin for companies in the hotel industry in the period from 1993 to 2021. years. Table 3 provides an insight into a systemic two-phase GMM model.

Table 3. Dynamic panel regression

Variable	(SE)
Gross margin $_{t-1}$	0.000 † (0.000)
Cost of net salaries	-0.037** (0.009)
Cost of materials	0.028** (0.006)
Indebtedness	0.008** (0.002)
Labour productivity	0.031** (0.008)
Constant	YES
Dummy variable for age	YES
Number of observations	11,952
Number of companies (group)	2,055
Probability > F	0.000
Number of instruments	224
Hansen test of exceeding restrictions (p-value)	0.189
AR (1) p-value	0.000
AR (2) p-value	0.187

Source: FINA. Author's calculation.

Note: The standard error of the estimator is in parentheses. Statistical significance: † <0.10; *<0.05; **<0.01. All variables are logarithmic values of the original variables. The Arellano-Bond test of the average autocovariance of order 1 residuals is zero (0). (H0: no autocorrelation). The Arellano-Bond test of the average autocovariance of order 2 residuals is zero (0). (H0: no autocorrelation). Source: author's calculation.

Table 3 shows the results of the panel analysis of the robust two-level systemic GMM panel regression model. Endogenous variables in the model are with the time lag of 1 to 3 year, and include gross margin and net salary costs. Instrumental variables are the variables found in the model without a time lag, the labour productivity variable, with a time lag of two at most, the cost of materials and the indebtedness, and an additional instrumental variable is the total asset turnover with a time lag of up to 1 because it explains the profitability of the company associated with income. The results indicate a significant negative impact of the cost of net salaries on the gross margin. Moreover, the analysis indicates that, on average, a 1 percent increase in net salary costs will result in a 3.7 percent decrease in gross margin.

5. CONCLUSION

Tourism, with its high multiplier effect on a country's economy, is significant for both developed and less developed economies. It contributes to employment growth and increases export revenues, which is crucial for countries like Croatia with low export propulsivity in the goods sector. This sector has unique structural characteristics, making it specific and very sensitive. The hotel and accommodation industry is capital-intensive, requiring significant investment in hotels, real estate, land, and equipment, leading to high fixed costs. Many companies borrow financial capital to obtain necessary funds, resulting in high levels of indebtedness and high capital costs. The assets owned by companies are often used as collateral to raise capital, leading to high liabilities and leverage ratios, making them vulnerable to environmental turbulence.

This industry is particularly sensitive to external changes such as financial crises, income drops, and climate change. The recent health crisis highlighted its vulnerability. In recent decades, larger companies and increased competition have exerted pressure to decrease prices. The relatively easy entry into the accommodation sector, except for hotel chains and branded hotels, leads to high price competition, high fixed costs, and interchangeable services, making the hospitality and tourism industry more competitive than others. Significant competition has also emerged from private accommodation.

Given these challenges, firms must manage costs effectively and differentiate their products (e.g., joining global hotel chains, improving hotel and service quality, location) to command higher prices and increase revenues. However, price increases are limited by high competition both domestically and internationally, which restricts income, time, and profit growth. Therefore, this paper focuses on the cost segment.

This paper examined the impact of personnel costs, measured by net salary costs, on the profitability of hotel industry companies, measured by gross margin. Using annual financial data from FINA for 6,127 companies from 1993 to 2021, the analysis employs the two-step system robust GMM method. The results show that a 1% increase in net salary costs results in a 3.7% decrease in gross margin, demonstrating the negative impact of rising labour costs on profitability.

Labour costs typically represent about 20% of total costs, while material costs account for about 50%. We investigated the impact of rising staff costs on business profitability. Recent emigration trends from Croatia and neighbouring countries have led to labour shortages, necessitating wage increases and/or importing workers from distant countries with lower productivity. This has significantly increased personnel costs in 2021 and 2022 compared to previous years. Hence, the significance of this paper is twofold. Firstly, it delivers practical insight into the effect of the labour costs on gross profit margin. Secondly, following the importance of the labour costs in the hotel industry in Croatia this paper enables a foundation for argumentative discussion about the current trends and developments in tourism and with it related tourism policy.

