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- Peer Review -

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BUILDING SUSTAINABLE PERFORMANCE THROUGH LEADERSHIP

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Abstract: *The past decades witnessed the emergence and development of the sustainability issue in any field of activity or industry. On the one hand, international organizations and governments worldwide collaborated and established numerous agreements, conventions and laws in favor of environmental protection. On the other hand, sustainability has become an interesting and appealing scientific research topic for a plethora of experts and scientists. Consequently, the leadership of organizations has made and makes significant efforts to build and attain sustainable performance. The purposes of the paper are to define in brief the concepts of sustainable performance and leadership, and to outline their relationship. To reach these aims the author employed a scientific methodology based on a qualitative research method. The findings show that leadership highly influences organizational performance in any domain of activity. Moreover, sustainable performance demands the reconciliation among the economic, the social, and the environmental sides. This is why leadership should make efforts to deeply embedded social and environmental aspects in the economic activities and processes of an organization.*

Keywords: *sustainable performance, leadership, sustainability, organization.*
JEL Classification: *L25, M19, Q01.*

1. Introduction

In the late 1960s, an eclectic group of individuals, composed from economists, scientists, academics, industrialists, civil servants from ten countries, gathered in Rome to discuss about the future of humanity. Starting from five key elements- population, industrial production, pollution, food production, natural resources- they concluded in their research that the limits to growth on our planet will be attained in the next one hundred years (Meadows et al., 1972). Later, the Brundtland Commission, appointed by the United Nations, addressed the most important challenges (e.g., environmental, economic) to the human society and called for sustainable development (World Commission on Environment and Development, 1987).

This is why the past decades witnessed the emergence and development of the sustainability issue in any field of activity or industry (Cornescu et al., 2004; Marinescu and Toma, 2015a). On the one hand, international organizations and governments worldwide collaborated and established numerous agreements, conventions and laws in favor of environmental protection. Sustainable growth and development became key objectives for many countries all over the world (Toma and Grădinaru, 2017; Toma, 2019). On the other hand, sustainability has become an interesting and appealing scientific research topic for a plethora of experts and scientists (e.g., ecologists, lawyers, economists, engineers) in an increasing globalized world (Toma, 2005; Toma and Săseanu, 2007).

On their turn, non-governmental organizations, business and non-profit organizations have understood the need to adopt, implement and promote the principles of sustainability in their activities and processes (Toma et al., 2011a; Toma et al., 2011b; Toma, 2012). Consequently, the leadership of organizations has made and makes significant efforts to build and attain sustainable performance.

The purposes of the paper are to define in brief the concepts of sustainable performance and leadership, and to outline their relationship. These aims were achieved through a qualitative research method. The structure of this study is as follows: the next

section illustrates the literature review. The research methodology is exhibited in the third section of the paper. The results are discussed in the fourth section. The paper ends with conclusions.

2. Literature review

Recent years confirmed the increasing role of sustainability issues in human society. Being analyzed through its three main dimensions (Kuhlman and Farrington, 2010)- economic (profit), social (people) and environmental (planet)-, sustainability means „transforming our ways of living to maximize the chances that environmental and social conditions will indefinitely support human security, wellbeing, and health" (McMichael et al., 2003, p.1919).

Sustainability raises a delicate question for any organization: how does the organisation relate to its environment? (Metcalf and Benn, 2012). Thus, it requires leaders of organizations to design sustainable strategies and to initiate sustainable practices (Metcalf and Benn, 2013). In essence, the shift to sustainability has deeply influence leaders in organizations to adopt the principles of sustainability. Therefore, they have sought not only to attain but to build sustainable performance in their organizations. Sustainable performance is defined as:

- the performance that „measures and assesses the performance of the firms from all aspects and for all stakeholders" (Iqbal et al., 2020, p.3).
- „organizations achievements regarding stakeholders' expectations in three main areas, i.e., economic, social, and environmental performances" (Dey et al., 2022, p.4).
- „the ability of the organization to achieve its business and increase value for shareholders, taking into account the long-term economic, environmental and social responsibility" (Al-Abbadi and Abu Rumman, 2023, p.3).
- „an organization's ability to achieve its financial objectives while making a positive impact on the environment, employees' well-being, and society as a whole" (Abensur, 2024, p.1).

These above-mentioned definitions allow the identification of the following features of sustainable performance:

- ❖ There is no unique definition of this concept.
- ❖ It is strongly connected with economic issues, social problems and environmental issues.
- ❖ The concept addresses a plethora of stakeholders (e.g., employees, shareholders).

On its turn, the concept of leadership is one of the oldest in the scientific literature. It is defined from various perspectives as:

- „an asymmetrical relationship of influence, where one actor guides or directs the behavior of others towards a certain goal over a certain period of time" (Underdal, 1991, p.140).
- „the actions of individuals who endeavor to solve or circumvent the collective action problems that plague the efforts of parties seeking to reap joint gains in processes of institutional bargaining" (Young, 1991, p.285).

- „the ability to motivate others and listen to them, be trustworthy and competent" (Twin, 2024, p.1).
- „a set of mindsets and behaviors that aligns people in a collective direction, enables them to work together and accomplish shared goals, and helps them adjust to changing environments" (McKinsey, 2024, p.1).

These above-mentioned definitions enable the identification of several characteristics of leadership, as follows:

- It represents a complex, elusive and multimensional concept (Toma et al., 2020a; Toma et al., 2020b).
- Leadership involves a relationship between the leader and its followers (Marinescu et al., 2015; Marinescu and Toma, 2015b).
- It is associated with the collective attainment of some common goals (Toma, 2008a; Toma, 2013).
- Leadership provides direction for an organization and its people (Grădinaru et al., 2020; Toma, 2024).

In order to build sustainable performance, the leadership of an organization should possess strategic thinking (Toma and Marinescu, 2015; Toma et al., 2016a), design and implement strategic plans (Toma and Marinescu, 2013; Toma and Grădinaru, 2016; Toma et al., 2016b), implement sustainable business models (Tohănean and Toma, 2018; Toma and Tohănean, 2018; Toma and Tohănean, 2019), promote an entrepreneurial mindset (Marinescu et al., 2017; Grădinaru et al., 2018; Catană et al., 2020), align with the corporate social responsibility principles (Toma, 2006; Toma and Hudea, 2012), utilize lean and agile management (Naruo and Toma, 2007; Marinescu and Toma, 2008; Toma, 2023) and marketing mix (Grădinaru and Toma, 2017; Catană and Toma, 2021a; Catană and Toma, 2021b), invest in its human resources (Marinescu and Toma, 2013; Săseanu and Toma, 2019; Catană et al., 2021), and use various managerial methods and techniques (Toma, 2008b; Toma et al., 2010).

Since the beginning of the 21st century, many researchers have published numerous articles and books related to the relationship between sustainable performance and leadership (Hind et al., 2007; Spreitzer and Porath, 2012). The analysis of this relationship is presented in chapter 4.

3. Research methodology

To attain the objectives of the paper, the author employed a qualitative research method. First, he ientified and colected needed the information through desk research from multiple secondary data sources such as articles and books. Second, the author carried on a comprehensive literature review. Third, he carefully analysed and synthesized the information. Then, the author elaborated the study.

4. Results and discussion

This section of the research analyses the relationship between sustainable performance and leadership at organizational level. By embracing the principles of sustainability, the leadership of an organization, irrespective of its size and industry, can hihly contribute to building sustainable performance. Starting from the literature review, the following outcomes seem relevant for the research:

- A responsible leadership should be at the core of organisational sustainable performance (Figure no. 1). In this case, there are several compulsory attributes for a leader such as (Hind et al., 2007):
  - Performing with integrity.
  - Being an open-minded person.
  - Taking care of subordinates.
  - Demonstrating a long-term perspective.
  - Knowing to communicate with others.
  - Behaving in an ethical manner.
  - Managing responsibly both inside and outside the organisation.
  - Showing respect for all employees.
  - Being positive, honest and trustworthy.
- An effective leadership should encourage not only a pro-organisational but also a pro-social, pro-environmental and pro-societal behavior (Lu and Lin, 2014).
- An ethical leadership should convince employees to behave in a socially responsible manner (Dey et al., 2022).
- A sustainable leadership should allow and stimulate employees to play a significant role in attaining superior organizational performance in a sustainable manner. A thriving workforce is essential for building sustainable performance (Spreitzer and Porath, 2012).
- A collaborative leadership should make organization members to often interact in ways that give birth to new forms of intellectual and social experiences and understandings (Gemmil and Oakley, 1992).
- A transformational leadership should create an organizational environment conducive to novel ideas and innovation (Shin and Zhou, 2003).
- An authentic leadership should stimulate leader's integrity and job performance (Walumbwa et al., 2008).

Figure no. 1. Sustainable performance and leadership
Source: author's contribution

In essence, these results outlined some of the most important features and facets leadership should possess in order to build sustainable performance within an organization. Without any doubt, leadership highly influences organizational performance in any domain of activity. Moreover, sustainable performance demands the reconciliation among the economic, the social, and the environmental sides. This is why leadership should make efforts to deeply embedded social and environmental aspects in the economic activities and processes of an organization.

5. Conclusions

Since the late 1980s, there has been a growing concern towards environmental protection. In the past decades, sustainable development and sustainability have become key issues both in theory and practice.

The paper defines the concepts of sustainable performance and leadership, emphasizing some of their characteristics. Also, it shows that building sustainable performance through leadership at organizational level requires the attainment of an equilibrium between the economic view and the socio-environmental side.

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THE IMPACT ON THE DEVELOPMENT OF A RESORT LOCATED ON THE BLACK SEA COAST BY THE CONSTRUCTION OF RESIDENTIAL BLOCKS

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Abstract*: Tourism is an economic and social phenomenon specific to modern civilization, strongly anchored in the life of society and influenced by its evolution. The evolution of tourism on the Romanian coast has been influenced by a series of factors, both internal and external, which have led to significant changes in this sector in recent years. Developing a resort on the Black Sea coast by building residential blocks brings both advantages and disadvantages. It is essential that local authorities, investors and communities collaborate to find a balance between economic needs and environmental protection. Only through a responsible and sustainable approach can a beneficial development be ensured for both tourists and permanent residents of the area, so that there are no dissensions between them. The Black Sea has the potential to become a top tourist destination, but this requires special attention to detail and a commitment to sustainable development. The increase in the number of tourists and housing can generate pressure on local resources, such as water, electricity and health services. Local authorities must ensure that these resources are managed effectively to prevent crises. Accommodation development can also attract investment in infrastructure, such as roads, public transport, and health and education services, benefits that can extend to permanent residents. Collaboration between local authorities, investors, and communities is essential to ensure balanced development. Community consultation in the planning and development process can reduce tensions and help create solutions that benefit all parties involved. An increase in the number of residents and tourists can stimulate the local economy, supporting businesses in the hospitality, retail, and entertainment sectors.*

Key words*: tourism, politics, investments, infrastructure, coastline*.
JEL Classification*: D01.*

1. Economic impact

Tourism is a key sector for the Romanian economy, and the Romanian coastline is one of the most visited destinations. The Black Sea, with its long beaches and natural landscapes, has become a popular destination for both tourists and those looking for holiday homes. Offering a large number of apartments can turn the resort into a mass tourist destination, which can lead to a loss of authenticity. According to statistics, the number of tourists visiting this area has been steadily increasing, which has led to an increase in demand for accommodation infrastructure, including apartment buildings.

In recent years, real estate developers have been attracted to this area, and infrastructure investments have increased considerably. Construction projects attract investments from real estate developers, which can include both domestic and foreign capital. This can lead to increased local incomes.

It is essential to analyze how this development affects local communities, the economy and the environment.

The development of Black Sea resorts has been a constant topic of discussion in recent decades, given the region's tourism potential. In the context of increasing demand for tourism and the need for housing, the question arises about the best way to develop these areas. This article analyzes the effects of developing a resort through the construction of residential blocks compared to the construction of accommodation units, discussing the advantages and disadvantages of each option, addressing economic, social and environmental aspects.

Both residential blocks and accommodation units have a significant economic impact, but from different perspectives. Residential blocks provide long-term stability, while accommodation units contribute to short-term economic growth, but can generate instability.

In the context of rapid urbanization and demographic changes, many seaside resorts have started to develop through the construction of residential blocks. These offer quick and efficient solutions to meet the growing demand, but they also come with significant challenges.

One of the solutions adopted to meet the demand for accommodation is the construction of apartment blocks.

One of the most obvious effects of developing new apartments in seaside resorts is the stimulation of the local economy. This construction generates jobs during the construction phase, but also later, in the service sector. This can contribute to the economic development of the area and reduce unemployment.

New restaurants, shops, entertainment centers and tourist facilities are often developed around new residential complexes, contributing to the economic growth of the region.

Attracting tourists is also another major benefit. Holiday apartments or short-term rentals can provide an additional source of income for local owners, thus stimulating consumption and infrastructure development.

Apartment blocks can offer more affordable and varied accommodation options for tourists, which can attract more long-term visitors, increasing the accommodation capacity of the area. These structures can offer a considerable number of accommodation units, which allows attracting a larger number of tourists. Offering new apartments or holiday homes can extend the peak season and diversify the accommodation offer. This can lead to an increase in tourism revenues.

Apartment blocks can offer a wide range of accommodation options, from simple apartments to luxury units. This diversification of the offer can attract tourists from different market segments, from families with children to couples or groups of friends, thus increasing the attractiveness of the resort.

In addition, apartment blocks can be used not only during the summer season, but also throughout the year, thus contributing to a more stable local economy.

Also, the increased demand for accommodation can lead to increased prices for local housing and goods, affecting affordability for permanent residents. Apartment blocks can provide long-term economic stability, as residents pay local taxes and contribute to the community economy. This can lead to improved infrastructure and public services. As the resort develops, investors can speculate on the anticipated increase in property values, which can lead to increased volatility in the real estate market.

Investments in apartment buildings can diversify the real estate offer of the region, attracting different segments of the population, from young professionals to families and retirees.

The construction of apartment buildings can contribute to the growth of the local population, facilitating the attraction of new residents to the area. This can lead to positive economic development, with increased demand for local goods and services.

At the same time, the construction of accommodation units, such as hotels and guesthouses, can stimulate tourism in the area. This can lead to an increase in the number of visitors, which translates into higher revenues for local businesses.

Accommodation units generate employment opportunities for locals, contributing to the reduction of unemployment and the professional development of the community.

Investments in real estate can attract developers and investors, contributing to the modernization of the area.

2. Social impact

The construction of apartment buildings brings with it a significant demographic change. This can lead to an increase in the population of the area, especially among young professionals and families seeking a more relaxed lifestyle. This migration can bring new cultures and ideas, enriching community life.

The development of the area must be accompanied by efforts to integrate the new residents into the community. Initiatives to organize local events, festivals and cultural activities can help create a sense of belonging and social cohesion. It is essential that development does not lead to segregation or the creation of isolated communities.

The transformation of an area through the construction of apartment buildings can change the character and identity of the community, leading to a loss of local identity. New construction can influence the architectural style and local traditions, which can be seen as both an opportunity for modernization and a threat to cultural heritage.

Rapid population growth can lead to overcrowding, which can affect the quality of life and available services.

Rapid development of resorts can lead to a change in community dynamics. Permanent residents may feel that their lifestyle is threatened by the influx of tourists, which can generate social tensions. In addition, property prices and rents can increase, making them unaffordable for local residents. Thus, low-income residents may be forced to leave the area, which can create a social divide in the community.

Rapid growth in the number of homes can lead to overcrowding in the area, which affects the quality of life of both tourists and permanent residents, and possible tensions between newcomers and locals. Existing infrastructure can become insufficient, generating traffic problems, crowding on beaches and a lack of parking spaces, water, sewage and transport systems, which can generate tensions between residents and tourists.

Much of the activity of accommodation units is seasonal, which can create economic instability for the community. Outside the tourist season, many businesses can suffer significant losses.

3. Environmental impact

Developing a resort by building apartment blocks can have a significant impact on the environment. Opening new construction sites can lead to deforestation, pollution, and the destruction of natural habitats for various plant and animal species. This can affect local biodiversity and lead to the extinction of some species. This can generate a negative reaction from the community, especially from those who advocate for environmental conservation.

The creation of new buildings and infrastructure can fragment existing ecosystems, limiting the migration of species and access to essential resources.

It is essential that urban planning includes environmental protection measures, such as building green spaces, promoting green transport, and efficient resource management.

It is also important for local authorities to enforce strict building regulations so that development is sustainable and does not negatively affect marine and coastal ecosystems.

Construction activities can lead to soil pollution through the use of chemicals, oils and other toxic products used in construction. Improper waste management can also contribute to soil contamination. Construction waste, such as scrap materials and chemicals, can end up in rivers or the Black Sea, affecting water quality and aquatic ecosystems.

Construction projects can stimulate community involvement in decision-making, and residents can be encouraged to participate in discussions about urban development, which can strengthen ties between community members.

One of the biggest disadvantages of development through the construction of apartment blocks is the negative impact on the environment. Building in ecologically sensitive areas can lead to landscape degradation, affecting local ecosystems and biodiversity. Also, temporary population growth can create additional pressure on natural resources, with mass tourism generating pollution and environmental degradation. Construction activities generate dust and emissions of gases such as carbon dioxide and nitrogen oxides, which can affect air quality. This can have a negative impact on the health of residents and tourists in the area.

Negative environmental effects can vary depending on the planning and implementation, so it is essential that developers consider sustainability in both cases.

To minimize the negative impacts of housing developments, sustainable urban planning is essential. This should include rigorous environmental assessments, consultations with local communities, and development strategies that prioritize environmental protection, with developers adopting mitigation measures, such as choosing environmentally friendly materials and construction techniques that minimize environmental impacts.

Developing campaigns to promote responsible tourism can help educate tourists about the importance of respecting the environment and local communities. This can include recycling initiatives, resource conservation, and respect for local culture.

4. Conclusions

The decision to build residential or accommodation units on the Black Sea coast must be well-founded, considering the long-term impact on the community, the economy and the environment. Each option has its advantages and disadvantages, and a balanced approach, integrating the needs of permanent residents with those of tourists, could represent the best solution for the sustainable development of the region. Collaboration between local authorities, developers and the community is essential to ensure a prosperous and harmonious future for the Black Sea resorts.

The development of seaside resorts through the construction of residential apartment blocks has a profound impact on the economy, demography, environment and local community. While there are many advantages, it is crucial that authorities and developers work together to manage these changes in a way that ensures a sustainable and prosperous future for all involved. Careful planning and social responsibility will be the key to success in transforming these areas into an attractive destination for both tourists and locals.

Promoting sustainable tourism can help maximize long-term economic benefits while protecting the area's natural resources and cultural heritage.

It is essential to have a sustainable development plan that integrates the needs and desires of the local community, protects the environment and cultural heritage, and provides adequate infrastructure to support demographic growth. Consultation with local expertise, urban planning, and community involvement are essential to ensure harmonious development.

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PARTICULARITIES OF THE NATIONAL BUDGET DEFICIT IN 2023

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Abstract: *Romania is going through a difficult economic phase due to the war on the border, the high budget deficit whose financing is carried out at high costs, but also due to the movements on the energy market, which have complicated the stability aspects. In particular, our country's budget deficit is ahead of that of the EU and the Eurozone, but its excess is observed even at the level of the Union, as well as the Eurozone, throughout the reference period, compared to the value provided for by the Maastricht Treaty. The imbalances that Romania faces represent a major vulnerability that can be reduced through efforts on several fronts: budgetary consolidation (reduction of the budget deficit), a better allocation of resources in the economy to support the production of goods with high added value, etc. An important role should be played by European funds, having both a direct impact, by increasing the sources of financing external deficits, and an indirect one, by implementing targeted investment and structural adjustment programs, with favorable effects on economic activity and, implicitly, in the sense of mitigating the amount of fiscal deficits.*

Keywords: *deficit, budget, public administration, economic crisis, financing, investments.*
JEL Classification: *H62.*

1. Introduction

The European and global economic context continued to be complicated in 2023 as a result of the prolongation of the Russian-Ukrainian conflict and implicitly of the disruptive factors generated by it, leading to the maintenance of a climate of uncertainty. Prices, although they showed a downward trend, remained at a still high level, and external demand decreased against the backdrop of the restriction of economic activity in partner countries.

These very complicated periods show, more than previous ones, the need for a change in the structure of economies, with an emphasis on environmental protection activities, the implementation and support of technological innovations in the digital field, increasing the degree of inclusion and reducing inequality. These crises also entailed and continue to entail important efforts to ensure the sustainability of accumulated debts, especially at the public, but also private sector level.

In the current period, the idea that the budget deficit becomes a means of relaunching economic activity, given that it is no longer inflationary in nature (Cioponea, 2007), can be acted upon in the demand for public goods and services by using conjunctural action funds, thus achieving a flexible budget policy, within which public spending can be resized in relation to the size of these funds. If no changes are made to tax regulations, tax revenues can constitute instruments of conjunctural adjustment.

In this sense, a crucially important process is the efficiency of public spending. The desired objectives can be achieved more efficiently, sometimes faster and at lower costs, without reducing the quantity or quality of services provided (Kolodko, 2015). Moreover, it is considered that the Government is the only economic actor that can maintain the level of

demand in the economy, spending more than it earns, that is, by registering a budget deficit (Chang, 2014).

2. Romania's budgetary deficit in 2023

2.1. Economic situation and synthetic budgetary indicators

For 2023, Romania is forecasting an economic growth of 2.8%, which took into account the contribution of the following factors:

- domestic demand seen as the engine of economic growth (3.3%);
- the growth rate of gross fixed capital formation forecast at 6.2%;
- final consumption expenditure of the population forecasted to have a real annual growth rate of 2.7% (MFP, Budget Execution Report 2023).

The statistical data published by the INS revealed, in 2023, a real growth rate of gross domestic product of 2.1%, representing an increase of 8.3 percentage points above the level recorded in 2019, considered a normal reference year. Although there is a trend of slowing economic growth, it should be noted that in 2023, Romania outperformed the economic growth in the EU and the euro area (0.4%), ranking 6th in a top of member states, ahead of countries such as Germany, Italy and France. Compared to the budget scenario, the achievements reveal a more pronounced decrease in industrial activity. As foreseen in the forecast, the economic context continued to be unfavorable, which prevented the slight recovery process of this sector from taking place. At the same time, it is worth noting the spectacular evolution of construction with a dynamics significantly higher than the forecasted level.

In 2023, the Romanian economy recorded a nominal value of gross domestic product of 1,605.6 billion lei, higher than estimated due to a higher level of the deflator compared to the estimated one, in the conditions of higher-than-forecast achievements for the CPI (annual average) and construction costs.

In terms of use, the significant contribution to economic growth of gross investments (+3.6 percentage points) and final consumption (+2.8 percentage points) is noteworthy. The positive evolution of the two components of domestic demand was not fully reflected in the GDP dynamics, however, the negative contribution of the change in inventories (-4.3 percentage points) considerably reducing the real economic growth rate.

Regarding private consumption, although the purchasing power of the population improved, given that real disposable incomes increased, consumers preferred to allocate a smaller percentage of their financial resources for the purchase of goods and services, also moving towards saving, thus, it had a modest dynamics (2.8%), contributing 1.8 percentage points to economic growth. On the other hand, government consumption (which includes individual consumption and collective consumption of the public administration) increased by 6.0%, contributing 1 percentage point to the real GDP growth rate.

Inflation followed a downward trajectory during 2023, amid the slowdown in energy and raw material prices, as well as the improvement of distribution chains. The adjustment of global demand and supply led to a decrease in consumer price dynamics, which was also reflected in the national economy, where annual inflation fell to 6.6% in December.

As an annual average, inflation in 2023 was 10.4%, with the downward trend manifesting itself in the food (14.9%) and non-food (7.1%) sectors. In the food component, the downward trend was more pronounced, due to the reduction in international raw material prices and the temporary capping of trade markups, which led to a deceleration in prices for

both processed and unprocessed food products. In the services sector, a slight increase was recorded, with an average of 11.3%, due to the pressures of high labor costs.

Compared to 2022, the deficit calculated according to the ESA 2010 methodology in 2023 increased by 0.3 percentage points from 6.3% of GDP in 2022 to 6.6% of GDP in 2023.

The structural balance of the general government (ESA methodology) stood at -6.0% of potential GDP in 2023, similar to the previous year. The result corresponds to a cyclical component of -0.6% and a negative output gap of -1.9% of potential GDP. (MFP, Budget Execution Report 2023).

Figure no. 1

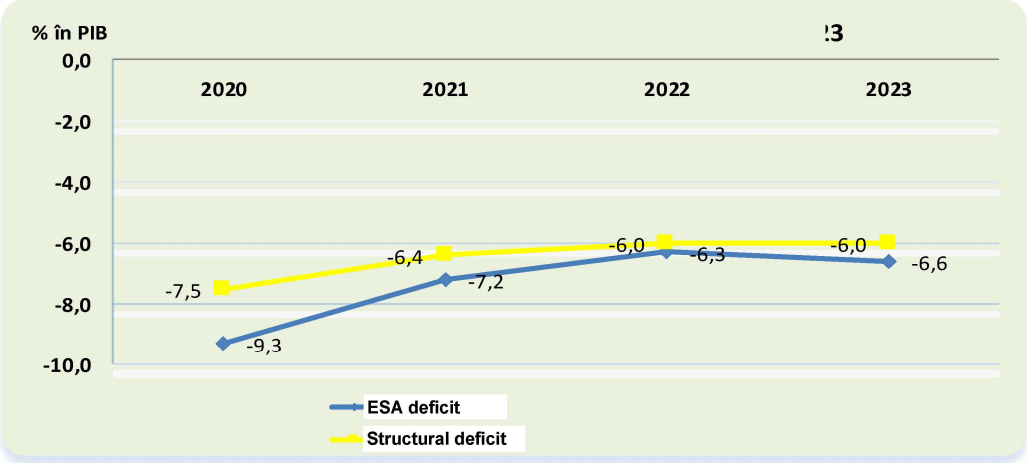
Structural deficit in Romania

	2020	2021	2022	2023
Structural deficit	-7,5	-6,4	-6,0	-6,0

Source: Ministry of Public Finance, *Report on the final budget execution for 2023*, www.mfinante.gov.ro

Figure no. 2

ESA deficit and structural deficit in Romania in the period 2019-2022



Source: Ministry of Public Finance, *Report on the final budget execution for 2023*, www.mfinante.gov.ro

Risks to global financial stability have developed mixedly since the previous year's Report. Most economies, as well as the financial system as a whole, have remained resilient throughout the disinflationary process, and investor sentiment has been supportive, contributing to the easing of financial conditions in global capital markets. However, the external economic and geopolitical context continues to be marked by uncertainties on multiple fronts.

Although expectations for global economic growth have improved slightly, they are heterogeneous internationally and remain modest by historical standards. The pace of global economic growth is projected to remain at the 2023 level in 2024 and 2025, at 3.2 percent, according to the IMF.

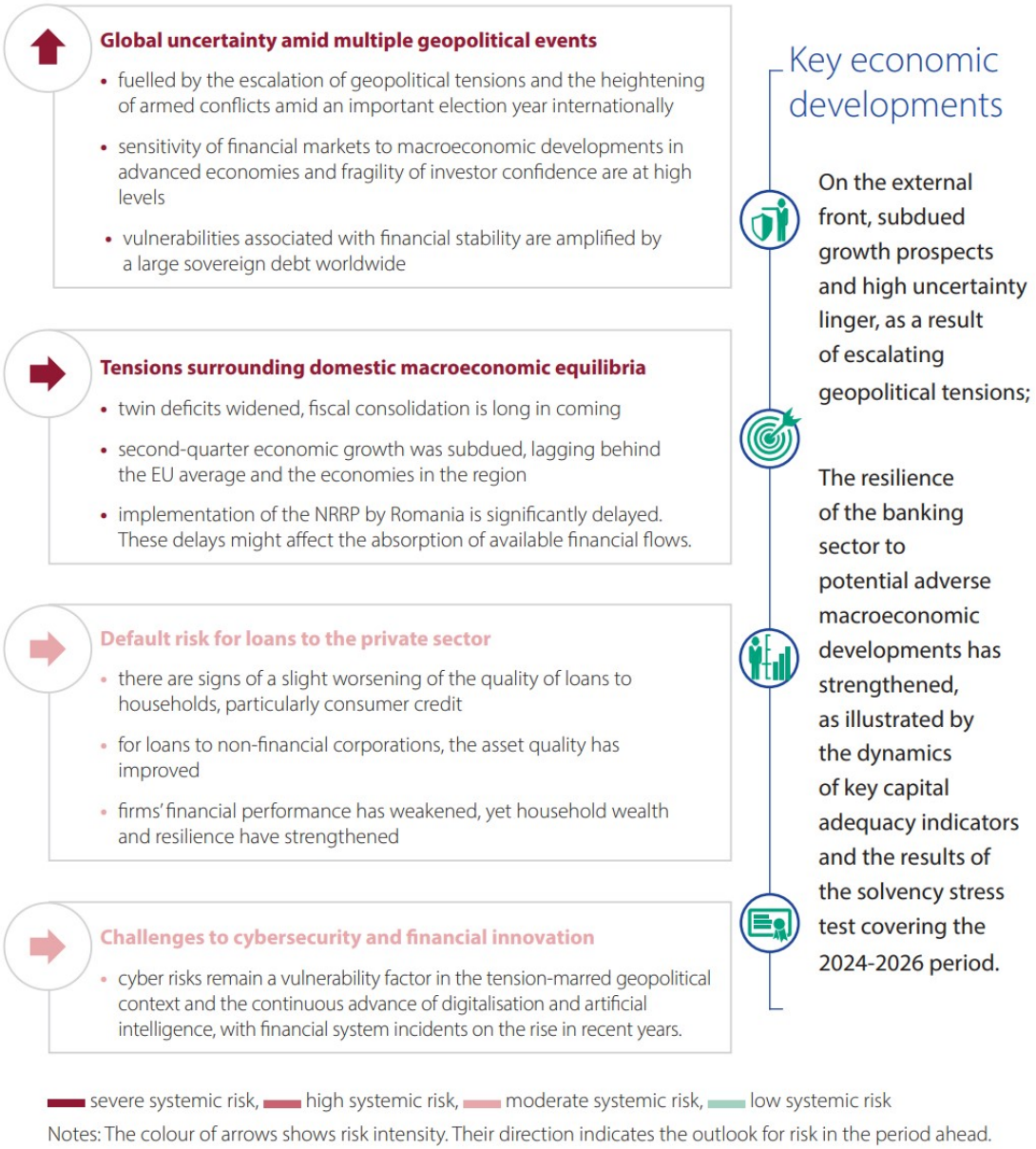
At the same time, there is a risk of sharp corrections in financial asset prices in the event that these optimistic prospects do not materialize, which may be tested by developments, both on the macroeconomic and geopolitical fronts, including as a result of the

intensification of the conflict in the Middle East and the continuation of the war in Ukraine. Potential new inflationary shocks on the supply side may generate volatility in international financial markets, as well as a sudden tightening of financial conditions.

Vulnerabilities to the global financial system may be amplified by high levels of indebtedness, both in the public and private sectors, in the context of an important international election year, which may exacerbate risks related to fiscal policy. Against the backdrop of unprecedented support measures, government debt has increased significantly during the pandemic and remains at high levels, with budget deficits increasing the public debt burden in many economies.

Figure no. 3

The main risks to financial stability in Romania



Source: NBR, *Financial stability report, December 2024 - overview*, https://www.bnr.ro

2.2. Analysis of the state budget revenues and expenditures in 2023

According to the final data, the execution of the general consolidated budget, during the period January 1 - December 31, 2023, ended with a cash deficit of 90.06 billion lei, respectively 5.61% of GDP.

Compared to the previous year, the deficit of the general consolidated budget in 2023, on a cash basis, decreased by 0.15 percentage points from 5.76% of GDP in 2022 to 5.61% of GDP in 2023.

Figure no. 4

Romania's cash budgetary deficit

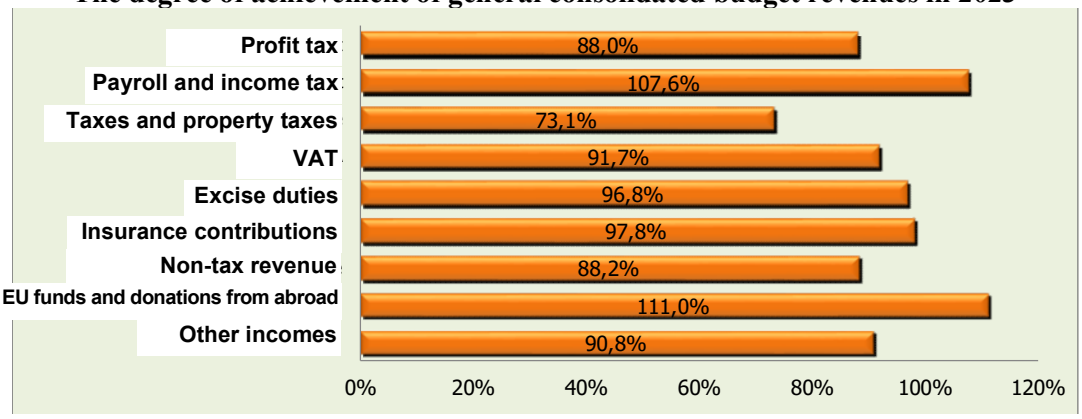
		2022	2023	2023/2022 differences
Budget balance	mil. lei	-80.765,8	-90.060,7	-9.294,9
	% din P.I.B.	-5,76	-5,61	0,15

Source: Ministry of Public Finance, *Report on the final budget execution for 2023*, www.mfinante.gov.ro

• **The revenues of the general consolidated budget, in 2023**, totaled 520.60 billion lei, representing 32.4% of GDP and a degree of achievement compared to annual estimates of 96.2%.

Figure no. 5

The degree of achievement of general consolidated budget revenues in 2023



Source: Ministry of Public Finance, *Report on the final budget execution for 2023*, www.mfinante.gov.ro

Tax revenue collections were below the level scheduled for 2023, with a level of achievement of 93.3%, influenced by the evolution of taxes and duties on goods and services and property taxes and duties.

Insurance contribution collections were below the collection program, with a level of achievement of 97.8%. The program's failure to achieve was determined by the lower annual program collections for insurance contribution revenues collected from the state social insurance budget (97.9%), the unemployment insurance budget (87.6%) and those from the budget of the National Single Health Insurance Fund (97.3%).

Non-tax revenue collections were below the annual program, with a level of achievement of 88.2%;

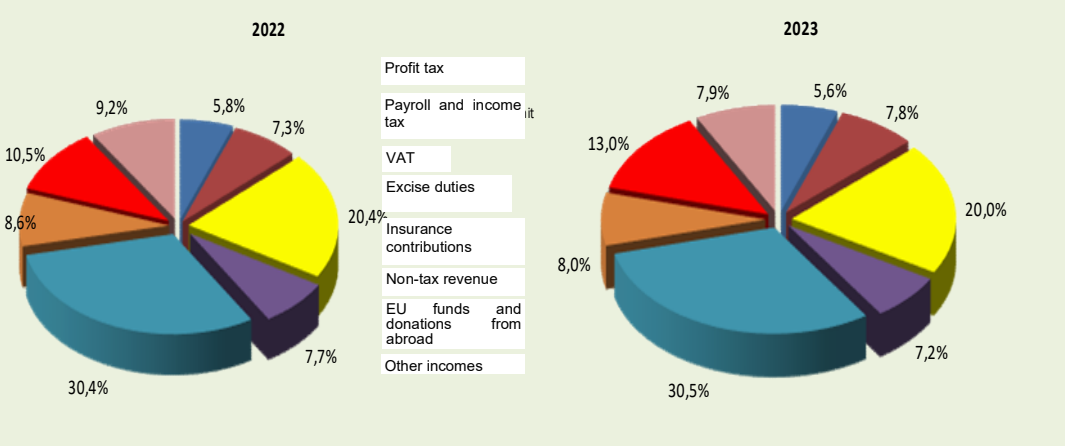
The receipts from the amounts received from the EU and other donors (including the non-refundable financial assistance related to the PNRR) on account of payments made were above the programmed level, the recorded degree of achievement being 111.0%.

Compared to the previous year, the revenues of the general consolidated budget, in 2023, increased by 13.1% (+60.39 billion lei) and as a percentage of GDP decreased by 0.4 percentage points from 32.8% in 2022 to 32.4% in 2023.

The amounts received from the European Union on account of payments made (including donations and amounts related to the PNRR), in 2023, amounted to 67.65 billion lei, 39.7% above the level recorded in 2022.

Figure no. 6

The budgetary revenue structure

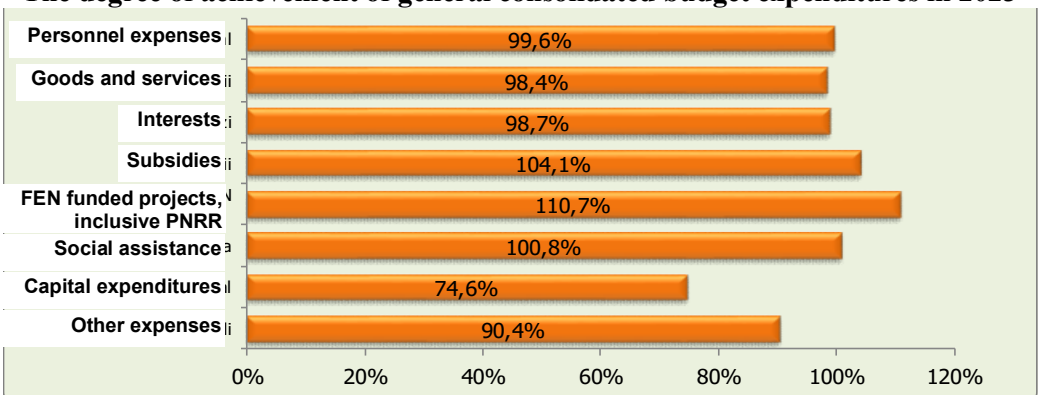


Source: Ministry of Public Finance, *Report on the final budget execution for 2023*, www.mfinante.gov.ro

- The general consolidated budget expenditures totaled 610.66 billion lei in 2023, which represents 38.0% of GDP and a degree of achievement compared to the planned level of 98.3%. Compared to the previous year, the general consolidated budget expenditures increased by 12.9%, and as a percentage of GDP they decreased by 0.6 percentage points from 38.6% in 2022 to 38.0% in 2023.

Figura nr. 7

The degree of achievement of general consolidated budget expenditures in 2023



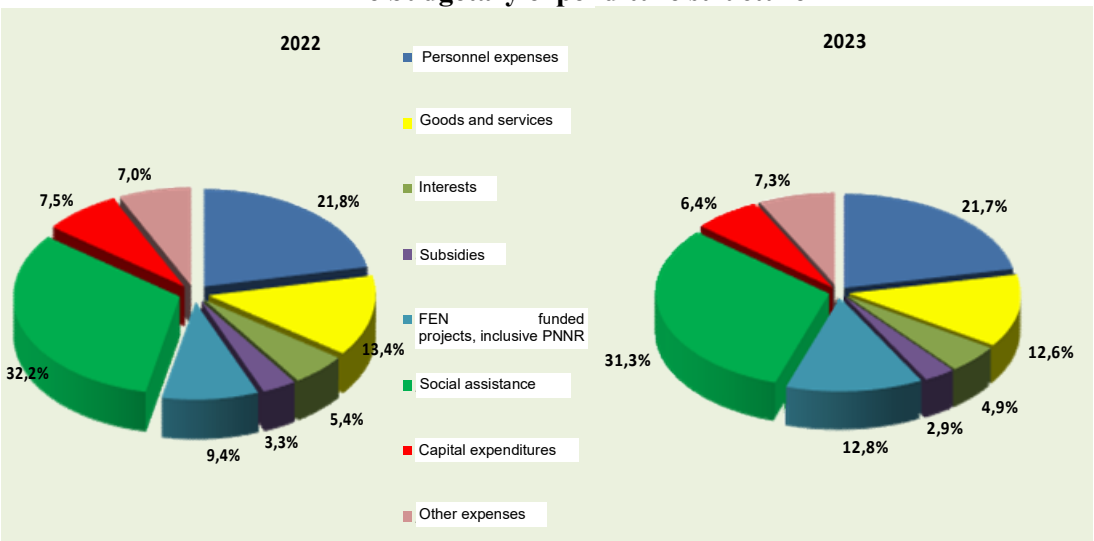
Source: Ministry of Public Finance, *Report on the final budget execution for 2023*, www.mfinante.gov.ro

In terms of the degree of achievement of the annual program, the main categories of budget expenditures recorded the following developments: personnel expenditures 99.6%, expenditures on goods and services 98.4%, interest expenditures 98.7%, expenditures on subsidies 104.1%, expenditures on projects financed from non-reimbursable external funds 110.7%, expenditures on social assistance 100.8%, capital expenditures 74.6%.

Compared to 2022, the economic structure of expenditures shows an increase in the share of total expenditures of expenditures on projects financed from non-reimbursable external funds including PNRR by 3.4 percentage points and of those in the other expenditures category by 0.3 percentage points and decreases in the share of all other expenditure titles.

Figure no. 8

The budgetary expenditure structure



Source: Ministry of Public Finance, *Report on the final budget execution for 2023*, www.mfinante.gov.ro

2.3. Sources of financing the budgetary deficit in 2023

At the end of 2023, as a result of the debt contracting to cover the financing needs of the general consolidated budget deficit, to refinance the maturing public debt, as well as to maintain and consolidate the foreign exchange reserve at the disposal of the State Treasury, the share of gross government debt, according to the EU methodology, stood at 48.8% of GDP, falling within the annual ceiling of 49.8% of GDP established by Law no. 360/2022 for the approval of the ceilings of certain indicators specified in the fiscal-budgetary framework for 2023, being below the ceiling of 60% of GDP established by the Maastricht Treaty.

According to data published by EUROSTAT on April 22, 2024, at the end of 2023 Romania ranked 17th among EU member states in terms of debt level, with the average government debt for the euro area (EA 20) being 88.6% of GDP, and that for the EU27 being 81.7% of GDP.

During 2023, the Ministry of Finance maintained a predictable and flexible issuance policy adapted to the requirements of the investment environment and in the context of the developments of the geopolitical conflict between Russia and Ukraine.

The financing of the budget deficit in 2023 was achieved from internal and external sources. The external sources necessary for the refinancing of the government public debt were secured from the markets on which these debts were initially issued, as well as from the foreign exchange financial reserve at the disposal of the Ministry of Finance.

a) In 2023, government bonds and loans were issued on the domestic market in a total amount of 140.7 billion lei equivalent, including government bonds intended for the population in the amount of 21.5 billion lei equivalent. The Ministry of Finance's policy aimed at extending the remaining average maturity of government bonds, most of the bonds being issued in the medium and long maturity segment. Issues intended for the population continued through the Tezaur and Fidelis programs. Through the Tezaur program, monthly issues were made, with maturities of 1, 2 and 3 years, with an attracted volume of 12.1 billion lei. Through the Fidelis program, four issues were launched, through a syndicate of banks. The issues were denominated both in lei (1 and 3 year maturities) and in EUR (1 and 5 year maturities), with an attracted volume of 9.4 billion lei equivalent.

b) Regarding foreign markets, the aim was to ensure a constant presence on them, under advantageous cost conditions for Romania, as well as diversify the investor base. Foreign financing was secured through Eurobond issues, withdrawals both within the framework of loans contracted from international financial institutions (EIB, IBRD) and within the loan component related to the PNRR. Within the MTN (Medium Term Notes) program, 3 issues and 12 private placements were launched, attracting the amount of EUR 10.6 billion equivalent. Financing on the foreign market also included withdrawals of approx. EUR 1.27 billion within the framework of loans contracted from international financial institutions (EIB, IBRD, CEB, etc.), as well as the amounts made available within the loan component for the implementation of the National Recovery and Resilience Plan (PNRR), in the amount of EUR 893 million.

3. The state budgetary deficit trends in 2024

The developments recorded to date in macroeconomic and budgetary indicators were determined by fiscal, budgetary and monetary policy measures combined with regulatory and prudential measures taken by the authorities for the financial sector, which limited the impact of the health crisis, generated by the COVID19 pandemic, which imposed the largest

lockdown, unprecedented in modern history, with severe and very specific implications on almost all economic and social levels. The measures taken have succeeded in ensuring the recovery of the economy, as well as maintaining sustainable growth with an average annual rate of 4.1% over the entire 2024-2026 horizon, higher compared to that estimated to be recorded at the EU and Eurozone levels, growth which according to the EU autumn forecast was estimated at 1.3% in 2024 and 1.2% respectively, and in 2025, given that inflation and the slowdown caused by the tightening of monetary policy will diminish, a strengthening of economic growth is expected, which will reach 1.7% for the EU and 1.6% for the eurozone.

The fiscal policy established at the level of the relevant ministry is based on the continuation of gradual fiscal consolidation, carried out under conditions of a balance between the need for fiscal adjustment and the need to support economic recovery, the health system, infrastructure, climate change, digitalization, green transition which remain priorities in the current difficult circumstances.

The pace of consolidation takes into account the fact that important reforms are needed from the PNRR such as the new pension law as well as the implementation of investment projects from grants and loans from the PNRR that must be completed by the end of 2026, which requires significant budgetary amounts. Romania is facing an exceptional opportunity, as it benefits from allocations from the PNRR.