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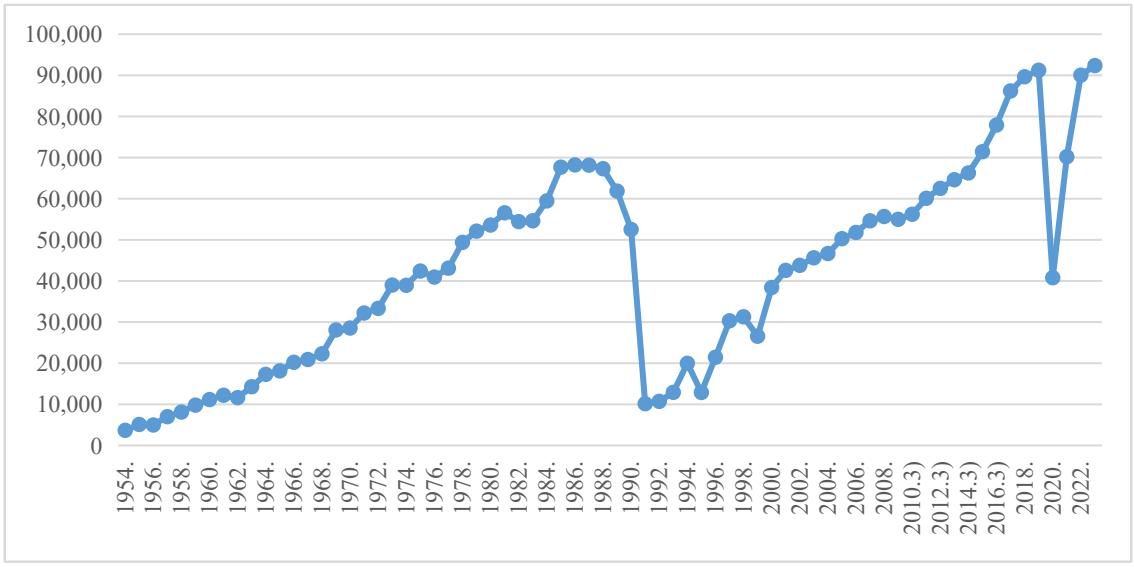
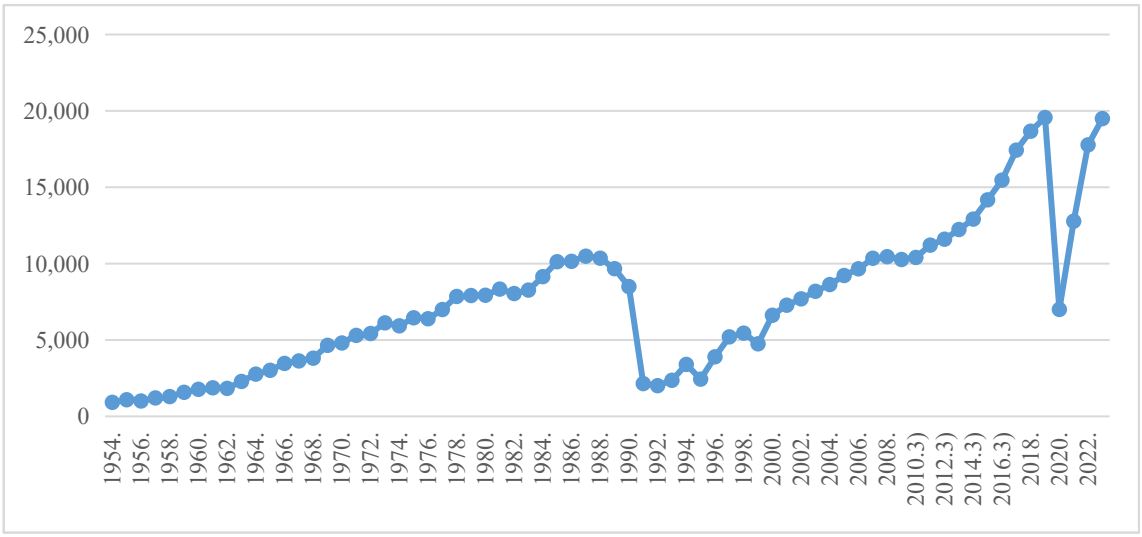
APPENDIX

Figure 1. Number of overnight stays in the Republic of Croatia, 1954 - 2023



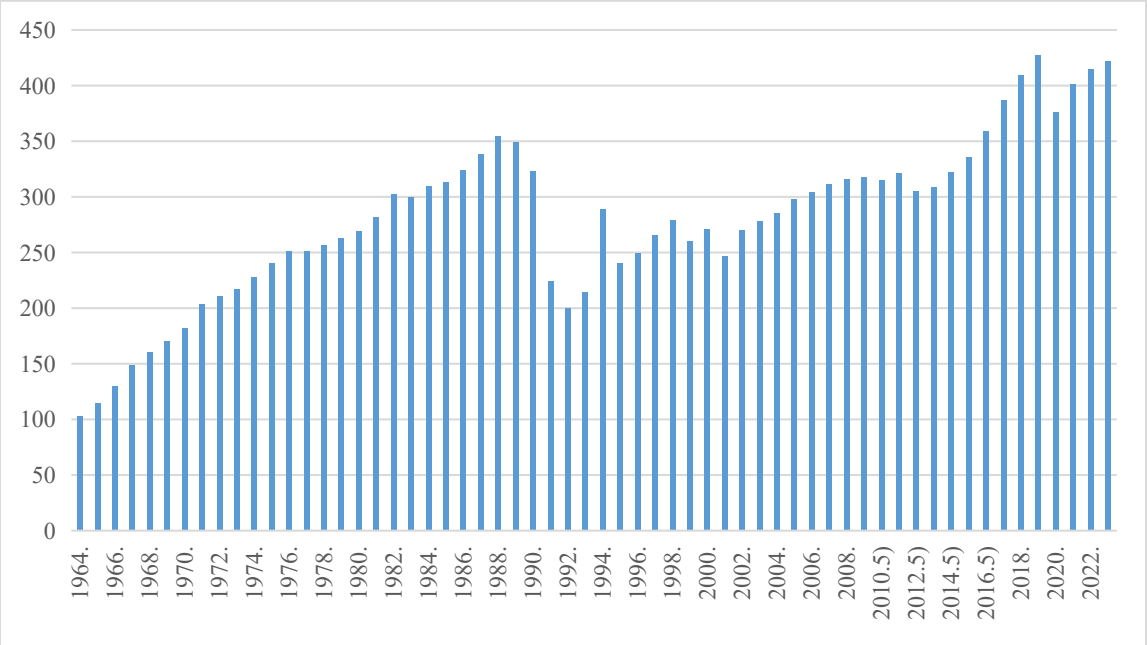
Source: Croatian Bureau of Statistics (2024). Tourism data (online). https://podaci.dzs.hr/hr/podaci/turizam/

Figure 2. Number of arrivals in the Republic of Croatia, 1954-2023



Source: Croatian Bureau of Statistics (2024). Tourism data (online). https://podaci.dzs.hr/hr/podaci/turizam/

Figure 3. Number of beds in the Republic of Croatia,1964-2023



Source: Croatian Bureau of Statistics (2024). Tourism data (online). https://podaci.dzs.hr/hr/podaci/turizam/ (1 April 2024)