In November 2023, the European Commission positively assessed the revised PNRR, its new value being 28,511.58 million euros, of which: 13,566.06 million euros for the non-reimbursable financial assistance component and 14,942.15 million euros for the loan component, respectively, the plan comprising 66 reforms and 111 investments. Romania's amended plan places a strong emphasis on the green transition, allocating 44.1% (up from 41% in the initial plan) of the available funds for measures supporting climate objectives.

This European financial package can lead to the mitigation of the contractionary impact of the macroeconomic correction, to the implementation of structural reforms, resulting in an increase in the robustness of the Romanian economy, attracting European resources being a sine-qua-non condition of a sustainable fiscal-budgetary and economic policy.

In such a context, of the great challenges facing humanity, of the common effort for a strong and healthy Europe, Romania has established as objectives of the budgetary construction for the year 2024 and the horizon 2025-2026 (MFP, Fiscal-Budgetary Strategy for the period 2024-2026):

- continuing measures for economic recovery, accelerating economic growth, maintaining and supporting a new framework for sustainable, fair and inclusive development that ensures an economically efficient, socially sustainable transition focused on competitiveness, innovation and decarbonization that leads to the elimination of vulnerabilities in the economy and ensures a decent standard of living;
- continuing the gradual achievement of fiscal consolidation, thus contributing to the decrease in inflation, interest rates, the trade and current account deficit of the balance of payments, as well as to the stability of the leu exchange rate, taking into account the fragility of the internal and external environment, the budgetary effort that must be allocated to the new law on the pension system and the implementation of the reforms in the PNRR that must be completed by 2026;
- reform, prioritization and multiannual programming of public investments in an efficient, professional and transparent manner with a multiplier effect and direct contribution

to gross fixed capital formation, by increasing the contribution of European funds related to the 2021-2027 financial framework and those related to the Recovery and Resilience Mechanism that finances the reforms and investments established through the National Recovery and Resilience Program, the largest stimulus package from European resources allocated to Romania;

- consolidation of a predictable fiscal policy committed to reducing the budget deficit, to support and adapt the business environment to the challenges raised by the series of crises that society is facing, simplifying taxation and improving legislation according to tax evasion phenomena, in order to create the premise of healthy and sustainable economic growth;
- development and diversification of public debt management instruments to maintain public debt at a sustainable level;
- measures to create and consolidate public finances, through qualitative efficiency of public spending, improving budget programming with a focus on:

- financing active economic measures to support the most vulnerable groups, reforms in the field of labor, pensions, support for SMEs whose supply chain was strongly affected by the war against Ukraine;

- improving budget programming by strengthening program budgeting based on result indicators for a credible and responsible budget construction, which allows for full transparency of public spending, improving the clarity and coherence of the budgeting process, prioritizing sectoral policies and ensuring real competition between projects proposed for funding and supporting performance;

- allocation directed towards well-defined priorities and more responsibility in the use of public funds, achieved by implementing measures to streamline public spending, by using best practices at European level and to avoid wasting public funds.

4. Conclusions

The main effects of public spending can be assimilated to the „crowding out" effect, which, in this case, refers to the phenomenon of diverting market resources from those sectors that the market shows as profitable to areas considered of interest by the state. Also, a hidden cost of the budget deficit and public debt is represented by their influence on the country rating, a guiding indicator for investors looking for business opportunities. Considering the current conditions, when Romania is trying to define its role and place in the world, when it is desired to identify and encourage those branches and sub-branches of the national economy that can be developed within the world economy, it is necessary to use fiscal levers in accordance with the requirements of the European Union and taking into account the other macroeconomic policies that can be adopted to overcome the current economic situation. Thus, the theory is established according to which, during the crisis period, it is preferable to ensure an increase in budget spending, with the objective of contributing to the relaunch of economic activity, the effects being reflected in the increase in employment and the reduction of unemployment.

The budget deficit can be reduced in three ways:

- by reducing the number of personnel in the budget sector;
- by temporarily reducing salaries, as was done in 2010;
- by financing the deficit, that is, through inflation, printing money, as Greece did, being on the verge of bankruptcy.

Unfortunately, Romania also had economic growth at the level of 2024, but at the same time, it also recorded an increase in public debt, with loans being used, largely, to cover expenses such as salaries and pensions, a deficit approach.

The economic growth model must be reanalyzed, given the experience of past years in which economic growth in our country was based on consumption, a situation that did not allow sustainable economic development. For this reason, a different orientation based on investments in sectors with high added value is required.

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INTELLECTUAL PROPERTY RIGHTS AND THEIR TREND ANALYSIS IN THE REPUBLIC OF MOLDOVA

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Abstract: *Intellectual property is widely recognized as a driver of enterprise growth, promoting innovation and competitiveness. This paper analyzes the trends in intellectual property rights registrations and granted protections for Republic of Moldova residents over the past 10 years. Based on statistical data analysis of the World Intellectual Property Organization, the State Agency for Intellectual Property, and the Global Innovation Index Report, the study reveals a notable dominance of trademark applications, accounting for 84.9% of the total applications. Conversely, patent and utility model filings, on the other hand, experienced significant declines of 41.5% and 29.7%, respectively. This gap reflects an overwhelming trend towards brand protection and not technological development in Moldova. While industrial designs and trademarks reveal highest success rates for registration, the underutilization of such valuable innovation tools as patents and utility models indicates underlying structural challenges, i.e., low investment in research and development, insufficient incentives for innovation, and potential weaknesses in the commercialization of research outcomes. Furthermore, underrepresentation of geographical indications and traditional specialties indicates untapped potential for leveraging Moldova's unique heritage.*

Keywords: *intellectual property rights, Moldova, patents, trademarks, innovation, geographical indications*

JEL Classification: *O31, O34.*

1. Introduction

The Republic of Moldova's intellectual property system is supported by a legal and institutional framework that provides a guarantee for the effective protection and promotion of intellectual property rights. The system allow natural and legal entities to identify, obtain, and protect intellectual creation-related rights through this very important sector at the foundation of innovation and economic development. The State Agency on Intellectual Property (AGEPI) is the primary institution that plays a central role in shaping national IP policies, aligning Moldova's regulatory framework with international standards, and providing services related to the protection and registration of intellectual property. Through coordinated planning, treaty implementation, and institutional cooperation, AGEPI is strengthening Moldova's position in global intellectual property systems and is helping integrate it into international innovation networks.

The significance of intellectual property was initially acknowledged at the international level through the establishment of determining agreements such as the Paris Convention (1883) and the Berne Convention (1886). Even today, intellectual property is a main factor in economic growth, competitiveness, and innovation. In this respect, industries with high intellectual property intensity in protection contribute to development with increased research, technology transfer, and foreign direct investment. A strong and transparent IPR regime is important to attract investment, ensure appropriate awards for creators and strengthen market positions of economic agents.

In Republic of Moldova, the development of the intellectual property system was closely associated with the transition of the country to the market-based system from the

planned economy during the 1990s. The framework for intellectual property protection is closely tied to the evolving ideas of private property and entrepreneurship. It's actually reflected into the country's Constitution, which clearly acknowledges both public and private ownership of material and intellectual assets, emphasizing the importance of their legal safeguarding. The Moldovan IP system consists of two major branches: industrial property (including patents, trademarks, industrial designs, geographical indications, plant variety, appellations of origin, traditional specialties guaranteed) and copyright and related rights. While these branches fall under the broad umbrella of intellectual property, each object maintains different characteristics in terms of scope, purpose, protection mechanisms and legal procedures. This difference continues to shape institutional, legislative and operational frameworks governing IP in Moldova.

The increasing ubiquity of IP in the economy, culture, science, and social life has driven heightened interest among applicants seeking robust legal protection of intellectual property rights (IPR). The protection of IPRs is of great importance in the commercial activities of agents on the market. IPRs protect the positions of creators and innovators, guaranteeing fair earnings from their work. Furthermore, IPRs facilitate the attraction of investments into research and innovation. Understanding the data of intellectual property is necessary to assess the performance and maturity of the national innovation system. These data provide an average insight into the levels of inventive activity, the engagement of individuals and firms in protecting their creations, and the sectors that have high innovation potential. They also show the effectiveness of institutional mechanisms and policies in encouraging the use of IP as a strategic tool. In addition, the trends in intellectual property filing - such as patents, trademarks, and industrial design – can serve as early indicators of economic dynamics, technological advancement, and the ability of the economy to use intangible assets to create and retain value.

This paper examines the evolution of industrial property over the past decade, with the objective of elucidating their developmental trajectory and their position within the Moldovan innovation ecosystem.

2. Data sources and methods

This study employs an integrated approach, combining qualitative and quantitative methods, to analyze the trends and dynamics of intellectual property objects (IPO) registration and protection in the Republic of Moldova over the past decade.

Statistical data analysis represents the central focus of the study, which examines several key indicators, including:

- The number of applications filed for patents, utility models, trademarks, industrial designs, and geographical indications, as well as the evolution of granted protection
- The success rate of IPOs, measured as the ratio of granted protections to filed applications.
- Growth indices (2023/2014), which highlight changes in IPO registration activity over a decade.

In order to contextualize Moldova's performance within an international framework, the study assesses its rankings and metrics in the Global Innovation Index (GII). The following GII indicators have been analyzed:

- Knowledge and technology outputs, with metrics such as patents by origin per billion PPP$ GDP and utility models by origin per billion PPP$ GDP.

- Creative outputs, featuring trademarks and industrial designs by origin per billion PPP$ GDP.

The research is based on secondary data from the following sources: the State Agency on Intellectual Property for national statistics on geographical indications, appellation of origin, plant variety registrations and protections; the National Bureau of Statistics for supplementary economic indicators; the World Intellectual Property Organization (WIPO) for trademark, patent, utility model, patent data. The findings are presented in graphical and tabular formats to ensure clarity and accessibility of the information.

3. Results and discussion

*Applications for IPO Registrations***.** The most important statistical indicators regarding the functioning of the national intellectual property system are closely related to economic, investment and innovation activities. These indicators reflect the maturity of the market economy, the competitive environment, and the interest of domestic and foreign producers in developing businesses in the Republic of Moldova. Table 1 presents a summary of the data regarding the applications for patenting/registration submitted in the last 10 years (2014-2023) by applicants residing in Moldova.

Table 1. Evolution of IPO applications by Moldovan applicants (2014-2023)

	2014	**2019**	**2020**	**2022**	**2023**	**Total 2014-2023**	**Index 2023/2014**	**Share, %**
Total patent applications	79	109	104	54	47	846	*59.5*	*1.7*
Utility model - Total applications	158	138	152	104	111	1376	*70.3*	*2.8*
Total trademark applications (direct and via the Madrid system)	1904	1794	2188	1747	1827	18401	*96.0*	*84.9*
Total design applications (direct and via the Hague system)	102	102	86	69	44	818	*43.1*	*3.8*
Plant variety application	27	11	24	18	9	210		*0.4*
Appellations of origin applications	0	2		1		5		*0.01*
Geographical indications applications	0	3	1			7		*0.01*
Traditional specialties guaranteed applications		1		5		6		*0.01*
TOTAL						**21669**		**100**

Source: author's calculation based on WIPO and State Agency for Intellectual Property data

During the period between 2014 and 2023, a total of 21,669 applications for various IPO categories were submitted by Moldovan residents. The largest share was accounted for by trademarks (84.9%), followed by industrial designs (3.8%) and utility models (2.8%). Patents constituted a mere 1.7% of the total, reflecting a limited engagement with high-value innovations that require robust patent protection.

- Trademarks. There was a slight decrease of 4% in the number of trademark applications submitted in 2023 in comparison to those submitted in 2014. However, in the 2023 year, this category of intellectual property exhibited a modest increase in comparison to the previous year (2022). The prevalence of trademarks indicates that Moldovan businesses, particularly SMEs and individual entrepreneurs, prioritize brand protection.
- Industrial designs. The number of applications for industrial designs exhibited considerable fluctuation, with a 56.9% decline observed between 2014 and 2023. Such variability may be indicative of shifts in product development priorities or market demands.
- Utility models and patents. Both categories exhibited a noteworthy decline, with patent applications decreasing by 41.5% and utility models by 29.7%. This trend suggests the presence of barriers to innovation and a lack of investment in research and development (R&D).

It would appear that entrepreneurs in Moldova tend to undervalue innovation as a key factor for competitiveness. Furthermore, there seems to be limited awareness of the benefits that innovation can bring, as well as the potential for collaboration in innovation development. The data on innovation activity in enterprises published by the National Bureau of Statistics is illustrative of this situation. Of the enterprises included in the survey, only approximately 420 were engaged in innovation activities during the 2021-2022 period. This represents approximately 11.4% of the total number of enterprises included in the survey, indicating that innovation activity in enterprises is not particularly widespread. Furthermore, the statistical data indicate a notable decline in the number of innovative SMEs between the 2017-2018 and 2021-2022 periods, with a reduction of 30.6%.

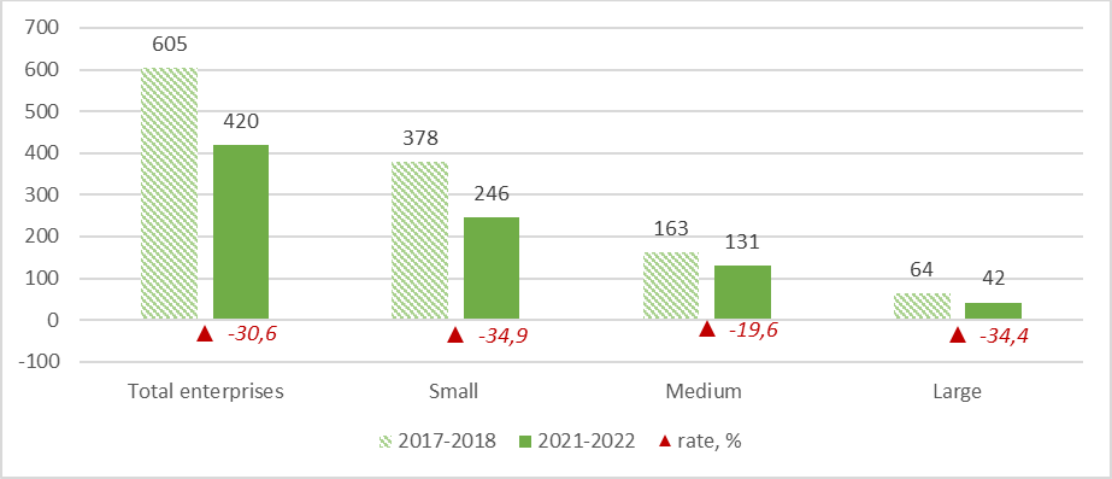

Fig. 1. Evolution of innovative enterprises by size class, 2021-2022 compared to 2017-2018

Source: author's calculation based on (National Bureau of Statistics, 2023)

*Granted protections***.** From 2014 to 2023, a total of 16,631 industrial property objects originating from Moldovan applicants were granted protection. These include registrations and grants obtained both domestically and internationally, thereby emphasizing the activity

and innovation of Moldovan residents in various intellectual property categories. The distribution highlights a strong preference for trademarks, which accounted for 85.6% of the total number of protections. Utility models and industrial designs constituted 6.2% and 3.8%, respectively, while patents, despite their significance for high-value innovation, represented only 2.8%. Table 2 provides detailed insights into these dynamics.

Table 2. The evolution of granted protection for applicants residing in Moldova (2014-2023)

	2014	**2019**	**2020**	**2022**	**2023**	**Total 2014-2023**	**Index 2023/2014**	**Share, %**
Total patent granted	63	35	44	38	41	469	65.1	2.8
Resident	*49*	*29*	*33*	*32*	*36*	*379*	*73.5*	*2.3*
Abroad	*14*	*6*	*11*	*6*	*5*	*95*	*35.7*	*0.6*
Total trademark registrations (direct and via the Madrid system)	1359	1534	1546	1815	1382	14238	101.7	85.6
Resident	*901*	*852*	*947*	*1135*	*969*	*9174*	*107.5*	*55.2*
Abroad	*458*	*682*	*599*	*680*	*413*	*5064*	*90.2*	*30.4*
Total utility model grants (direct and PCT national phase entries)	132	82	89	88	62	1031	47.0	6.2
Resident	*130*	*78*	*88*	*86*	*62*	*1008*	*47.7*	*6.1*
Abroad	*2*	*4*	*1*	*2*		*23*	*0.0*	*0.1*
Total design registrations (direct and via the Hague system)	105	48	83	62	32	637	30.5	3.8
Resident	*80*	*34*	*60*	*41*	*30*	*483*	*37.5*	*2.9*
Abroad	*25*	*14*	*23*	*21*	*2*	*154*	*8.0*	*0.9*
Plant variety	26	23	37	7	21	238	80.8	1.4
Appellations of origin		1	1	1	1	5		0.03
Geographical indications		2	1		1	7		0.04
Traditional specialties guaranteed		1			5	6		0.04
TOTAL						**16631**		**100**

Source: author's calculation based on WIPO and State Agency for Intellectual Property data

The number of registered trademarks exhibited a modest increase of 1.7% in 2023 when compared to the figures recorded in 2014. Of these, 64.4% were granted within Moldova, while the remaining 35.6% were obtained abroad, reflecting the strategic focus of Moldovan applicants on both domestic and global brand protection.

There was a notable decline in the number of patents granted during the period under review, with a reduction of 35% observed. The proportion of domestic patent grants was higher than those from abroad (80.8% vs. 19.2%). This decline indicates a deficiency in high-value innovation and an absence of adequate incentives for patentable inventions.

The number of registrations for industrial designs exhibited considerable volatility, with a pronounced decline of -69.5% between 2014 and 2023. The limited growth indicates a necessity for more robust support for design-driven innovation and product diversification.

Moldova has made some progress in leveraging its agricultural and geographical resources for intellectual property protection, but challenges still remain. While there was an initial modest but steady evolution in plant variety protection, there was a 19% decline between 2014 and 2023. Conversely, applications for appellations of origin and geographical indications have remained minimal, indicating a significant untapped potential for the promotion of Moldova's distinctive agricultural and regional products. This indicates the necessity for a more concentrated effort and investment in the protection and marketing of these valuable resources.

The data demonstrate a structural imbalance in Moldova's IP landscape, with a pronounced emphasis on trademarks but minimal engagement in patents, utility models, and designs. This pattern underscores the existence of significant challenges, including a dearth of R&D investment, an absence of adequate innovation incentives, and a deficiency in strategic support for industrial and design innovations.

IPOs that have obtained protection in the total number of applications submitted. Of the total 21669 applications submitted, 16,631 received granted protection (76,8%), with varying success rates across intellectual property categories (Table 3).

- *Patents:* Of the 846 applications, only 469 (55.4%) were granted protection. This relatively modest success rate may be attributed to either the application of rigorous examination standards or the submission of applications that fail to meet the exacting patentability requirements.
- *Utility models:* A higher success rate was observed for utility models, with 1,031 grants from 1,376 applications, representing a success rate of 74.9%. This can be attributed to their suitability for incremental innovations and the less stringent innovation and novelty requirements compared to patents.
- *Trademarks*: A total of 14,238 protections were granted out of 18,401 applications, resulting in a robust success rate of 77.4%. This high rate serves to illustrate the considerable emphasis placed by applicants from Moldova on the securing of brand protection. In comparison to other categories, trademarks not only demonstrate the highest volume of applications but also exhibit a competitive success rate, reflecting the relative clarity of the distinctiveness and originality criteria within this category. This performance shows the important role of trademarks as a foundation of intellectual property activity in Moldova.
- *Industrial designs*: With 637 protections out of 818 applications, industrial designs achieved a high success rate of 77.9%, indicating a strong alignment with aesthetic and functional design criteria.
- *Plant varieties, geographical indications, and traditional specialties:* These categories demonstrated remarkable success rates, with geographical indications and traditional specialties exhibiting 100% success, and plant varieties achieving 113.3%. This indicates that in specific years, grants may exceed applications due to backlogs or carryovers from previous years, where pending applications from earlier periods are evaluated and granted protection in later reporting years. This highlights the strategic significance of these categories in safeguarding and advancing Moldova's agricultural and cultural heritage.

The overall success rate of 76.8% across all categories demonstrates a high degree of alignment between the submitted applications and the established criteria for protection. While trademarks and industrial designs exhibit solid performance, the relatively lower success rates for patents suggest room for improvement in fostering high-quality patent submissions and innovative activities.

Table 3. Share of IPOs that have obtained protection in the total number of applications submitted, 2014-2023, %

	Applications	**Granted**	**Granted (rate of success), %**
Patent	846	469	*55.4*
Utility model	1376	1031	*74.9*
Trademark	18401	14238	*77.4*
Industrial design	818	637	*77.9*
Plant variety application	210	238	*113.3*
Appellations of origin applications	5	5	*100.0*
Geographical indications applications	7	7	*100.0*
Traditional specialties guaranteed applications	6	6	*100.0*
Total	***21669***	***16631***	***76.8***

Source: author's calculation based on WIPO and State Agency for Intellectual Property data

Table 4 offers insight into Moldova's performance in the Global Innovation Index (GII) between 2016 and 2024, with a particular focus on knowledge and technology outputs, creative outputs, and specific intellectual property indicators.

Between 2016 and 2024, Moldova's performance in the Global Innovation Index (GII) indicates a notable decline in several key areas. The overall score for knowledge and technology outputs decreased from 34.9 to 23.4, resulting in Moldova's rank declining from 31st to 44th. This decline reflects the presence of significant challenges in sustaining knowledge production and technology dissemination. Similarly, there was a notable decline in patenting activity, with patents per billion PPP$ GDP declining from a value of 3.8 to 1.2. This was accompanied by a reduction in the country's rank, from 31st to 47th (a decline of 16 positions).

A similar downward trajectory was observed in the case of creative outputs, with the score decreasing gradually from 39.6 to 31.5 and the rank declining from 34th to 51st (a reduction of 17 positions). The value of trademarks by origin/bn PPP$ GDP, which had previously been a significant asset, saw a notable decline, from 179.2 to 80.8. This shift resulted in Moldova's ranking moving from the first position to the twelfth. Furthermore, there was a decline in the number of industrial designs, which resulted in a drop in the rank from 6th to 11th. This suggests that Moldova's innovation ecosystem, which has traditionally been regarded as a strength, is experiencing a weakening.

Notwithstanding these challenges, Moldova retains the opportunity to capitalize on its comparative advantages. The country's strong rankings in utility models and trademarks indicate potential for growth in these areas, particularly if supported by policies that enhance the creation and commercialization of intellectual property. Addressing these downward

trends will require targeted efforts, such as boosting R&D investments, fostering creative industries, and simplifying IP filing processes to encourage broader participation.

Table 4. Moldova's Performance in the Global Innovation Index (GII), 2016–2024

Indicators	**2016**		**2024**		**2016/2024**	
	Value/Score	*rank (out of 128 economies)*	*Value*	*rank (out of 133 economies)*	*Rank evolution*	*Value/Score*
Knowledge & technology outputs	*34.9*	*31*	*23.4*	*44*	*-13*	*-11.5*
Patents by origin/bn PPP$ GDP	3.8	31	1.2	47	-16	-2.6
Utility models by origin/bn PPP$ GDP	8.8	1	2.5	4	-3	-6.3
Creative outputs	*39.6*	*34*	*31.5*	*51*	*-17*	*-8.1*
Trademarks by origin/bn PPP$ GDP	179.2	1	80.8	12	-11	-98.4
Industrial designs by origin/bn PPP$ GDP	17.4	6	7	11	-5	-10.4

Source: Global Innovation Index Reports (Cornell University, INSEAD and WIPO, 2016; World Intellectual Property Organization, 2024b)

4. Conclusion

The analysis of IPR trends in Republic of Moldova over the last decade offers a comprehensive overview of the country's intellectual property landscape and its role within the innovation ecosystem. The majority of applications are for trademarks, which reflects a focus on brand protection rather than technological innovation. However, the significant decline in patent and utility model registrations highlights a number of structural challenges, including limited investment in research and development, inadequate incentives for innovation, and potential deficiencies in the commercialization of research outputs. These trends indicate that Moldova's innovation ecosystem is underutilized, particularly in domains that require high-value intellectual property, such as patents and utility models.

The consistently high success rates for industrial designs and trademarks indicate the efficacy of the IP registration system in these categories. Nevertheless, the underrepresentation of geographical indications and traditional specialties suggests that there are untapped opportunities for leveraging Moldova's distinctive cultural and agricultural heritage. The implementation of targeted initiatives to promote these areas has the potential to enhance the economic and cultural value derived from intellectual property.

To address the structural imbalances identified, policymakers in the Republic of Moldova should put more emphasis on the following areas:

- To strengthen R&D investment and innovation support systems including funding mechanisms for research institutes and businesses.

- To increase commercialization framework for patent and utility models, facilitating translation of scientific research in profitable products.
- To increase awareness and provide encouragement for geographical indications and traditional specialties, promoting a more diverse and inclusive IP ecosystem.
- To implement targeted policy reforms, aimed at reducing obstacles to patent and encourage widespread participation in IP-related activities.

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THE INFLUENCE OF COMMUNICATION STYLES IN ORGANIZATIONAL CONFLICTS

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Abstract: *Within many organizations, the issue of conflict prevention and management is both fundamental and sensitive at the same time. The daily interaction between the members of an organization has the potential for antagonisms and disagreements that can sometimes trigger wider conflicts. Between getting along and conflict stands communication, which has the vital role of maintaining professional relationships at a functional and, why not, synergistic level. The present work is based on quantitative research in which the perception of conflict at an organization level, the behaviour of individuals in conflicting situations, the causes of conflict, methods and strategies used to avoid and manage conflict, and also the typology of conflicts were highlighted in order to better understand the communication styles used by the members of an organization.*

Key words: *communication, conflict, types of communication styles, prevention, dialogue, causes of conflict, interpersonal relationships.*
JEL Classification: *M10.*

1 . Introduction

Conflict is rooted in the very existence of diversity in the human character and nature. People are different, so are their interests, their own way of relating to the world, to themselves and to others. Thus, conflict begins where an individual allows themselves to be deceived by the idea that others should see and judge things the way they see it. In any present or future organization, the diversity of character and temperament stands out very fast, from the ground floor to the top floor. Quantitatively, the causes or sources of conflict in an organization can be countless. However, we can identify certain sources as more significant, their frequency of occurrence being quite high.

Human life naturally involves having a perpetual relationship with those around us. It is through interaction with our fellow humans that we define and fulfil our purpose onearth. Meeting the "other" can enrich us spiritually, cognitively, affectively, but at the same time, it can just as well throw us into an abyss of depression, anger, envy, etc. Approaching someone else becomes the fundamental stake of any act of communication, both in our personal lives and at work, whether it is with strangers or those close to us.

A good knowledge of the typology of communication styles accompanied by a masterful application of them is desired by any organization.

Organization Y is a prestigious educational institution with a long and fruitful tradition of institutional culture. Being more than a century old, it has given society generation after generation of bright graduates.

Thanks to the impeccable training of its members and the well-built organizational culture, Y organization has managed to keep and increase its high standards, being among the top organizations of its kind in the county. It has a well-developed resource base with state-of-the-art laboratories and facilities. It stands out for its massive and fruitful participation in national competitions and Olympiads, while having a united and motivated team.

Organization Y promotes and ensures equal opportunities, innovation, and the high quality of its educational processes. Its objectives are:

- Development of interest in education, knowledge and training
- Promoting an inclusive organizational climate
- Ensuring a responsible and high-calibre management
- Ensuring the application and compliance with school provisions and labour legislation
- Active participation in the constructive transformation of society

2. Research methodology

The present research aims to highlight the perception of conflicts in organization Y, the typical reactions in conflict situations of its members, and the relationship between communication and conflict. To achieve this, a questionnaire was applied to 30 people (N=30) and was used as a data collection tool. The priorities of the questionnaire were to find out:

- How is conflict perceived within the organization?
- What is the behaviour of individuals in conflict situations?
- The methods and strategies used to manage and resolve a conflict
- Causes that can generate a conflict
- Communication styles of respondents (Passive, Aggressive, Passive-Aggressive and Assertive on the one hand and: Direct, Analytical, Sociable, Emotional on the other).
- How do conflicts affect the emotional and spiritual balance of an individual?

One of the highlights of this research consists in the fact that it manages to concretely capture the reactions of the respondents and their way of thinking and acting according to specific conflict situations. We practically have in front of us a small picture of the reactions and the ways people relate to conflicts, which reveal some behavioural patterns.

1) research objectives:
   - general - determining how communication styles influence conflict in organization Y

2) specific
   - determining how a conflict is perceived at a company level
   - determining how to react to a conflict
   - identifying conflict prevention strategies

3) research hypothesis
   - We assume that in organization Y there is a balanced and mature approach to conflict situations from both its employees and its management
   - We assume that in the analysed organization employees have a tendency to use the avoidance strategy as a way to resolve conflicts
   - We assume that in organization Y there is different communication styles of respondents;

4) the purpose of the research
   - achieving/creating a valid conflict management model by using appropriate communication techniques and styles

3. Data analysis and interpretation

The data analysis highlighted the following aspects:

Chart no. 1

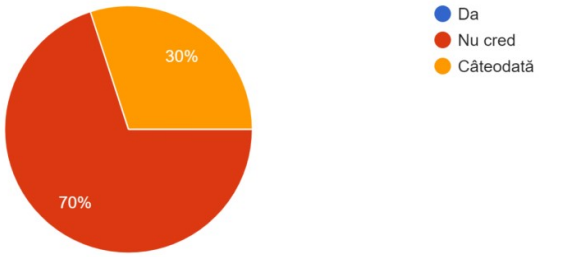


Table no.1

Yes	No	Sometimes
0	21	9

1. Do you consider yourself an individual prone to arguing?
Source: Created by the author based on gathered data

70% of the respondents believe that they are not prone to arguing. But a percentage of 30% believe that in certain situations they may adopt an aggressive attitude and implicitly an aggressive communication style.

Chart no. 2

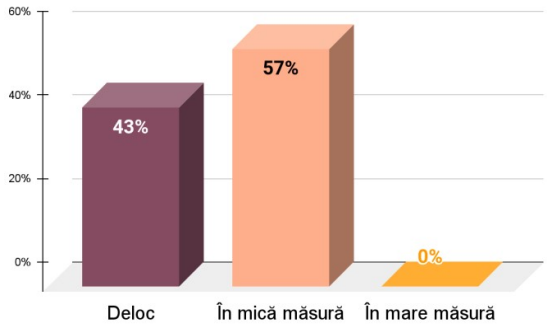


Table no. 2

Not at all	To a small extent	To a large extent
13	17	0

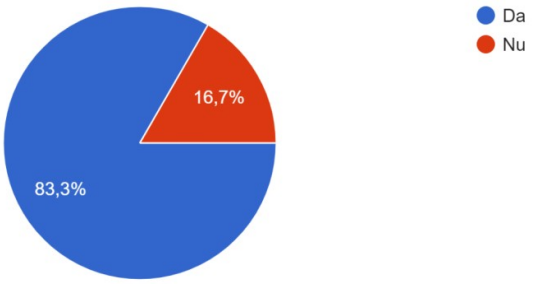
2. To what extent do you consider arguing a problem-solving solution?
Source: Created by the author based on gathered data

Most of the respondents, however, are of the opinion that to a small extent conflict can be a solution to solving problems. Only 43% agree that we cannot solve problems through conflict. This answer shows us that no matter how civilized or educated we are, a dose of aggression remains latent in each of us (we are referring, of course, to the instinct of self-defence.)

Chart no. 3

Table no. 3

Yes	No
24	6



3.Do you think that there is a way to avoid conflict within an organization?
Source: Created by the author based on gathered data

Most respondents believe that within anorganization conflict can be avoided.

Chart no. 3.a.

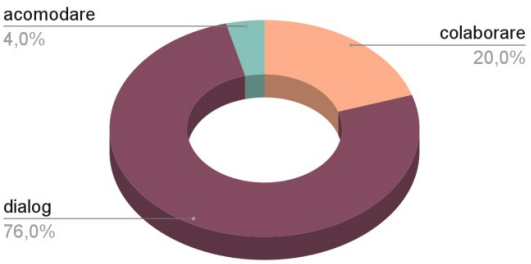


Table no. 3.a.

collaboration	dialogue	compromise	consideration
5	19	0	1

3.a. If "Yes", how?
Source: Created by the author based on gathered data

A high percentage of respondents (76%) believes that the main means of avoiding conflict is dialogue, while 20% would rather see collaboration as a viable solution. A low number of respondents (4%) adopts a passive attitude and accepts being considerate or accommodating as a means of compromise.

Chart no. 3.b.

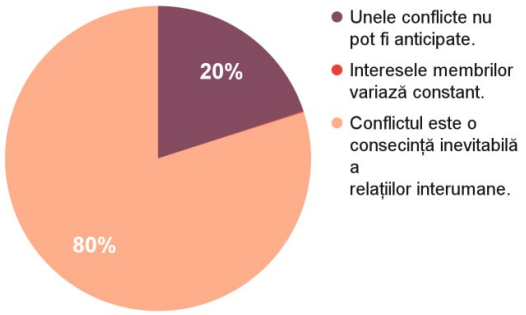


Table no. 3.b.

Some conflicts cannot be predicted	The goals of the members of the team are constantly changing	Being in conflict is an inevitable consequence of human nature
1	0	4

3.b. If "No", why?
Source: Created by the author based on gathered data

Among the respondents who see conflict as an inevitable situation, 80% believe that it is an inevitable consequence of human relations, while 20% believe that it's impossible to predict some conflicts, regardless of precautions taken.

Chart no. 4

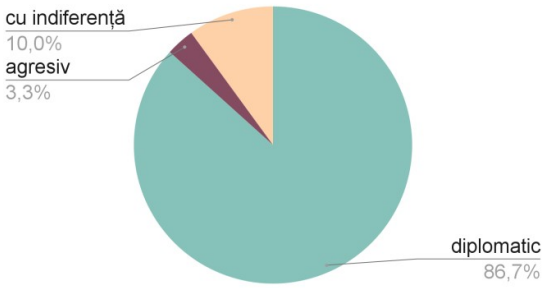


Table no. 4

diplomatically	aggressively	with indifference
26	1	3

4.What is the communication style in dealing with conflicts?
Source: Created by the author based on gathered data

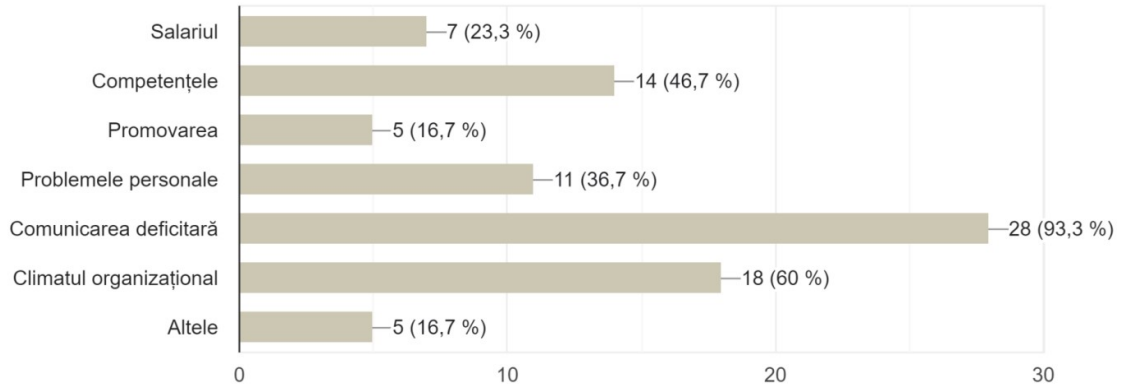
On the matter of approaching conflicts, most of the respondents (86.7%) choose to approach a conflict diplomatically, 10% see indifference as a solution, and 3.3% prefer an aggressive style.

Table no.5

Salary	Skills	Promotion opportunities	Personal problems	Poor communication	Company morale	Other
7	14	5	11	28	18	5

5.What do you see as the causes of conflictwithin the company?
Source: Created by the author based on gathered data

Chart no. 5



5. What do you see as the causes of conflict within the company?
Source: Created by the author based on gathered data

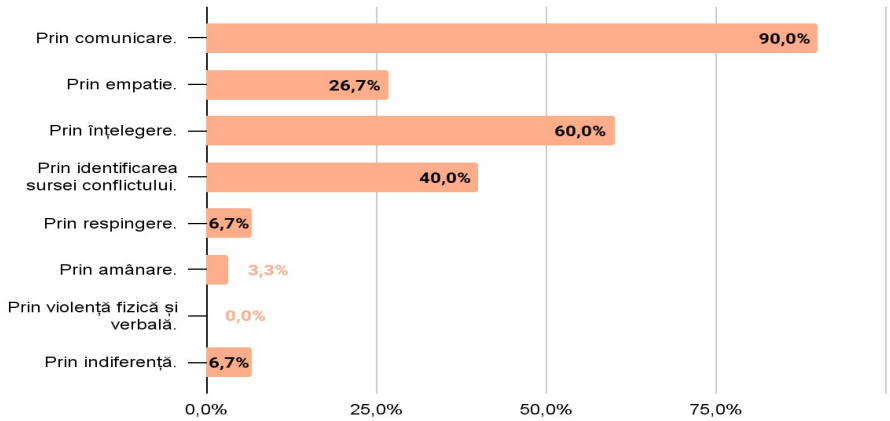
Overall, poor communication ranks first as a cause of conflict (93.3%), followed by morale (60%), skills (46.7%) and personal problems (36.7%).

Table no. 6

Through communication	Through empathy	Through understanding	Through noticing the source of the conflict	Through rejection	Through delay	Through verbal and physical violence	Through indifference
27	8	18	12	2	1	0	2

6.How do you think conflict can be avoided?
Source: Created by the author based on gathered data

Chart no. 6



6. How do you think conflicts can be avoided?

Source: Created by the author based on gathered data

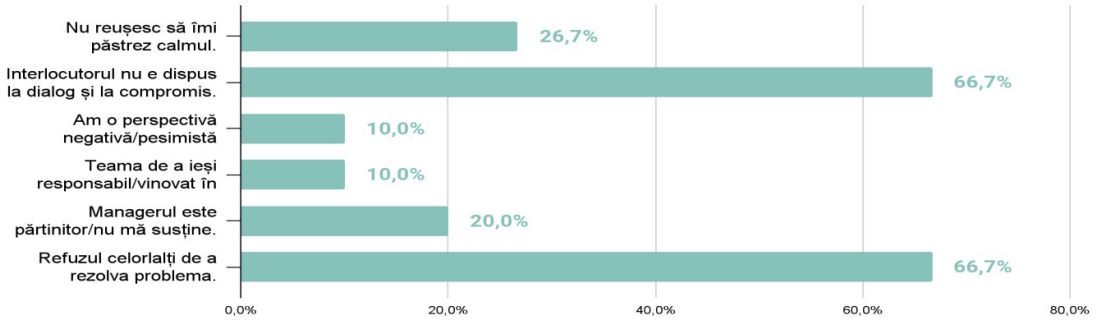
90% of the respondents thought that communication is the most effective tool for avoiding conflict. Being understanding and identifying the source of the conflict were also chosen as alternative solutions.

Table no. 7

I can't keep my cool	The other party is not willing to talk and compromise	I have a negative outlook on the situation	Fear of being blamed or being guilty	The manager is biased/unsupportive	The others refuse to cooperate and solve the problem
8	20	3	3	6	20

7. What difficulties do you encounter when trying to manage a conflict?
Source: Created by the author based on gathered data

Chart no. 7



7. What difficulties do you encounter when trying to manage a conflict?
Source: Created by the author based on gathered data

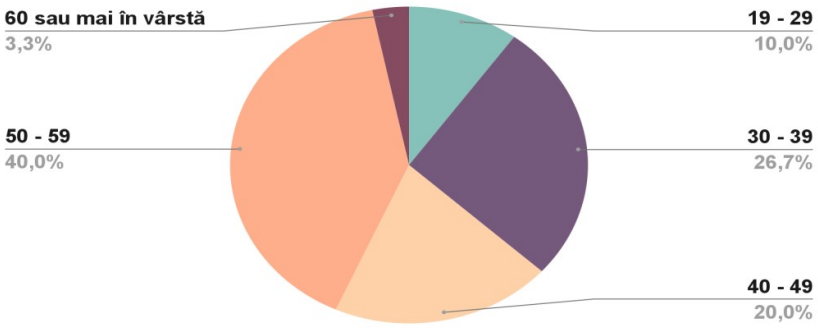
When it comes to managing a conflict, 66.7% of the respondents are of the opinion that it is difficult to resolve a conflict because either "The other party is not willing to have an open dialogue and compromise" or "The other party refuses to solve the problem." 26.7% of the respondents fail to keep their cool, 20% believe that "The manager is biased/doesn't support me." For some, i.e. 10%, they have a "Fear of appearing responsible/guilty in front of others.", and the other 10% have a "negative/pessimistic perspective on the situation."

Table no. 8

18 or younger	19 – 29	30 - 39	40 - 49	50 - 59	60 or older
0	3	8	6	12	1

8. What age category do you fall into?
Source: Created by the author based on gathered data

Chart no. 8



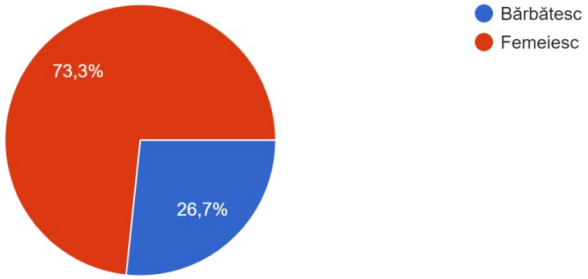
8. What age category do you fall into?
Source: Created by the author based on gathered data

The highest number of respondents for this question were those in the 50-59 age range (40%), then those in the 30-39 age range (26.7%), then those in the 40-49 age range (20%), then 19-29 years olds (10%) then 60 or above (3.3%). Young people under 18 did not participate, because the sample was made in a limited space, i.e. in an organization, and there are no staff employed in this category.

Chart no. 9

Table no. 9

Male	Female
8	22



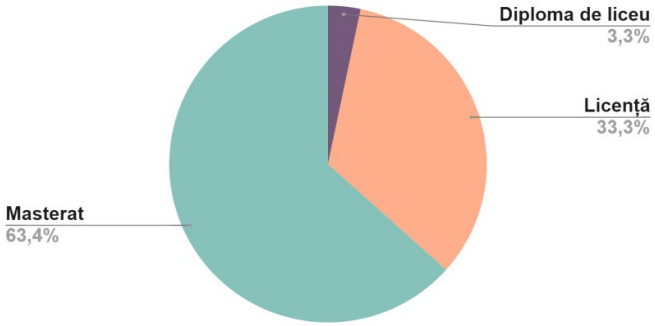
9. Your gender:
Source: Created by the author based on gathered data

73.3% of respondents are female and 26.7% are male. The resulting percentages are based on the rate of disclosure of this information by the respondents.

Table no. 10

Less than High-school	High-school diploma	Post-secondary studies	Bachelor's degree	Master's degree
0	1	0	10	19

Chart no. 10



10. What is the highest level of education completed?
Source: Created by the author based on gathered data

The majority of respondents have completed higher education due to the conditions of employment in their organization: 63.4% have a Master's degree, 33.3% a Bachelor's degree and 3.3% a High-school diploma.

4. Conclusions

Taken as a whole, the results of this paper show that, although most people prefer cooperation at work, in special situations - and especially conflict-related ones - people give priority to asserting their own individuality, even at the cost of showcasing an aggressive

attitude to others. Another interesting aspect that has been revealed after research, are the well-defined aspects of human nature regarding their interactions with fellow human beings.

Conflict, before being categorized as a bad thing or to be avoided, must be seen as a natural, necessary and inevitable phenomenon that occurs wherever there are inter-human relations. We can see it manifesting itself in various forms such as: dissatisfaction, frustrations, envy, irony and sarcasm, arguments, verbal or physical bullying, mobbing, physical aggression, etc. Our daily experiences show us that Mother Nature has arranged things in such a way that people attack and support each other according to circumstances and interests. A person who is your friend today can be your enemy tomorrow and vice versa.

In terms of things that cause them, conflicts can be fuelled by: a lack of communication or poor communication, a lack of organizational culture, competition between employees or competitiveness imposed by the organization, envy, faulty management and disproportionate distribution of work tasks, unjustified use of stereotypes (which are actually social prejudices), lack of feedback, gossip, intrigues and conspiracies, narcissistic/egoistic traits, interference of family matters in work issues, etc.

In each of these situations, the manifestation of the conflict surely reveals an inability on our part to make ourselves understood, to peacefully win the agreement with the other, to find the optimal method of communicating what we have to communicate. Or, to put it more briefly, the presence of conflict or its prolonged manifestation shows us that mature people do not master and do not know how to fully use the communication resources at their disposal. It is especially interesting to note that only a small percentage of those who advance in age manage to educate themselves about how they should relate to others. All of these things start from the way we understand communication.

All harmony between humans ultimately resides in how we understand communication between each other—and why not—how we understand communication itself as a fundamental act specific to living beings. In this sense, some theoretical resources related to what we call communication styles were mobilized in the second part of the paper. Styles that relate to our personality and to that of others, for when two people communicate, there is a meeting of two distinct kinds of communication styles. The way in which we manage to "fit in" with other humans shows our degree of maturity and mastery of language, good manners, and emotions.

In order to verify and confirm the theories discussed in the first two parts of the paper, I have carried out a practical research to see how the ideas, advice and conclusions put together in this paper are verified in real life and in direct relationships between people.

The results were satisfactory, but also surprising. I found that:

a) People naturally seek (at least at the level of intention or aspiration) to avoid conflicts and end them as quickly as possible.
b) Each respondent knows that dialogue and communication are the solution to conflicts, but when faced with a conflictual situation, the fight we have to fight is with ourselves, with our emotions, with our prejudices, with our shortcomings and not with carefully crafted words or phrases.
c) A conflict situation is - no matter how hard it may be to accept - a way of seeing ourselves; we have the chance to see where we stand in terms of self-control and openness to others.
d) Every conflict situation presents us with our weaknesses but also the opportunity to work with them, to improve them, to perfect ourselves on the path of interpersonal relations.

e) As a final word, we can say that the big stake in interpersonal relationships is not that of avoiding or resolving conflicts. On the contrary, true wisdom is to approach any conflict with elegance, to lead with diplomacy and look attentively at the claims of both parties, and to transform the conflict into an effective tool for knowing oneself and others. But, of course, this was and will remain the privileged path of the few, of those who choose to devote their lives to the ideal of self-improvement.

The results obtained through the questionnaire can serve as a support (a base) for further research on conflict avoidance and amelioration. Regarding how conflicts influence communication styles, we can say that in a conflict situation the parties always have difficulties in:

- Keeping calm
- Finding the right words
- Quelling one's negative emotions
- Admitting fault or incompetence (where appropriate)
- Owning a fault where it exists

A constructive attitude was also found regarding:

- The intention to avoid conflicts
- Using dialogue and cooperation as a means of prevention
- Willingness to approach tense situations with calmness and maturity

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EVALUATION OF OPERATIONAL STABILITY IN MODERN LOGISTICS: THE SYNERGISTIC IMPACT OF TRANSPORT COMPANIES AND THE CUSTOMS REGIME

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Abstract: *Maintaining operational stability in logistics is of utmost importance in the context of increasingly complex global supply chains. This study assesses the operational stability of modern logistics systems, focusing on the synergistic effects created by the interaction between transport companies and customs authorities. The author uses a combination of quantitative analysis of operational performance data and qualitative insights from new practices to improve customs logistics synergy. The paper studies the link between logistics companies' performance and the efficiency of customs procedures. This analysis examines the extent to which the synergy between transparency and digitalization of the Customs Service and the private sector contributes to a more significant increase in efficiency, beyond their individual positive effects. Conversely, inefficiencies in one area are significantly increased when combined with bottlenecks in another, resulting in increased operational instability, costs, and reduced supply chain flexibility. Key factors driving this coordination include coordinated planning, information exchange protocols, and mutual understanding of operational constraints between transport companies and customs authorities. The more closely the operational processes directly related to logistics are aligned with customs management, the more efficient global trade will be conducted. This study contributes to the literature related to logistics and supply chain management by empirically examining the effects of coordination on the operational efficiency of transport companies and customs regimes.*

Keywords: *operational stability, logistics systems, customs procedures, synergy, efficiency.*
JEL Classification: *O33, F13, C43.*

1. Introduction

Logistics performance indicators, including customs, are directly correlated with economic development. The Logistics Performance Index (LPI) report highlights that no country has achieved successful growth without a well-developed international trade sector, which is closely linked to high-quality logistics services. Customs procedures are a key component of this index. Thus, national economic policies and synergies between customs and logistics have a mutual influence. Proactive government measures can help develop synergies, while high levels of such synergies improve national economic performance, attract investment, and create favorable conditions for further improvement of customs and logistics processes, creating a positive feedback loop. The LPI measures the current state and serves as a tool for informing and shaping policies in this area (Arvis et al., 2007).

The global economy is marked by massive interdependence, with global logistics chains serving as the essential foundation of international trade. However, recent developments have highlighted their increasing susceptibility to various risks, from pandemics and geopolitical tensions to economic crises and environmental problems. Under such circumstances, ensuring the operational integrity of logistics frameworks has evolved into a facet of efficiency, a fundamental component of the competitive stature of national economies and individual enterprises, and a safeguard for sustainable economic advancement.

Logistics stability encompasses the predictability, reliability, and sustainability directly related to transporting goods and information from the origin to the point of sale and final consumption. The interaction between the stakeholders in the given process is essential in

maintaining the functionality of supply chains, namely, transport companies and customs authorities. This imperative determines that transport companies representing the private sector should maximize efficiency, improve delivery speed, and reduce costs in the context of intense competition. Customs authorities assume a multifaceted mission that includes fiscal, economic, and legislative enforcement responsibilities.

Conventional analysis of logistics systems often regards transportation operations and customs procedures in isolation, evaluating their effectiveness independently. However, such an approach proves inadequate for comprehending the intricate dynamics of contemporary supply chain processes (SCPs). Improving a single system component, such as accelerating transport, may fail to yield the expected outcomes and could even exacerbate existing challenges if other elements, such as customs clearance, remain inefficient and act as a "weak link" in the logistics chain. In this analysis, synergy is defined as a phenomenon wherein the outcome of coordinated interactions between transportation companies and customs authorities diverges significantly from the mere aggregation of their efforts.

Positive synergy denotes that coordinated actions result in disproportionately elevated stability, speed, and efficiency levels, surpassing the anticipated outcomes of isolated improvements. Conversely, negative synergy manifests when inefficiencies and a lack of coordination in one domain exacerbate issues in another, culminating in a cascading escalation of instability, costs, and diminished supply chain flexibility—the outcome is inferior to the sum of the individual shortcomings. Grasping the mechanisms through which both positive and negative synergies materialize at the intersection of transportation and customs is essential for formulating effective strategies to enhance operational stability. This study aims to assess the operational stability of modern logistics systems through the prism of the synergistic effect of interaction between transport companies and customs regimes.

2. Literature review

O. Kuchma concludes that the versatility of evaluating criteria when choosing transport connections and cargo transportation schemes will necessitate further clarification for different participants (Kuchma, 2024). P. Guarnieri et al., in their paper, emphasize that compared to traditional regimes, the Special Customs Regime for Industrial Warehouses under Computerized Control (SCRIC) lessens the working capital required for purchasing raw materials and inputs due to the tax suspensions. The need for capital to pay Tax on Industrialized Products (TIP) and Import Tax (if applicable) for domestically sold final products only arises from the point of sale until payment is received. If the product is exported, there is a need for working capital for TIP (and applicable Import Tax) and reducing existing costs (Guarnieri et al., 2008). Australian industry is very effective with the flexibility and workability of the Business Continuity Plan (BCP) and the additional support material available (Thornton, 2008).

Technologies like Truckcam are growing in popularity in some parts of the world. Using dashcam footage of accidents is now standard practice to establish liability. It has implications for logistics firms, in other parts of the world, where such practices might not yet be so commonplace, and for drivers and society more broadly (Hopkins & Hawking, 2018).

3. Methodology

The research methodology is based on a mixed-methods approach, combining quantitative and qualitative analysis. Quantitative analysis includes the processing and

interpreting of aggregated data, such as the World Bank Logistics Performance Index (LPI), and consideration of conceptual approaches used in efficiency and synergy studies. Qualitative analysis is based on studying theoretical models, analyzing case studies, examining reports and recommendations of international organizations (in particular, the World Customs Organization - WCO), and interpreting data from expert interviews and literature reviews. Such synthesis allows for a comprehensive and in-depth understanding of the complex interaction problem between transport and customs and the resulting synergistic effects.

4. Theoretical Framework for Interaction

A synergetic theory, or synergetics, is a key theoretical lens for analyzing the joint effect of interaction. Originating in the natural sciences, it studies self-organization processes in complex open systems. Its basic principles are also applicable to socio-economic systems such as logistics. The interaction between transport companies and customs can be viewed as the interaction of two complex subsystems within a larger international trade system. Synergetics argues that under certain conditions (openness of the system, non-linearity of interactions, the presence of control parameters – "order parameters"), coordination between subsystems can lead to the spontaneous emergence of new macroscopic properties, such as increased order, efficiency, and stability. These properties are not inherent in the subsystems individually. Thus, the synergetic approach helps explain why the coordinated actions of transport and customs can produce an effect that exceeds the sum of their efforts.

Understanding the coordination mechanisms requires drawing on inter-organizational interaction and information exchange theories. These include Transaction Cost Economics (TCE), which explains the choice of coordination forms (e.g., market contracts, hierarchy, hybrid forms) in terms of the desire to minimize the costs associated with finding partners, negotiating, concluding, and monitoring agreements. Within the context of transportation and customs, TCE provides a valuable framework for understanding why stakeholders opt for specific information exchange mechanisms and procedural agreements aimed at minimizing interaction costs at the border. Resource-Based View and Resource Dependency Theory focus on how organizations use their unique resources and manage dependencies on external resources to achieve competitive advantage (Guo & Bouwman, 2016). Transport companies rely on customs authorities to gain access to international markets, while customs agencies depend on timely and accurate information from carriers to ensure effective regulatory enforcement.

Listed theories explain the motivation for cooperation to gain access to critical resources (information, faster processing) and reduce dependency (Feng et al., 2024). Customer loyalty is the key to a company's survival and ability to compete with its competitors in fierce competition (Christian, 2024). Relational View and Social Exchange Theory emphasize the importance of trust, reciprocity, reputation, and long-term relationships in interorganizational interactions. Successful coordination between transport and customs often depends on formal procedures and the level of trust and willingness to cooperate based on the positive interaction experience. These theories help to understand why coordination is successful in some cases and not in others, even under similar formal conditions. Finally, the Contingency Theory reminds us that there is no universally "best" way of coordination.

The optimal mechanisms for interaction between transport and customs depend on many contextual factors: the type of goods being transported (e.g., perishable goods require

closer coordination), the level of technological readiness of the partners, the degree of uncertainty and risk in the operating environment, the specifics of national legislation and international agreements. Digital technology optimizes inventory management and achieves supply chain coordination and integration (Yan, 2024).

Commercial organizations strive to maximize profits, reduce operational costs (like fuel consumption, travel time, and idle time), and provide fast, reliable delivery to meet customer expectations and improve service satisfaction. Their activities are limited by market competition, demand volatility, the state of the transport infrastructure, the need to comply with numerous regulatory standards (including customs), and the efficiency of managing their resources (fleet of vehicles, personnel, warehouse capacity).

Customs authorities fulfill three primary functions integral to regulating and facilitating global trade in goods. Fiscal Function pertains to the revenue-generating and control aspects of customs operations. It encompasses the systematic collection of customs duties, taxes, and other applicable fees levied on imported and, in some instances, exported goods. A core component of this Function is the diligent oversight of the accurate calculation and timely remittance of these financial obligations, ensuring compliance with established tariff schedules and taxation policies.

The Regulatory and Economic Policy Implementation Function is that customs authorities execute a nation's trade policy objectives. It involves administering and enforcing various trade measures, such as quotas, licensing requirements, and import/export prohibitions. Furthermore, this Function includes the verification of origin to ascertain the provenance of goods. It is crucial for applying trade agreements and protecting industries from unfair competition or practices that could undermine the national economy.

Law Enforcement and Security Function focuses on safeguarding national security and public safety by ensuring the integrity of international supply chains. Customs authorities are tasked with preventing and interdicting illicit trade activities, including smuggling, the illegal trafficking of narcotics, weapons, and counterfeit products. A critical aspect of this Function is proactively identifying and mitigating potential terrorist threats associated with moving goods across international borders.

Using New Zealand Customs data for 2022, an analysis of seaborne imports from 51 countries, covering 22 vessels and 5,626 full container loads (FCLs). The study revealed significant differences in customs clearance and port processing efficiency. On average across all countries (51), 91.5% of full container loads (FCLs) were cleared before vessel arrival, with a mean lead time of 7 days and 7 hours (Table no. 1).

Table no. 1. Seaborne imports: top 10 overseas countries of loading

Country	Vessels	FCLs	Released before arrival	Arrival to release (mean)	Arrival to Gate-out (mean)
All countries (51)	22	5,626	91.5%	-7d, 7h	5d, 10h
Malaysia	7	1,342	95.1%	-10d, 22h	4d, 17h
Singapore	10	1,261	90.8%	-6d, 13h	5d, 12h
Australia	16	1,207	89.2%	-4d, 19h	5d, 21h
China	8	523	88.5%	-6d, 12h	6d, 15h
USA	8	171	82.5%	-6d, 18h	4d, 21h
Panama	2	130	88.5%	-7d, 22h	8d, 1h
Thailand	3	105	97.1%	-5d, 21h	3d, 19h
Hong Kong (SAR)	3	102	100.0%	-8d, 22h	9d, 6h
Indonesia	4	91	98.9%	-9d, 9h	5d, 12h
Vietnam	4	83	98.8%	-12d, 3h	2d, 22h

Source: (New Zealand Customs Service, 2022).

The average duration from vessel arrival to customs release was 5 days and 10 hours. Statistically significant differences were observed among the top ten countries by FCL volume. Vietnam demonstrated the highest efficiency, with 98.8% of FCLs released an average of 12 days and 3 hours before vessel arrival, and a total gate-out time of just 2 days and 22 hours. Similar high performance was recorded for Thailand, where 97.1% of FCLs were released before vessel arrival (5 days and 21 hours on average), and the arrival to departure time was 3 days and 19 hours. Malaysia, the leading importer of FCLs (1,342), showed a high pre-release rate (95.1%) with a significant lead of 10 days and 22 hours and an average arrival to departure time of 4 days and 17 hours.

Singapore and Australia, also major suppliers by volume, showed 90.8% and 89.2% pre-release, respectively. An interesting observation is the situation of Hong Kong (SAR), which, despite releasing 100% of FCLs before vessel arrival (8 days and 22 hours on average), recorded one of the longest average arrival-to-departure times at 9 days and 6 hours. Similarly, for Panama, the figure was 8 days and 1 hour, indicating potential delays at the port processing stage after the vessel's arrival, despite pre-clearance procedures. Among the top ten, the US has the lowest percentage of pre-releases (82.5%). The results indicate that although pre-clearance is widely implemented, there remains significant potential for optimizing in-port customs documentation procedures and reducing the overall cargo dwell time.

The efficiency of logistics operations varies significantly by country of origin, underscoring the need for a differentiated approach to enhancing supply chain procedures. These findings can serve as a basis for benchmarking and identifying best practices to improve international maritime transport's overall speed and predictability. The data in Table no. 2, representing a selection of the key components of the Logistics Performance Index (LPI) for 2023, serve as a valuable source for analytical frameworks to assess operational stability in logistics and customs regimes. In particular, the indicators of the efficiency of customs services (Customs Score/Rank) and the competence level of logistics operators (Logistics Competence Score/Rank) are direct indicators of the potential reliability and predictability of these systems.

Table no. 2. Logistics Performance Index for 2023

Country	LPI Rank	LPI Score	Customs Rank	Customs Score	Logistics Competence Rank	Logistics Competence Score
Malaysia	26	3,6	31	3,3	28	3,7
Singapore	1	4,3	1	4,2	1	4,4
Australia	19	3,7	14	3,7	14	3,9
China	19	3,7	31	3,3	20	3,8
USA	17	3,8	14	3,7	14	3,9
Panama	57	3,1	47	3	61	3
Thailand	34	3,5	31	3,3	38	3,5
Hong Kong (SAR)	7	4	12	3,8	11	4
Indonesia	61	3	59	2,8	65	2,9
Vietnam	43	3,3	43	3,1	53	3,2

Source: (World Bank, 2023).

The analysis shows significant differentiation among countries in these parameters. Singapore (LPI Score: 4.3; Customs Score: 4.2; Logistics Competence Score: 4.4) and Germany (LPI Score: 4.1; Customs Score: 3.9; Logistics Competence Score: 4.2) demonstrate high scores, which indicate developed customs procedures and high quality of logistics services that contribute to operational stability. Hong Kong (SAR) (LPI Score: 4.0; Customs Score: 3.8; Logistics Skills Score: 4.0) and Austria (LPI Score: 4.0; Customs Score: 3.7; Logistics Skills Score: 4.0) are also among the top performers.

Comparing the key components of the Logistics Performance Index (LPI) in Table no. 2 (Customs Performance and Logistics Competence, 2023) with the operational performance of seaborne imports in Table no. 1 provides an in-depth understanding of the factors that influence operational stability and demonstrates the importance of using multi-dimensional analytical frameworks. The expected correlation is observed between high Customs Performance scores (Table no. 2) and pre-clearance performance (Table no. 1).

Countries with high Customs Performance Scores, such as Singapore (4.2) and Malaysia (3.3), exhibit a high percentage of cargo released before vessel arrival (90.8% and 95.1%, respectively), reflecting the efficiency of their pre-clearance procedures. It confirms that the objective assessment of Customs performance at the macro level (LPI) is often reflected in the actual speed of Customs clearance at the operational level. However, the Logistics Competence Score (Table no. 2) and its relationship with the actual port handling times and the arrival to gate-out from Table no. 1, require a more detailed examination. Hong Kong SAR, with a high Logistics Competence Score (4.0) and Customs (3.8) in Table no. 2, as well as 100% pre-release of cargo (Table no. 1), nevertheless shows the longest time from arrival to gate-out from the terminal (9 days 6 hours). It may indicate that Logistics Competence, as a component of the LPI, reflects the overall quality and availability of services.

5. Mechanisms of positive synergy

The positive synergy cannot arise in a vacuum; it is a consequence of interaction and efforts to build effective coordination. The key mechanisms contributing to this include joint planning of transport operations, arrival/departure schedules, and use of infrastructure such as land border crossing points and ports. It allows you to avoid load peaks, optimize flows, and reduce waiting times. Creation and use of common information platforms and standardized protocols for real-time data exchange between carriers, shippers, customs brokers, and customs authorities will lead to faster customs clearance. Providing advance information about goods and vehicles allows customs authorities to conduct risk assessments before arrival, accelerating the customs clearance process for low-risk shipments. Increased transparency throughout the process for all participants reduces uncertainty and facilitates better planning (Chow et al., 2022).

Developing partnerships between customs and business, particularly through Authorised Economic Operator (AEO) programmes, based on mutual trust and understanding of each other's operational realities and objectives. It promotes a more open exchange of information and collaborative problem-solving. Standardisation and harmonisation: The use of internationally recognised standards in the field of data, like the WTO Data Model, procedures (revised Kyoto Convention), and technologies, promotes the compatibility of systems and the simplification of cross-border transactions. Methodologies for measuring synergy: The assessment of the synergy effect requires using specific methods that allow for the quantitative or qualitative measurement of the benefits of coordination.

Performance-based models: Methods such as data envelope analysis (DEA) can be used to assess a logistics system's technical and overall scale performance. Comparing efficiency at different levels of coordination or analyzing changes in efficiency over time allows us to identify synergistic effects. Cost/benefit models: This approach measures synergies as total cost savings for all supply chain participants when moving from an uncoordinated state to an optimal, coordinated interaction structure. Such models also allow us to assess the distribution of synergies (benefits) between different participants (goods owner, carrier, forwarder, customs).

Indexing methods: Building integral synergy indices based on a system of indicators characterizing the state of key subsystems (e.g., infrastructure and equipment, organizational management, commercial operations, information interaction) and their level of consistency. To determine the weights of the indicators, expert methods like Analytical Hierarchy Process – AHP, or objective methods based on the statistical properties of the data (Lu et al., 2019). Qualitative methods: Analysis of case studies of successful examples of cooperation, conducting surveys and interviews among experts to identify factors contributing to synergy and describe its manifestations in practice.

6. Conclusions

Data such as the Logistics Performance Index (LPI) and seaborne import statistics reveal significant differences between countries in customs clearance and port handling efficiency. Although the practice of pre-declaration is common, there is considerable scope for optimization of port handling processes. Countries with high customs efficiency scores tend to perform better in the pre-release of goods. However, high levels of logistics competence do not always guarantee minimum port handling times, indicating that the issue is multifactorial.

Various methodologies can be used to measure synergies, including performance-based models, cost-benefit analysis, index methods, and qualitative approaches such as case studies and expert surveys. The study, therefore, highlights the need to deliberately develop and strengthen synergies between the transport sector and customs authorities using modern approaches to planning, information sharing, and performance measurement to improve operational stability in modern logistics.

Acknowledgments

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EUROPE'S ENERGY MARKET: LESSONS FROM THE 2021 ENERGY CRISIS AND RECENT SHIFTS

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Abstract: *The upheavals that struck the energy sector in 2021 were predictable, as early warning signs had begun to emerge three years before the crisis. Each premise alone would not have led to a crisis if other premises had not accompanied it. Prices started to rise in the second half of 2021, because this year there has been a decrease in supply and an increase in demand due to the recovery of production in all sectors of the economy after the isolation caused by the COVID-19 pandemic. Many more factors influenced the decline in supply than the increase in demand. When demand-pull and cost-push inflation occur in the same period, prices increase several times. This study also examines how Europe's transition to green energy occurs. A comparative analysis of the dynamics of green energy before, during, and after the crisis was carried out. This study explores the premises of the crisis and the lessons that Europe has learned. This study uses multiple methods (comparative analysis and time-series analysis) to examine the antecedents and factors that led to the record rise in European natural gas prices and assess the European energy market's current state and trajectory (towards increasing the share of green energy). By examining the current state of the European energy market and overall trends, the study provides a comprehensive understanding of how the market has evolved since the crisis and what challenges remain to ensure long-term energy security and price stability. The article highlights the role of energy diversification, reconsidering EU strategies in stabilizing the market and accelerating the transition to a more sustainable energy system.*

Keywords: *European energy crisis, energy security, energy transition, renewable energy.*
JEL Classification: *Q41, Q42.*

1. Introduction

The energy sector is strategically important for economic and social stability and for the national and energy security of the European Union (EU), which imports key energy resources such as oil and natural gas. The global energy crisis that began in September 2021 and worsened in 2022 has become a severe test for the EU, revealing the vulnerability of the European economy and exacerbating the need for an energy transformation (Eminov et al., 2024). The peculiarity of this crisis is the considerable influence of geopolitical factors on the import structure of energy resources. With the aggravation of the geopolitical struggle, the economies of the countries importing energy resources became most vulnerable. The energy crisis has affected not only the energy sector and the economy, but also trade, competitiveness (Gutium & Postolaty, 2019), human development (Balan, 2024), and the well-being of the population (Gutium, 2021).

Economic recovery after the recession caused by the COVID-19 pandemic is the main factor in increasing demand for energy resources. In 2021, according to the International Monetary Fund, the real GDP of Europe increased by 6.0% (IMF, 2024). At the same time, Germany continued to close nuclear power plants despite the energy crisis and economic growth; only the deadline for closing nuclear power plants was extended. The policy of phasing out nuclear energy in Europe does not guarantee a rapid transition to alternative energy sources. At the same time, there was a decrease in hydroelectricity and an increase in wind energy production in 2022 compared to 2021.

More and more scientists are advocates of the idea of the decarbonization process during the transformation of the energy sector (Gojaeva et al., 2024; Scott, 2022), as well as

the diversification of energy resources, which would balance demand with supply in this market and ensure a reduction in carbon dioxide emissions (De Rosa et al., 2022; Hussain et al., 2023). The prerequisites have been created for the introduction of renewable energy sources (RES) and for "green" investments (Magalhaes, 2021), "however, there has not been a corresponding decrease in demand for fossil fuels" (Alkemade et al., 2023).

The study's relevance is predetermined by the need to study the causes and effects of the energy crisis. It is necessary to identify the economic factors that contributed to the transition of many European countries to the principles of green energy, in addition to such factors as limited sources of acquisition of traditional energy resources. This article aims to provide an in-depth analysis of how the European energy market has responded to external and internal shocks and what the long-term consequences of these shocks are. The article analyzes the structure of the European energy market, examines the causes of the energy crisis, and identifies the main lessons learned from the crisis that had a direct impact on accelerating the transition to green energy in the post-crisis period.

2. Underlying factors behind the energy crisis: a focus on natural gas price dynamics

The beginning of the 21st century can be called the period of peak globalization, in which food and energy systems are highly concentrated. Naturally, establishing barriers and severing economic and energy ties could not help but lead to a crisis. The energy crisis of 2021-2022 is associated with increased prices for natural gas in Europe. Indeed, over the five years, the price at the TTF gas hub has increased 12.8 times (August 2022 to August 2017), while the spot price at the Henry Hub has increased 3.1 times, and for Liquefied Natural Gas (LNG) (Japan), 2.4 times (Fig. no. 1). During 2021, the highest monthly growth at the European TTF gas hub was recorded in September (by 48.1%), and in 2022, in March (by 55.7%) and July (by 53.0%). The prerequisites for the energy crisis are the emergence of a new player in the natural gas market, namely the United States, and the geopolitical turmoil, which led to severing many economic and logistical ties.

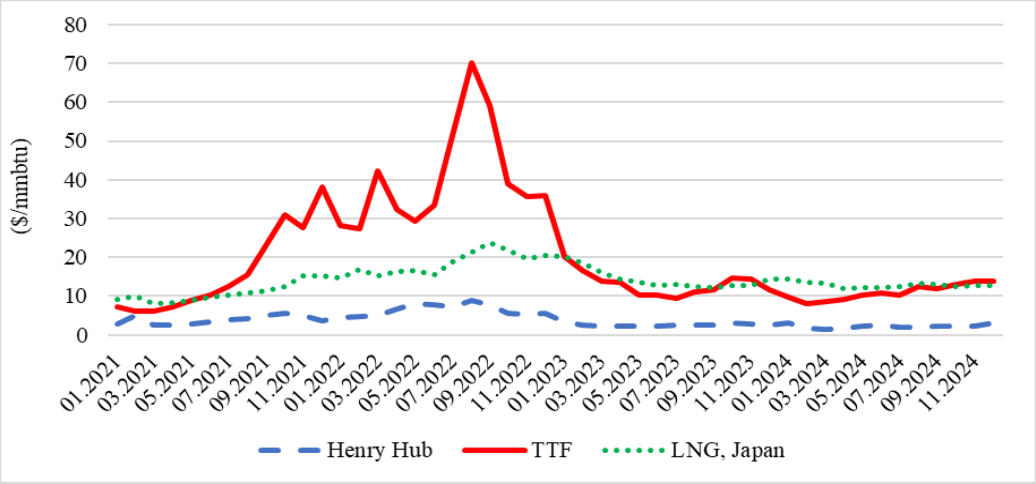

Figure no. 1. Monthly dynamics of natural gas prices

Source: (World Bank, 2024).

Until 2016, the United States was an importer of natural gas. Since 2018, it has been an exporter (Fig. no. 2). In 2017-2022, the export potential of the United States increased significantly, which led to the United States having the opportunity to influence this market to weaken competitors. In 2022, gas exports exceeded imports by 2.3 times. In 2023, US gas exports continued to grow and exceeded imports by 2.6 times.

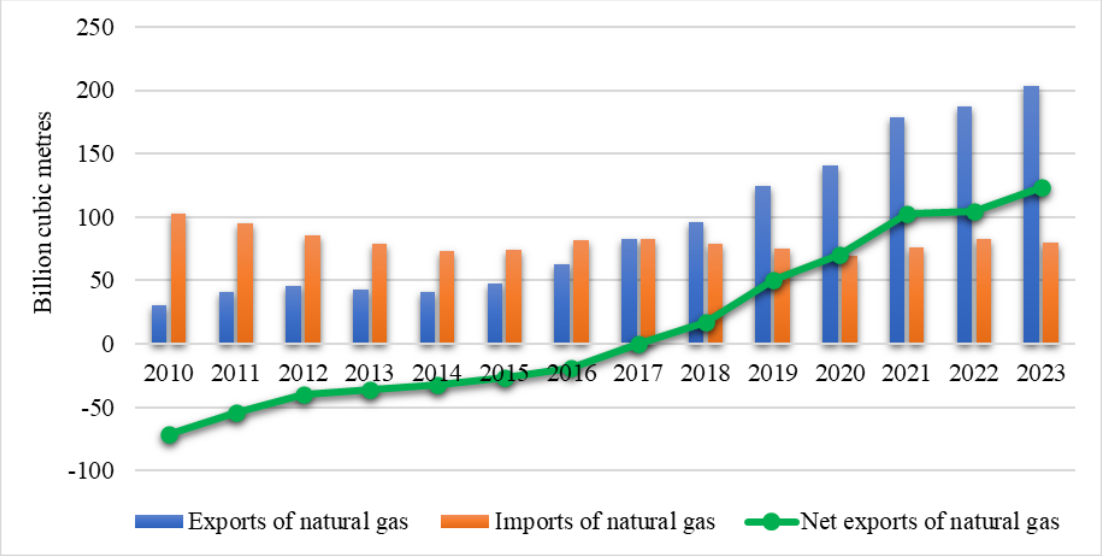

Figure no. 2. Dynamics of US exports and imports of natural gas
Source: (Energy Institute, 2024).

LNG exports from the United States increased 6.1 times in 2022 compared to 2017 (when the gas trade balance was zero), while the growth in pipeline gas exports was only 25.9% (Energy Institute, 2024). Naturally, in this situation, it is beneficial for the United States that European countries shift from importing pipeline gas to importing LNG. The structure of European imports changed significantly over the analyzed period. Starting from 2017, there has been a negative trend in the share of pipeline gas, which decreased by 1.1 percentage points compared to 2016, and for 2017-2022 by 32.3 percentage points (Fig. no. 3). This decline was caused by a decrease in pipeline gas imports from the Russian Federation by 54.9%. In 2017-2023, the share of pipeline gas fell by 39.5 p.p., and the reduction in pipeline gas imports from the Russian Federation amounted to 84.1%.

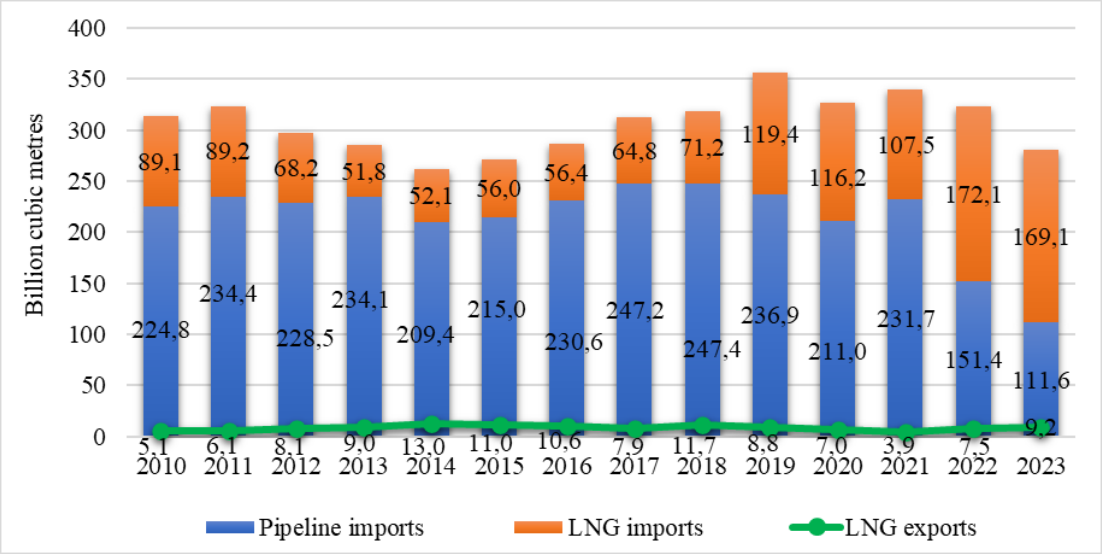

Figure no. 3. Dynamics of European imports and exports of natural gas
Source: (Trading Economy, 2024).

During 2017-2022, European LNG imports increased by 2.6 times, including to EU countries: to Belgium by 9.5 times, to France by 3.2 times, to Spain by 73.5%, to Italy by 72.3%. LNG imports to the UK increased by 3.8 times. At the same time, European LNG exports fell by 5.1%.

Changes influenced the increase in gas prices and the formation of energy prices. The gas pricing mechanism influences the role of natural gas in the country's energy balance. Over thirteen years (2010-2022), changes have occurred in Europe's pricing structure of natural gas. OPE price share decreased from 59.0% in 2010 to 17.4% in 2022, while GOG price share increased from 36.0% to 82.2% (Fig. no. 4). One of the main reasons for the transition of European importing companies from prices tied to crude oil or petroleum products to spot gas prices is the fact that the former exceeded the latter.

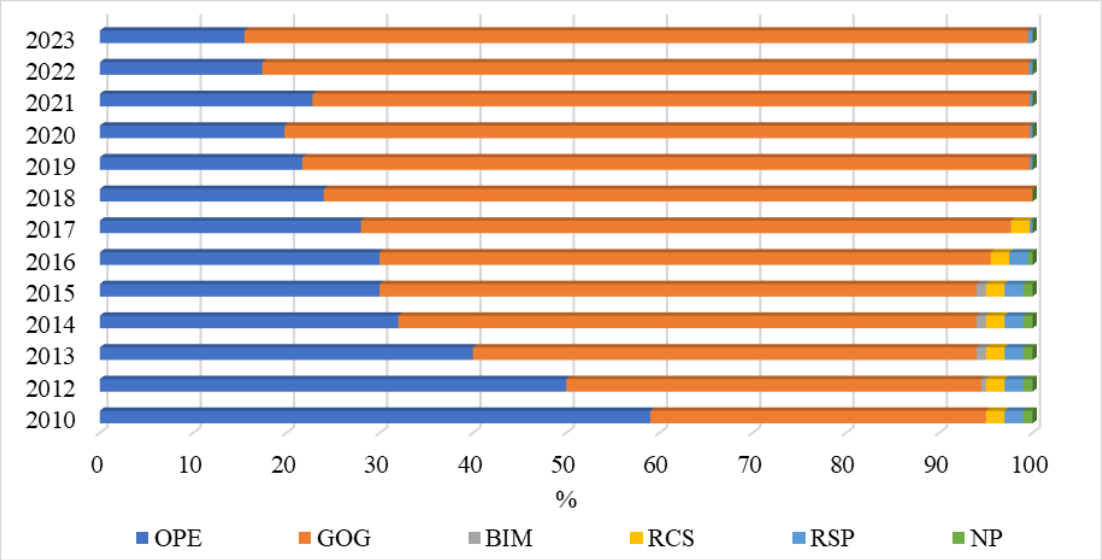

Figure no. 4. Gas price structure in Europe (consumption), %

Source: (International Gas Union, 2024).

Note: OPE – oil price escalation; GOG – gas-on-gas competition; BIM – bilateral monopoly; RCS – regulation price: cost of service; RSP – regulation price: social and political; NP – no price.

It should be noted that each pricing mechanism has both positive and negative sides. One of the disadvantages of setting gas prices in European hubs is that they are not sufficiently volatile and cannot function as a reliable pricing mechanism immune to manipulation by prominent exporting actors seeking to advance their interests.

The growth in global gas demand in 2021 amounted to 4.3% compared to the previous year, reaching 3913 billion cubic meters (International Gas Union, 2024). If a similar increase in supply does not meet the increase in demand, this leads to an increase in price. Economic growth after the recession caused by the COVID-19 pandemic is one of the factors in the rising demand for energy resources. In 2021, according to the International Monetary Fund, the real global GDP increased by 6.3%, that of advanced economies by 5.6%, emerging market and developing economies by 6.9%, and Europe by 6.0%. (IMF, 2024). In 2022, real GDP growth continued, but at a lower rate than in 2021. The higher the level of a country's development and the degree of industrialization of its national economy, the higher the consumption of energy resources and, consequently, the greater the demand.

Other reasons for the increase in demand are the cold front called "Beast from the East 2" that hit Europe at the beginning of 2021, and the increased need for indoor air conditioning in the summer due to the persistent heat. Naturally, as gas prices increased, the prices of other energy resources also rose: coal (South African) - by 3.1 times, Dubai oil - by 93.8%, Brent oil - by 91.9%, West Oil Texas Intermediate (WTI) – by 90.7% (August 2022 to August 2017) (Fig. no. 5). This price increase is inferior to the growth recorded in natural gas prices in Europe.

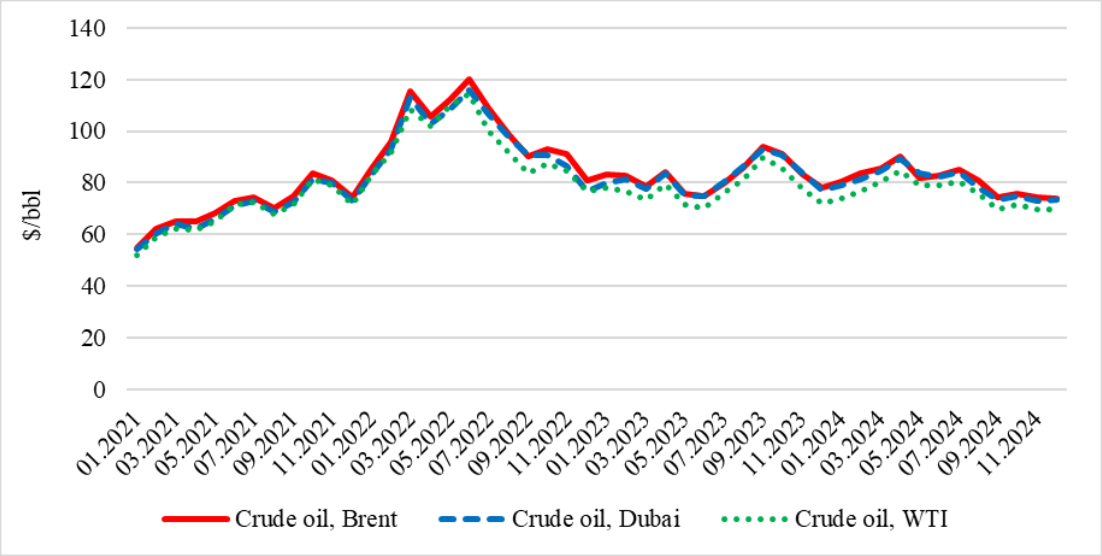

Figure no. 5. Monthly dynamics of oil prices

Source: (World Bank, 2024).

The change in the structure of the natural gas supply is due to several reasons. Firstly, European countries began to reduce the volume of pipeline gas purchases and abandon long-term contracts in favor of purchasing gas from hubs. Secondly, uncontracted volumes of liquefied gas were redirected to the Asian market, where the price was higher than in Europe. For example, in February 2021, the price of liquefied natural gas in the Asian market was 1.6 times higher compared to the price at the TTF hub, and by May 2021, both prices were almost equal.

Starting from June 2020, a rising trend in gas prices in Europe was registered during the analyzed period. According to ICE exchange data Futures, on August 26, 2022, the following maximum of natural gas futures was set at the TTF hub, for 339.20 euros per MWh (Trading Economy, 2024). One of the reasons is the low level of gas reserves in European storage facilities, which were at historical lows. According to the Aggregated Gas Storage Inventory, as of September 1, 2021, 752.534 TWh of gas had been stored in Underground Gas Storage (UGS), with storage capacity filled to 67.85% (Aggregated Gas Storage Inventory, 2024). The mistakes made in the previous year were considered, and by September 1, 2022, the gas storage level was higher, reaching 80.73%.

3. Energy transition in Europe: during the energy crisis and recent shifts

Any progress takes time; it is not feasible to abruptly abandon traditional energy sources without first ensuring the stability of green energy. Such a decision contributed to a reduction in the electricity supply. Nuclear and coal-fired power plants were closed, and calm weather for several months in northwestern Europe prevented wind energy production in 2021. Green energy is vulnerable, depending on the number of sunny and windy days. Ensuring round-the-clock and daily stable operation of a wind and solar power plant is impossible. At the same time, it should be noted that this type of energy is relatively green since today, there are no effective methods for recycling solar panels and blades from wind turbines.

The weather is unpredictable and brings surprises. Drought in the southern United States, for the first time in 10 years, caused hydroelectric generation to decline to a minimum. As a result, the Edward Hyatt power plant had to be closed, although it was the fourth-largest power plant in California. To provide the required amount of electricity, a decision was made to use coal and gas power plants more intensively, which led to an increase in carbon dioxide emissions in the United States and an increase in the price of coal.

As noted above, in 2021, in Europe, winters were comparatively colder and summers were hotter, while the period of calm was prolonged. Thus, the electricity demand increased, and the supply fell during this period. As a result, the UK was forced to reactivate the mothballed West Burton coal-fired power station instead of promoting green energy. If we compare natural gas with coal, the former is a relatively more environmentally friendly fuel.

As noted above, modern green energy is not as harmless as initially thought. Firstly, the frequencies generated by a wind turbine are harmful to the ecosystem, especially to birds, bats, and their habitats. Secondly, they create noise that harms humans in a specific sound spectrum. Thirdly, the blades are made of composite materials; today, no harmless technologies exist for their production. Instead of recycling, they are buried, which causes irreparable damage to the environment.

A similar situation is with solar panels, which are placed over large areas, can affect the climate, disrupting the natural temperature regime, and contain harmful substances such as lead, arsenic, copper, cadmium, gallium, etc. Solar panels are not yet sufficiently cost-effective; their cost is high. In addition, their service life is only 20-30 years. However, this period is not the limit; service life depends on the quality and production technology. For comparison, amorphous silicon modules (the first generation of thin-film technologies) have a service life of seven years or more, and monocrystalline solar modules have a service life of 30 years or more. Not only the production, but also the disposal of solar panels harms the environment.

The most vulnerable to the energy crisis are countries that do not have the necessary energy resources, cannot negotiate, and are economically dependent on donors such as the World Monetary Fund. The rise in prices for natural gas triggered increasing prices for other energy resources. Against the backdrop of worsening geopolitical confrontations and the exchange of sanctions, logistics ties were severed, which led to a shortage of energy resources, especially in importing countries.

A comparative analysis of the dynamics of the price of natural gas and the share of renewable energy in total net electricity production showed that the share of green energy did not increase during the energy crisis. In the months with a peak increase in the price of natural gas, the share of green energy fell. For example, in August 2022, the gas price was $ 70.04 / mmbtu, which is the highest price, 4.5 times higher than the price in August 2021. The share of renewable energy in August 2022 fell by 1.9 percentage points compared to August 2021 (Fig. no. 6). This decrease was caused by a decline in hydro electricity production by almost 18% and wind electricity by 14% in the analyzed period. In the post-crisis period, the share of green energy increased. It amounted to 51.6%, meaning more than half of the electricity produced, which is 10.2 p.p. higher than in August 2022. This growth was driven by a 1.5-fold increase in solar power generation, a 36% increase in wind power, and a 16% increase in hydropower.

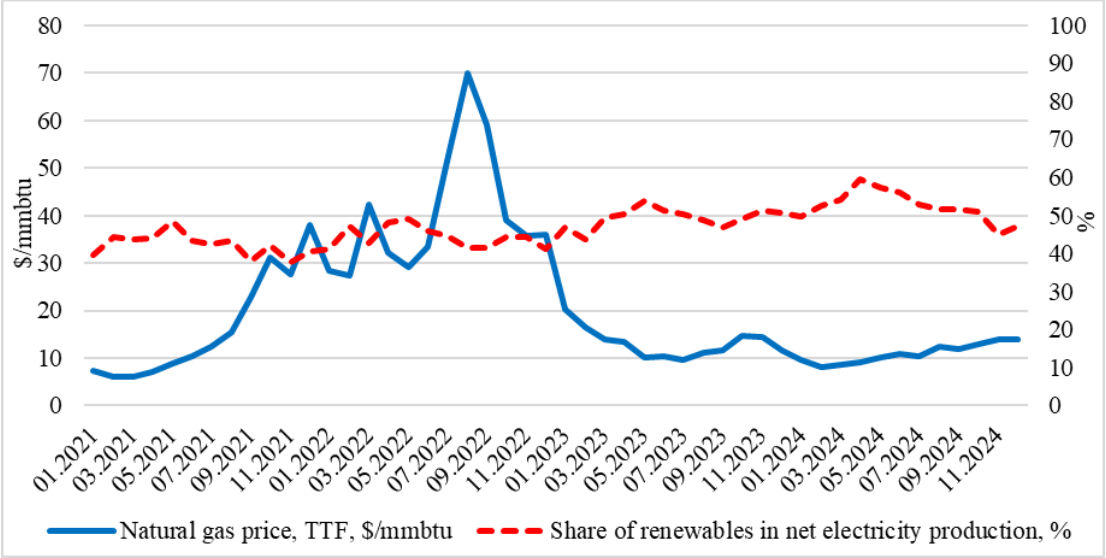

Figure no. 6. Monthly dynamics of natural gas prices (TTF) and the share of renewables in net electricity production (in OECD-Europe)

Source: (World Bank, 2024).

Note: Renewables include hydro, wind, solar, geothermal, other renewables, and combustible renewables.

4. Conclusions

A study of the European energy market has shown that the energy transformation that began long before the energy crisis slowed down during the crisis, but in the post-crisis period, the transition to green energy accelerated. This is because a lack of available capital for investment became evident in the European economy during the COVID-19 pandemic and the energy crisis, and energy transformation requires investment. In January 2021, hydropower accounted for the largest share of renewable energy sources, while in December 2024, wind power held the largest share, surpassing the share of electricity generated from natural gas.

Strategic recommendations for accelerating the energy transition in Europe: increasing investments in green energy and especially in energy storage; supporting research, development, innovation, and large-scale deployment of green energy technologies; effective implementation of the Net Zero Industry Act; increasing energy resilience through green energy diversification.

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RON EXCHANGE RATE DETERMINANTS

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Abstract: *The exchange rate of the leu has been very stable in recent years, with fluctuations approaching zero. At the same time, there have been opinions in the public debate that the deficits in the trade balance and the current account could be explained, at least in part, by an appreciation of the exchange rate. This last assertion has been supported, verbally, but also through studies and analyses, not only by economists present in the media, but even by representatives of the Romanian currency authority (BNR). Therefore, this communication aims to connect the exchange rate variations of the last 20 years with the demand and supply of foreign exchange on the Romanian market and to analyze the impact of other variables (inflation, interest rate differential between the Romanian market and other markets) on the exchange rate of the leu.*

Key words: *exchange rate, depreciation, current account, inflation, interest.*
JEL Classification*: F31.*

1. Introduction

A glance at the annual evolution of the exchange rate of the RON over the last ten years shows a remarkable stability (Table 1).

Table no. 1. RON exchange rate (1999-2024)

Year	RON/EUR exchange rate		RON/EUR exchange rate depreciation (-) / appreciation (+) (%)		RON/USD end of period	depreciation (-)/ appreciation (+) RON /USD (%)	exchange rate USD/EURO	depreciation (-) / appreciation (+) USD/euro (%)
	Average value	Value at end of period	Compared to the average rate	Compared to the course at end of period	Value at end of period	Compared to the course at end of period	Value at end of period	Compared to the course at end of period
1999	1,6296	1,8331	-	-	1,5333	-	1,0658	-
2000	1,9956	2,4118	-22,46	-31,57	2,1693	-29,32	0,9236	13,34
2001	2,6027	2,7881	-30,42	-15,60	2,9061	-25,35	0,8956	3,03
2002	3,1255	3,4919	-20,09	-25,24	3,3055	-12,08	0,9456	-5,58
2003	3,7556	4,1117	-20,16	-17,75	3,3200	-0,44	1,1312	-19,63
2004	4,0532	3,9663	-7,92	3,54	3,2637	1,73	1,2439	-9,96
2005	3,6234	3,6771	10,60	7,29	2,9137	12,01	1,2441	-0,02
2006	3,5245	3,3817	2,73	8,03	2,8090	3,73	1,2556	-0,92
2007	3,3373	3,6102	5,31	-6,76	2,4383	15,20	1,3705	-9,15
2008	3,6827	3,9852	-10,35	-10,39	2,5189	-3,20	1,4708	-7,32
2009	4,2373	4,2282	-15,06	-6,10	3,0493	-17,39	1,3948	5,17
2010	4,2099	4,2848	0,65	-1,34	3,1779	-4,05	1,3257	4,95
2011	4,2379	4,3197	-0,67	-0,81	3,0486	4,24	1,392	-5,00
2012	4,4560	4,4287	-5,15	-2,52	3,4682	-12,10	1,2848	7,70
2013	4,4190	4,4847	0,83	-1,26	3,3279	4,22	1,3281	-3,37
2014	4,4446	4,4821	-0,58	0,06	3,3492	-0,64	1,3285	-0,03
2015	4,4450	4,5245	-0,01	-0,95	4,0057	-16,39	1,1095	16,48
2016	4,4908	4,5411	-1,03	-0,37	4,0592	-1,32	1,1069	0,23
2017	4,5681	4,6597	-1,72	-2,61	4,0525	0,17	1,1297	-2,06
2018	4,6535	4,6639	-1,87	-0,09	3,9416	2,81	1,181	-4,54
2019	4,7452	4,7793	-1,97	-2,47	4,2379	-6,99	1,1195	5,21
2020	4,8371	4,8694	-1,94	-1,89	4,2440	-0,14	1,1422	-2,03
2021	4,9204	4,9481	-1,72	-1,62	4,1604	2,01	1,1827	-3,55
2022	4,9315	4,9474	-0,23	0,01	4,6885	-11,26	1,053	10,97
2023	4,9465	4,9746	-0,30	-0,55	4,5743	2,50	1,0813	-2,69
2024	4,9746	4,9741	-0,57	0,01	4,5984	-0,52	1,0824	-0,10

Source: www.bnro.ro, database

The evolution of the RON/EUR exchange rate between 1999 and 2024 shows that the stability in recent years has not been constant. Thus, at the end of the 1990s and the beginning

of the 2000s, the RON depreciated annually by 20-30%, and in the years before joining the European Union and in the year of integration the RON started to appreciate, in some years the annual appreciation rate being close to or exceeding 10%. During the financial crisis, in 2008 and 2009, the RON returned to a depreciation process, losing about a third of its value cumulatively in those two years. The following period, 2010-2015, was one of mixed performance, the years in which the exchange rate depreciated alternating with those in which it appreciated, but the values were modest, below one percent (the exception being 2012, when depreciation exceeded 5%). From 2016 until the last year analyzed, 2024, there is a period of continuous depreciation of the RON/EUR exchange rate, but if in the first six years of this interval the depreciation percentages are between 1 and 2%, in the last three years, 2022, 2023, 2024, the depreciation percentages are below 0,5%, if we refer to the annual average exchange rate, and if we look at the exchange rate at the end of the period, in two years, 2022 and 2023, we even witness a more than modest appreciation of 0.01% (i.e. the year ends with a RON/EUR exchange rate arithmetically lower than the one at which the year started).

If we look at the RON/USD exchange rate, in recent years we observe a higher volatility, appreciations and depreciations following one another from one period to another, but the percentages of these variations (except for the one in 2022) are not absolutely large. If we also look at the evolution of the USD/EUR exchange rate, we see that this is in fact the cause of the RON/USD exchange rate variations and we also see that many times the USD variations against the euro have not been integrated into the RON/USD exchange rate, and in three of the last five years the USD movements against the euro have been even different from the movement of the RON against the USD.

These developments and, in particular, those of the last few years, raise concerns, in the sense that they come against the backdrop of an inflationary crisis, both in Romania and globally, a deterioration of our country's trade balance and, last but not least, disappointing economic growth performance (especially in the last year, 2024), that is to say, causes that should have caused a stronger depreciation of the RON. But at the same time the inflows of foreign currency into our country, through debt, foreign investments, remittances from abroad, as well as the level of deposit interest rates on the Romanian banking market have had values that have annihilated a good part of the depreciation pressures and have led to the modest movements observed in the RON/EUR exchange rate

2. Exchange rate determinants in the literature

In economies where the exchange rate of the currency is flexibly determined, it is determined by the supply and demand for foreign exchange, and will therefore depend on the causes that define the size of the two variables: the size of the gross domestic product, the part of it that is exported, the size of imports (the latter, considered cumulatively, forming the trade balance), changes in domestic prices relative to international prices, labor productivity, foreign exchange inflows and outflows as a result of that country's participation in international financial flows (foreign direct or portfolio investment, credits/loans and placements, including foreign exchange reserve fluctuations, elements that form the financial account of the balance of payments), but also monetary factors, such as interest rates or the volume of money issuance (Dornbusch, Fischer, Startz, 2007; Wheelen, 2016; Jackson, 2022).

Recent studies confirm that many of the determinants in the classical literature maintain their impact on the exchange rate, but some complement the theory with other factors.

Thus, Ramasamy and Karimi Abar (2015) state that the results of their studies indicate that all macroeconomic variables significantly influence the exchange rate except employment and budget deficit, and that psychological factors such as investor confidence dominate over economic variables, determining the exchange rate fluctuation.

Another study (Fraz, Fatima, 2016), explores the relationship between gross domestic product growth (GDP growth), consumer price index (inflation) and interest rate with the exchange rate for developed and developing countries, and the results show that they have a strong influence on the exchange rate for both categories of countries.

Chavez (2020), analyzing data from a long period, 1980-2019, finds that inflation, economic growth, fiscal and monetary policy have positive effects on real exchange rate values, while money supply and terms of trade have a negative impact on the real exchange rate.

Kappler, Reisen, Schularick, and Turkisch (2011), using a large dataset covering nearly 50 years of international economic history between 1960 and 2008, find that (1) the current account balance typically deteriorates sharply in response to appreciation and revaluation shocks, and three years after exchange rate strengthening the current account balance declines by about three percentage points of GDP, (2) the effects on output are limited (the negative effect on the level of output amounts to 1% after six years), (3) export growth declines significantly after appreciation and revaluation, (4) most of these effects appear to be more pronounced in developing countries.

Longaric (2022) finds that an appreciation of the domestic currency against the USD can be expansionary depending on the strength of the financial channel (the size of foreign exchange inflows) and that it amplifies the effects of foreign monetary policy shocks.

Chinn (2013) analyzes how unconventional monetary policy measures implemented in recent years (such as quantitative easing) have affected asset prices, with particular reference to exchange rates, and concludes that these measures have introduced more volatility in global markets.

Karahan (2020) argues that especially in developing countries, production depends on imported capital and intermediate goods, and hence an increase in exchange rates makes imported production inputs more expensive and thus negatively affects economic growth.

Zhao (2020) observes that while there is a concomitance between labor productivity and currency appreciation (higher productivity leads to a stronger domestic currency, but the reverse is also true), and that high productivity also plays a role in compensating for the loss of international competitiveness

Finally, Dăianu, Dumitru, and Uzum (2025) find that "*a 1 percentage point appreciation of the real effective exchange rate (increase) brings about a fall (deterioration) in the current account balance of between 0.08 and 0.14 pp of GDP. But this does not necessarily imply a deliberate depreciation of the RON to improve competitiveness, which would again boost inflation*", the authors believe that the solution would be "*a wage policy in line with productivity dynamics and investment in efficiency/productivity gains, which would not lead to an increase in unit labor costs [...]*".

3. Correlations between the RON/EUR exchange rate and other economic variables

We will proceed to analyze the impact of the main variables that affect the exchange rate of the RON.

The exchange rate of a currency is determined by the demand and supply of foreign exchange, and the latter is influenced by the inflows and outflows of foreign exchange as a result of:

a) trade relations with foreign countries, quantified in the trade balance (exports and imports of goods and services, respectively);

b) the primary income that a country receives from abroad or transfers abroad (receipts/payments of wages, dividends, interest, taxes, subsidies, rents);

c) the secondary income that a country receives from abroad or transfers abroad (EU structural funds receipts/payments or contribution to the EU budget, remittances of national workers abroad). Components a, b, c form the first part of the balance of payments, called the current account;

d) capital account (Export/Import of natural resources, licenses, trademarks, goodwill, debt forgiveness, capital taxes, investment grants).

The balance resulting as the difference between the receipts and payments in foreign currency included in the current account and the capital account, respectively, shall have the meaning:

- either of financing capacity (a surplus/credit/positive balance), when receipts are higher than payments, in which case the surplus of foreign currency entering the country leads to an appreciation of the national currency;
- or of necessary to finance (a deficit/debit/negative balance), when receipts are lower than payments, and in this case the shortage of foreign exchange to be paid abroad leads to depreciation of the domestic currency.

Looking at the trade balance, current account, and cumulative current and capital account figures shows a chronic deficit for Romania over the period 2005-2024, which means a continuous demand for foreign currency to cover it. Our country has recorded surpluses only in the combined current and capital account and only in four years, 2013-2016, and this is because in those years the deficits of the trade balance and the current account had the lowest values, which could be offset by surpluses in the capital account, mainly resulting from capital inflows from European funds, earmarked for investment. Depending on the economic environment, the absolute value of deficits followed the following trend:

- The deficits increased in the pre-accession period and immediately after accession until the financial crisis, which began to manifest itself in Romania in the latter part of 2008 and reached impressive figures of 18-19 billion EUR for the trade balance and 16-17 billion EUR for the current account and the combined current and capital account. I say impressive because the share of deficits in our country's GDP at its peak reached between 20% and 25%, and as a share of annual foreign exchange transactions they approached 100% at the beginning of the period, when the reporting base was modest, and fell below 50% as the volume of foreign exchange transactions increased.

- Starting in 2009, with the recession that accompanied the financial crisis and the contraction in external trade, deficits fall, reaching their best performance in terms of the smallest deficit in 2014 on the trade and current account and the largest surplus on the combined current and capital account in 2015. After that, deficits resume their upward trend,

reaching around 10 billion EUR in the year of the pandemic crisis. The share of deficits in GDP fell to around 1-2% and 2-6% in annual foreign exchange transaction volumes, respectively, and increased to 10-15% as a share of GDP and 20-30% in annual foreign exchange transaction volumes, respectively.

- From 2021 onwards, the deficits increase sharply: the trade balance deficit is between 15 and 20 billion EUR, the current account deficit exceeds 20 billion EUR, and the combined current and capital account deficit is approaching 20 billion EUR. The shares in GDP of these deficits have been between one-fifth and one-third, and the share in the volume of annual foreign exchange transactions is between 30-60%.

Table no. 2. Trade balance, current and capital account (2005-2024)

Year	Trade balance *(bn euro)*			Total current account *(bn euro)*			Total current and capital account (net lending (+) / net borrowing (-)) *(bn euro)*		
	Export	Import	Difference	Credit/ Collections	Debit/ Payments	Sold	Credit/ Collections	Debit/ Payments	Difference
2005	19,4	27,6	-8,2	24,7	31,7	-6,9	25,4	31,7	-6,3
2006	24,0	35,8	-11,8	31,3	41,5	-10,2	32,0	42,2	-10,3
2007	31,5	49,5	-18,0	40,9	58,1	-17,3	42,0	58,6	-16,5
2008	38,3	57,4	-19,1	49,2	66,0	-16,8	50,1	66,4	-16,2
2009	32,6	40,6	-8,1	40,4	46,2	-5,8	41,3	46,5	-5,2
2010	40,6	48,7	-8,1	47,3	53,8	-6,4	47,9	54,1	-6,3
2011	48,8	56,5	-7,7	55,7	62,3	-6,6	56,9	62,7	-5,9
2012	49,8	56,6	-6,8	56,7	63,1	-6,4	59,0	63,5	-4,5
2013	57,3	58,4	-1,1	65,2	66,7	-1,5	68,3	66,8	1,5
2014	61,9	62,6	-0,7	68,8	69,8	-1,0	72,8	69,9	2,9
2015	65,7	66,7	-1,0	73,8	75,7	-1,9	77,8	75,9	2,0
2016	70,2	71,7	-1,5	78,0	81,5	-3,5	82,4	81,7	0,8
2017	77,9	81,9	-4,0	85,6	91,6	-6,0	87,9	91,6	-3,8
2018	85,6	92,1	-6,4	95,3	104,2	-9,0	97,9	104,3	-6,4
2019	90,1	98,9	-8,8	102,0	112,5	-10,5	105,2	112,9	-7,6
2020	81,3	90,8	-9,5	93,1	104,0	-10,9	97,5	104,3	-6,8
2021	98,1	111,8	-13,7	110,3	127,8	-17,5	82,8	92,2	-9,4
2022	123,0	141,9	-19,0	137,1	163,1	-26,0	144,9	163,9	-19,0
2023	126,5	142,0	-15,5	142,7	165,2	-22,5	150,7	166,6	-15,9
2024 I-IX	93,6	108,0	-14,4	106,1	125,9	-19,8	108,8	126,1	-17,3

Source: www.bnro.ro, interactive database and author's own calculations

Table 3. Trade balance, current account and capital account balances compared with gross domestic product and foreign exchange market turnover (2005-2024)

Year	GDP (bn euro)	Balance sheet balance share commercial, current account and crt. act. + capital share in GDP (%)			Annual volume of transactions market currency billion euro	share of trade balances, current account and current + capital accounts in foreign exchange turnover (%)		
		Commercial balance	Current account	Current account + capital account		Commercial balance	Current account	Current account + capital account
2005	79,5	-10,3	-8,7	-8,0	8,1	-101,2	-85,5	-78,4
2006	97,7	-14,9	-12,8	-12,9	13,9	-85,0	-73,5	-73,9
2007	123,7	-22,6	-21,8	-20,8	29,7	-60,6	-58,2	-55,7
2008	139,7	-24,0	-21,1	-20,4	38,7	-49,3	-43,4	-41,9
2009	118,3	-10,1	-7,3	-6,6	29,4	-27,4	-19,8	-17,7
2010	124,1	-10,2	-8,1	-7,9	33,2	-24,5	-19,4	-18,8
2011	131,5	-9,7	-8,3	-7,4	36,7	-21,1	-18,0	-16,0
2012	133,9	-8,5	-8,0	-5,7	34,6	-19,6	-18,5	-13,0
2013	144,7	-1,4	-1,9	1,9	32,3	-3,4	-4,8	4,6
2014	150,8	-0,8	-1,3	3,7	30,2	-2,2	-3,4	9,7
2015	159	-1,3	-2,4	2,5	32,0	-3,1	-6,1	6,1
2016	167,5	-1,9	-4,4	1,0	29,8	-5,1	-11,7	2,6
2017	187,8	-5,0	-7,5	-4,7	32,9	-12,1	-18,1	-11,4
2018	204,5	-8,1	-11,3	-8,1	31,9	-20,2	-28,1	-20,2
2019	223,3	-11,0	-13,2	-9,6	34,2	-25,7	-30,6	-22,3
2020	221,1	-12,0	-13,7	-8,6	30,7	-31,0	-35,5	-22,2
2021	242,3	-17,2	-22,0	-11,8	32,8	-41,8	-53,3	-28,6
2022	281,7	-23,9	-32,8	-23,9	43,2	-43,9	-60,3	-44,1
2023	324,4	-19,5	-28,3	-20,0	44,6	-34,8	-50,5	-35,6
2024 I-IX	366,3	-18,1	-24,9	-21,8	47,3	-30,5	-41,8	-36,6

Source: www.bnro.ro, interactive database and author's own calculations

The conclusion is that the deficits of the trade balance and the current account and the combined current and capital account have exerted a strong pressure on the foreign exchange market in the sense of depreciation of the RON, and if they were not reflected in exchange rate changes, it is because other factors acted contrary, the financing needs of the balance of payments being covered by foreign currency inflows through the financial account.

Table no. 4. Evolution of direct, portfolio and other investments and comparisons with the depreciation/appreciation of the exchange rate of the RON, current and capital account balance, gross domestic product and foreign exchange reserve (2005-2024)

An	Direct investment (ownership of min. 10% of shares in a company by a non-resident investor)			Portfolio investments (bonds, investment funds, equities <10%)			Other investments (deposits, loans, insurance, SDRs)			Total investments (direct, portfolio, other investments)			Depreciation (-) / Appreciation (+) RON/EUR exchange rate (%) (annual average)	% of the balance crt. and cpt. of cap. in total investments	% of total investment balance in Romania's GDP	Movements in reserve assets (gold, foreign reserve, SDRs) *Thousand euro*	Romania's foreign exchange reserve *Euro mil.*
	Assets = residents' foreign holdings/placements/purchases; Liabilities = non-residents' domestic purchases/obligations vis-à-vis non-residents; million euro																
	Active	Passive	Difference	Active	Passive	Difference	Active	Passive	Difference	Active	Passive	Difference					
2005	275	5.256	-4.981	123	902	-779	1.006	6.593	-5.587	1.404	12.751	-11.347	10,60	56,0	-8,0	5.434	18.300
2006	383	8.700	-8.317	650	456	194	893	7.568	-6.675	1.926	16.724	-14.798	2,73	69,4	-10,5	5.159	23.200
2007	470	7.377	-6.907	-104	378	-482	597	14.662	-14.065	963	22.417	-21.454	5,31	77,1	-13,4	4.504	27.200
2008	165	9.186	-9.021	212	-351	563	655	9.657	-9.002	1.032	18.492	-17.460	-10,35	92,9	-11,6	-37	28.300
2009	-11	3.416	-3.427	140	656	-516	1.969	5.451	-3.482	2.098	9.523	-7.425	-15,06	70,3	-4,4	2.117	30.900
2010	195	2.496	-2.301	388	1.262	-874	-91	5.728	-5.819	492	9.486	-8.994	0,65	69,5	-5,0	3.487	36.000
2011	4	1.723	-1.719	40	1.717	-1.677	-691	1.633	-2.324	-647	5.073	-5.720	-0,67	102,8	-4,5	897	37.300
2012	-183	2.395	-2.578	468	4.014	-3.546	-41	-4.135	4.094	244	2.274	-2.030	-5,15	221,9	-3,4	-1.453	35.400
2013	-27	2.897	-2.924	224	5.656	-5.432	127	-7.795	7.922	324	758	-434	0,83	-345,9	1,0	2.143	35.400
2014	227	2.930	-2.703	105	2.964	-2.859	1.130	-8.759	9.889	1.462	-2.865	4.327	-0,58	68,0	2,0	-1.236	35.500
2015	929	3.884	-2.955	300	305	-5	932	-4.931	5.863	2.161	-742	2.903	-0,01	67,4	1,2	-601	35.500
2016	1.143	5.656	-4.513	351	1.327	-976	1.253	-3.490	4.743	2.747	3.493	-746	-1,03	-101,9	0,5	2.257	37.900
2017	350	5.233	-4.883	510	3.497	-2.987	3.122	-1.207	4.329	3.982	7.523	-3.541	-1,72	106,0	-2,0	424	37.100
2018	1.259	6.204	-4.945	422	3.302	-2.880	1.830	-1.532	3.362	3.511	7.974	-4.463	-1,87	144,4	-3,2	-771	36.800
2019	1.723	6.572	-4.849	1.368	3.804	-2.436	698	-1.757	2.455	3.789	8.619	-4.830	-1,97	158,0	-3,4	-255	37.500
2020	115	3.073	-2.958	38	13.461	-13.423	6.035	3.047	2.988	6.188	19.581	-13.393	-1,94	50,8	-3,1	5.601	42.500
2021	1.112	9.933	-8.821	1.582	5.056	-3.474	-1.253	3.551	-4.804	1.441	18.540	-17.099	-1,72	54,8	-3,9	2.251	45.800
2022	2.090	10.897	-8.807	1.470	6.412	-4.942	-1.165	7.404	-8.569	2.395	24.713	-22.318	-0,23	85,3	-6,8	6.574	52.300
2023	1.611	8.252	-6.641	1.487	15.260	-13.773	-488	4.860	-5.348	2.610	28.372	-25.762	-0,30	61,6	-4,9	13.270	66.000
2024	644	5.994	-5.350	992	15.184	-14.192	921	1.465	-544	2.557	22.643	-20.086	-0,57	86,2	-4,7	5.669	73.700

Source: www.bnro.ro, interactive database and author's own calculations

If the deficits of the trade and current account balance and the combined current and capital account would represent the demand for foreign exchange to cover them, the inflows of foreign exchange through direct investment, portfolio investment, other investment (loans received, opening of deposits, etc.), items appearing in the financial account of the balance of payments would represent the supply of foreign exchange.

In Romania's case, direct investment, portfolio investment and other categories of financial investment had consistent values, which covered demand in most years, in a few years this was covered by movements in foreign exchange reserves.

In the first four years of the analyzed interval they were on the rise, dominated by direct investments and other investments (loans received, opening of deposits, etc.), being 25% to 50% higher than the deficits of the trade balance and current account and the current and capital account, which is why part of the capital surplus was taken up by the foreign exchange reserve and led to an appreciation of the exchange rate.

In the financial crisis years (2008-2010) and the five post-crisis years that followed, financial flows declined sharply, with direct investment falling by up to a quarter compared to previous values. During the crisis years, the main categories of financial capital inflows into Romania were loans from international financial organizations (their repayment since 2012, negatively affecting the balance of financial flows) and after the crisis years, portfolio capital

inflows (the latter peaking in 2012 and then contracting sharply). In the post-crisis years, financial inflows into Romania were insufficient to cover the trade balance and current account deficits. For these reasons, the exchange rate of the RON depreciated quite steeply during the crisis and afterwards in 2012, and the country's foreign exchange reserves contracted significantly.

Since 2016 (and until 2019) the financial situation started to improve and cash flows started to increase. Thus, capital investments, which were on the rise, approached pre-crisis values, as did portfolio investments, while the other investment category was affected by repayments of foreign loans (or withdrawals of non-resident deposits). As a result, financial flows were no longer sufficient to cover the deficits of the trade balance and current account, which is why the foreign exchange reserve either remained stagnant or even contracted, and the exchange rate of the RON entered a period of steady depreciation of around 2%.

After the pandemic year, from 2021 onwards, we see a financial boom, with financial flows reaching around 30 billion EUR in 2023, coming mainly from direct investments in 2021 and 2022 (10 billion EUR or more), then in 2023 and 2024 from portfolio investments (over 15 billion EUR). For this reason, the coverage of the trade and current account deficits did not pose a problem, with sufficient capital remaining to increase the foreign exchange reserve, while the exchange rate depreciated, albeit by negligible percentages.

There are also a number of economic reasons for exchange rate depreciation or appreciation. The impact of price changes and interest rate differentials will be analyzed below.

Table 5. Comparison between price deflator in Romania and other countries (2010-2023)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Austria	0,9	1,8	2,1	1,7	2,0	2,3	1,8	1,0	1,8	1,5	2,6	1,9	4,8	6,6
Czech Republic	-0,5	-0,2	1,3	1,3	2,7	1,2	1,5	1,7	2,8	3,8	4,5	4,0	8,7	8,1
France	1,1	0,9	1,1	0,7	0,6	1,1	0,5	0,6	1,1	1,2	3,0	1,2	3,2	5,3
Germany	0,7	1,2	1,4	2,0	1,9	1,7	1,3	1,5	1,9	2,0	1,8	2,8	6,1	6,1
Italy	0,6	1,7	1,7	1,1	0,9	0,8	1,2	0,7	1,1	1,0	1,6	1,3	3,6	5,8
Poland	1,6	3,1	2,2	0,3	0,5	1,3	0,1	1,8	1,2	3,0	4,2	5,3	10,7	9,5
Romania	5,9	4,0	3,8	1,4	1,7	3,3	2,6	4,7	6,2	6,9	4,1	5,6	12,1	12,8
Hungary	2,5	1,9	2,9	2,8	3,7	2,8	1,3	4,0	4,8	4,8	6,4	6,3	14,2	14,6
United Kingdom	1,6	2,2	1,5	2,1	1,3	0,7	2,0	1,9	1,9	2,1	5,0	0,1	5,4	7,1
United States	1,2	2,1	1,9	1,7	1,7	0,9	1,0	1,8	2,3	1,7	1,3	4,6	7,1	3,6
Turkey	7,0	8,2	7,4	6,3	7,4	7,8	8,1	11,0	16,5	13,9	14,8	29,0	96,0	68,2
How much higher was the price deflator in Romania														
Austria	5,0	2,2	1,7	-0,3	-0,3	1,0	0,8	3,7	4,4	5,5	1,5	3,7	7,3	6,1
Czech Republic	6,4	4,2	2,5	0,1	-1,0	2,0	1,1	3,0	3,4	3,1	-0,4	1,6	3,4	4,6
France	4,8	3,1	2,7	0,6	1,1	2,1	2,1	4,1	5,1	5,7	1,1	4,4	8,9	7,5
Germany	5,2	2,8	2,4	-0,6	-0,2	1,6	1,4	3,2	4,3	4,9	2,4	2,8	6,0	6,6
Italy	5,3	2,3	2,1	0,3	0,8	2,5	1,4	3,9	5,1	5,9	2,5	4,3	8,5	7,0
Poland	4,4	0,9	1,6	1,1	1,2	1,9	2,5	2,9	5,0	3,9	-0,1	0,3	1,4	3,2
Hungary	3,4	2,1	0,9	-1,4	-2,0	0,5	1,3	0,6	1,3	2,2	-2,3	-0,7	-2,1	-1,8
United Kingdom	4,3	1,8	2,3	-0,7	0,4	2,6	0,7	2,8	4,3	4,8	-0,9	5,5	6,6	5,6
United States	4,7	1,9	1,9	-0,3	0,0	2,3	1,7	2,9	3,9	5,3	2,8	1,0	5,0	9,2
Turkey	-1,1	-4,2	-3,6	-4,9	-5,7	-4,6	-5,5	-6,3	-10,3	-6,9	-10,7	-23,4	-83,9	-55,5

Source: https://data.imf.org and author's calculations

Domestic price dynamics is another factor influencing the exchange rate of the national currency. Domestic price developments also change the ratio in which a national currency is exchanged for a foreign currency unit. If this ratio did not change we would see a change in the competitiveness of domestic goods and services on international markets. Rising domestic

prices should lead to a depreciation of the national currency, just as falling domestic prices should lead to an appreciation of the national currency. Except as domestic prices change, so can prices in other countries, and therefore the exchange rate should take into account the difference between the price changes in the domestic markets whose currencies enter into the exchange ratio. Thus, the currency of the country with a positive price increase differential should depreciate and the currency of the country with a negative price differential (the market in which prices increase less relative to others) should appreciate.

This study compares the evolution of prices in Romania with other European countries, in the European Union, or outside the European Union and the United States of America, using two indicators that quantify price changes: the GDP deflator (GDP deflator), which takes into account all prices of goods and services included in the gross domestic product, and the harmonized index of consumer prices (HICP), which is limited to the prices of goods and services consumed by the population.

A simple comparison of the price dynamics in Romania with those of the compared countries shows that for both GDP and HICP, our country has had much higher increases, except for Turkey and, in recent years, Hungary, and for HICP, Poland. On average, GDP in Romania was 2.6% higher than in countries with which the comparison was made, while for HICP prices in Romania were 1.4% higher (excluding Turkey), while in the same period the RON depreciated against the euro by only 1% on average.

Table no. 6. Comparison between the harmonized index of consumer prices in Romania and other countries (2010-2023)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
European Union	2,1	3,1	2,6	1,5	0,6	0,1	0,3	1,7	1,9	1,5	0,7	2,9	9,2	6,4	2,6
Euro area	1,6	2,7	2,5	1,4	0,4	0,2	0,2	1,5	1,7	1,2	0,2	2,6	8,4	5,4	2,4
Austria	1,7	3,6	2,6	2,1	1,5	0,8	1,0	2,2	2,1	1,5	1,4	2,8	8,6	7,7	2,9
Czech Republic	1,2	2,2	3,6	1,3	0,5	0,2	0,7	2,4	1,9	2,6	3,3	3,3	14,8	12,0	2,7
France	1,7	2,3	2,2	1,0	0,6	0,1	0,3	1,2	2,1	1,3	0,5	2,1	5,9	5,7	2,3
Germany	1,2	2,5	2,1	1,6	0,7	0,7	0,4	1,7	1,9	1,4	0,3	3,2	8,7	6,1	2,5
Italy	1,6	2,9	3,3	1,3	0,2	0,1	-0,1	1,4	1,2	0,7	-0,2	1,9	8,8	5,9	1,2
Poland	2,7	3,9	3,6	0,8	0,1	-0,7	-0,2	1,6	1,2	2,1	3,6	5,2	13,2	10,9	3,6
Romania	6,1	5,8	3,4	3,2	1,4	-0,4	-1,1	1,1	4,1	3,9	2,3	4,1	12,0	9,7	5,8
Hungary	4,7	3,9	5,7	1,7	0,0	0,1	0,5	2,4	2,9	3,4	3,4	5,2	15,3	17,0	3,7
United Kingdom	3,2	4,5	2,9	2,5	1,5	0,0	0,7	2,7	2,4	1,8					
United States	2,4	3,8	2,1	1,3	1,3	-0,8	0,6	1,8	2,2	1,4	0,8	5,3	8,7	3,0	2,0
Turkey	8,6	6,5	9,0	7,5	8,9	7,7	7,7	11,1	16,3	15,2	12,3	19,6	72,3	54,0	58,5
How much higher was the harmonized index of consumer prices in Romania															
European Union	4,0	2,7	0,7	1,7	0,8	-0,5	-1,3	-0,6	2,2	2,4	1,6	1,2	2,8	3,4	3,2
Euro area	4,5	3,1	0,9	1,8	1,0	-0,6	-1,3	-0,5	2,3	2,7	2,1	1,5	3,6	4,3	3,5
Austria	4,4	2,3	0,8	1,1	-0,1	-1,2	-2,0	-1,1	2,0	2,4	0,9	1,3	3,4	2,0	2,9
Czech Republic	4,9	3,7	-0,2	1,9	0,9	-0,6	-1,8	-1,3	2,1	1,3	-1,0	0,8	-2,7	-2,2	3,1
France	4,3	3,5	1,2	2,2	0,8	-0,5	-1,4	-0,1	2,0	2,6	1,8	2,0	6,1	4,1	3,5
Germany	4,9	3,3	1,3	1,5	0,7	-1,1	-1,5	-0,6	2,2	2,5	2,0	0,9	3,3	3,7	3,4
Italy	4,4	2,9	0,1	1,9	1,2	-0,5	-1,0	-0,3	2,9	3,2	2,5	2,2	3,3	3,9	4,7
Poland	3,4	1,9	-0,3	2,4	1,3	0,3	-0,9	-0,5	2,9	1,8	-1,3	-1,1	-1,2	-1,1	2,2
Hungary	1,4	1,9	-2,3	1,5	1,4	-0,5	-1,5	-1,3	1,2	0,5	-1,0	-1,1	-3,3	-7,3	2,1
United Kingdom	2,8	1,4	0,5	0,7	-0,1	-0,4	-1,8	-1,6	1,7	2,1	2,3	4,1	12,0	9,7	5,8
United States	3,7	2,0	1,3	1,9	0,1	0,3	-1,6	-0,7	1,9	2,5	1,6	-1,2	3,3	6,7	3,8
Turkey	-2,5	-0,6	-5,6	-4,3	-7,5	-8,2	-8,7	-10,0	-12,3	-11,3	-9,9	-15,5	-60,3	-44,2	-52,7

Source: Eurostat and author's calculations

The interest rate also influences the exchange rate of the domestic currency, i.e. the difference between the interest rate on the domestic market and that on foreign markets. In

other words, capital will try to find the best return by migrating to the markets with the highest interest rate.

Taking the interest rate on bank term deposits as an example, we observe that in Romania, both compared to the Eurozone and to the interest rates on the markets of other EU countries located in Eastern Europe, the interest rates on deposits have always been much higher. Thus, the interest rate differential is consistently higher when comparing Romania - Euro Area, Romania - Czech Republic, Romania - Poland (except for the years in the middle of the second decade, but with minor differences), Romania - Hungary (except for the last two years of the inflationary crisis). These positive and large differences in our country's favor explain the large capital inflows in the second decade, which led to the coverage of trade and current account deficits and the relative stability of the RON .

Table 7. Comparison between deposit interest rates in Romania and other countries (2010-2023)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Romania	11,99	7,31	6,30	5,51	4,55	3,02	1,89	1,11	0,89	1,30	1,79	1,93	1,58	4,19	6,44
Euro area	1,67	2,25	2,76	2,71	1,56	0,97	0,65	0,45	0,34	0,31	0,21	0,16	0,15	1,39	3,29
Hungary	8,14	4,93	5,49	6,27	3,77	1,78	1,11	0,58	0,12	0,06	0,10	0,47	1,01	8,36	13,12
Czech Republic	1,27	1,08	1,04	1,02	0,86	0,70	0,53	0,37	0,28	0,28	0,39	0,30	0,23	1,40	2,41
Poland	4,80	4,10	4,34	4,78	2,68	2,43	1,71	1,56	1,48	1,57	1,55	1,61	1,67	1,73	1,79
Turkey	17,65	15,27	14,11	17,19	15,30	16,94	14,92	14,61	15,29	23,28	25,41	13,36	20,70	27,04	51,33
How much higher interest rates were in Romania															
Euro area	10,32	5,06	3,54	2,80	2,99	2,05	1,24	0,66	0,55	0,99	1,58	1,77	1,43	2,80	3,15
Hungary	3,85	2,39	0,81	-0,77	0,78	1,24	0,78	0,53	0,77	1,24	1,68	1,46	0,57	-4,18	-6,68
Czech Republic	10,72	6,23	5,26	4,48	3,69	2,32	1,36	0,74	0,61	1,03	1,40	1,62	1,35	2,79	4,03
Poland	7,19	3,21	1,96	0,73	1,87	0,59	0,18	-0,45	-0,59	-0,27	0,24	0,32	-0,09	2,46	4,65
Turkey	-5,66	-7,96	-7,81	-11,69	-10,74	-13,92	-13,03	-13,50	-14,40	-21,98	-23,62	-11,43	-19,12	-22,86	-44,89

Source: Database: World Development Indicators and author's calculations

4. Is the RON/EUR exchange rate overvalued (conclusions)?

Thus, although Romania's trade and current account and combined current and capital account deficits are chronically in deficit, they are now being offset by substantial financial inflows, which cancel out depreciation pressures.

The element that acts in the sense of depreciation of the RON remains the domestic prices / inflation in Romania, which is significantly higher and which is normal to be taken into account because if it were not taken into account, even partially, by the exchange rate, it would lead to a decrease in the competitiveness of exports. In fact, if we look at the evolution of Romania's exports in 2024, we notice that they are already affected by the stability of the exchange rate of the RON in the last 2-3 years.

Also, the interest rates attached to deposits in RON, at least over a time horizon of 1-2 years, maybe even longer, lead to the prolongation of the current situation of stability of the RON, in the sense of annual depreciation of the RON by 1%, 2% at most. So, somewhere around 5 bani per year.

At the same time, we must not forget that a good part of the capital flows entering our country are more or less debt and any change in the international economic environment or deterioration of Romania's position (country ratings, political turmoil, social tensions, the worsening of military conflicts in the region) may result in a reversal of these flows and depreciation pressures on the RON, especially since Romania's foreign exchange reserve covers only a quarter of Romania's international position (in September 2024 our country's

foreign exchange reserve was 73.7 billion EUR, while the liabilities of Romania's international position amounted to 280 billion EUR).

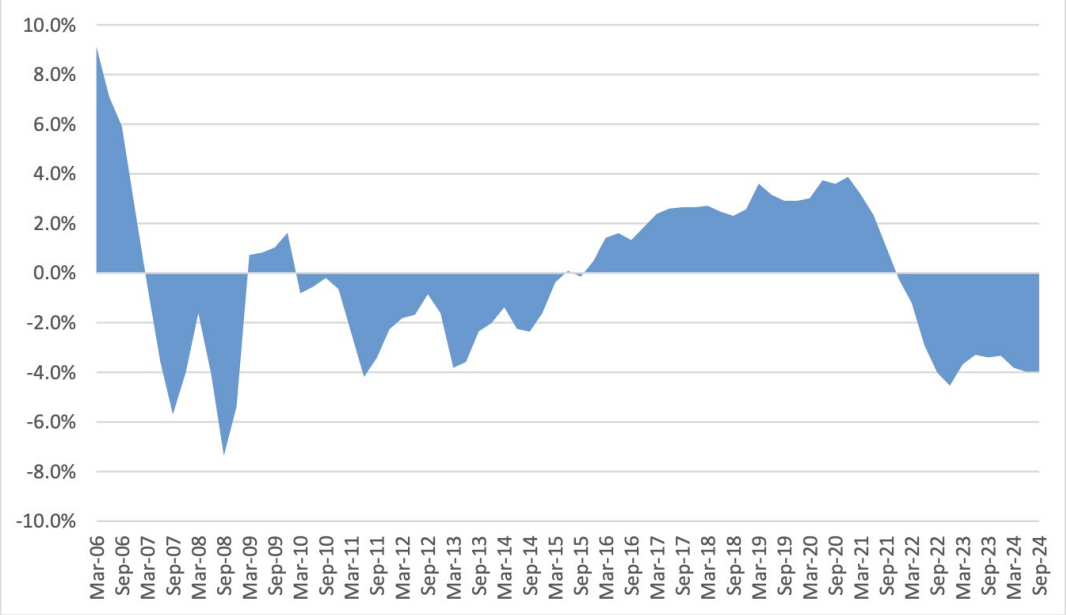
The claim that the overvaluation of the RON is several percent is confirmed by other positions or specialized studies. Thus:

- Dăianu, Dumitru and Uzum, (2025) consider that "*in the period 2006-2024 periods of undervaluation alternated with periods of overvaluation*" and that the overvaluation of the RON was approx. 4% "in recent years".

- The NBR Governor, Mr. Mugur Isărescu, stated that, based on the calculation of the real effective exchange rate of the RON, it is overvalued by up to 5%, which does not explain the high external deficit (Popa, 2024).

- In the same article, the author (Popa, 2024), citing an analysis of the Romanian Commercial Bank, "*a report assumed by the chief economist of the institution, Ciprian Dascallu*" states that "*The overvaluation of the currency affects in particular sectors with low profit margins, which depend on low-skilled labor. Our models indicate that the RON is overvalued in real terms by 6-7% against the EUR. We anticipate a gradual depreciation of the nominal RON over time, with improving fundamentals leading the currency towards its fair value*".

Graph 1. Deviation of the real exchange rate from equilibrium over the period 2006-2024



Sursa: estimările autorilor

Notă: Valorile pozitive ale deviației de la echilibru ale cursului de schimb reprezintă o subevaluare, în vreme ce valorile negative reprezintă o supraevaluare.

Source: Dăianu, D., Dumitru, I., Uzum, L.,

- Gheorghe (2024), citing an analysis carried out by economists at Erste Bank, notes that among its conclusions were: (a) the RON at the time of the analysis is overvalued by 6%; (b) "*the highest over- and undervaluation was around 11.6% (in 2007, just before the great*

financial crisis) and 8.4% in Q1/2005, respectively; (c) between Q1/2013 and Q4/2022, the real exchange rate was correctly valued most of the time, with the deviation ranging in the range of ±2.25%[...]"; (d) in the period analyzed (2005 - 2023), the deviation was, on average, 0.2% and (e) "*the degree of overvaluation of the real exchange rate has a downward trend in the medium term (2 years), assuming a reduction in the inflation differential vis-à-vis the euro area and a gradual nominal depreciation of the RON , in line with its historical norm*".

- Sandrina (2024) mentions that the chief economist of the NBR, Valentin Lazea, emphasized during the 5th edition of the Romanian Economic Forum that "*although there is an appreciation of the RON in real terms, this is not the main obstacle to boost Romanian exports*." and that "*although the appreciation of the RON has an impact on competitiveness, this is not significant enough to have a major impact on exports*".

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THE RELATIONSHIP BETWEEN THE ECONOMY AND MIGRATION

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Abstract: *Economic migration is the most important component fuelling the global migration phenomenon. The current paper focuses on describing the phenomenon of economic migration with an emphasis on identifying and describing the main factors impacting this phenomenon. Thus, the following factors have been identified: the dependence of the world economy on innovation and the exponential development of technologies especially IT&C, digitalisation and digital transformation of the economy and central and local public administration, polarisation trends of the world economy by shifting from "globalised economy" to "autonomist economy", trends of diffusion of economic power between states, change of economic paradigm against the background of demographic developments worldwide, lack of critical resources needed leads to migration of population from deficit areas, including to the European Union. These factors shape the phenomenon of global economic migration and induce trends in global population movement.*

Keywords: *migration, economics, technology, paradigm, autonomist economics, digitalisation.*
JEL classification: *J6.*

1. Introduction

Economic factors have the greatest impact on the migration phenomenon, influencing large movements of people from poorer to richer areas. Although seemingly simple, the phenomenon of economic migration is a complex one, as purely economic factors are dependent on other factors, such as technological, legal (migrant legislation in the destination country), the level of acceptance of the population in the destination country, the capacity of migrants, especially from the Middle East and Africa, to integrate into Western society.

Migration can be described as a spatial phenomenon, as it involves a change in a person's place of residence over a varying or fixed period of time. Migration involves the movement of population, either within a country which is internal migration, or outside the borders of a country called international migration.

A person's motivation to leave their home country is based on a combination of economic, political or ethnic factors. A number of attractive factors can be observed that may influence the migrant's decision to leave the country of origin, such as improved quality of life, personal and professional development, as well as political factors such as respect for rights, law and freedom, safety and security.

Economic factors have the greatest impact on the decision to leave the country of origin. Migration is driven by the wage differentials between two geographical regions, the migrant's country of origin and the destination country. They will look closely at all their options and choose the one that will maximise their utility and meet their needs at the time. The main reason migrants choose to leave their home country temporarily or permanently is to increase their income. The direct and positive correlation between an increase in the migrant's income and an improvement in the quality of life of the migrant and his/her family, access to better health care systems, educational systems for children, personal and professional development and other needs influences the migrant in choosing a new destination.

2. Factors and consequences of economic migration

Economic migration within the EU can be attributed to several factors:

- **Employment opportunities:** workers may migrate to countries with stronger economies in search of better job prospects and higher wages. This is particularly common in sectors with labour shortages, such as healthcare, IT and hospitality.
- **Economic disparities:** Disparities in wealth and income levels between EU countries can push individuals and families to seek better economic opportunities elsewhere. Countries with higher living costs or lower wages may experience migration flows to countries offering opportunities.
- **Unemployment:** High levels of unemployment in some regions may lead individuals to seek employment in other EU Member States where job prospects are more promising. This can create a flow of labour from areas with few job opportunities to regions with growing economies.
- **Education and skills:** some people migrate to take advantage of educational opportunities or to acquire new skills in demand in other EU countries. Access to quality education and training programmes can attract migrants who want to improve their career prospects.
- **Business opportunities:** entrepreneurs and business professionals can migrate to EU countries with a favourable business climate and regulatory framework to start or expand their business. This can contribute to economic growth and job creation for both migrants and locals.
- **Social benefits and social protection systems:** some people may migrate to EU Member States with more generous social protection systems or better health services. This can put pressure on social services in destination countries and influence public perceptions of economically-driven migration.

Migration within the EU for economic reasons has several consequences, both positive and negative.

Positive consequences:

- **Economic growth:** Economic migration can help boost the economy by filling labour shortages and contributing to overall labour productivity.
- **Cultural exchange and ethnic diversification:** Migration brings people from diverse backgrounds together, leading to cultural exchanges and promoting tolerance and understanding between different communities.
- **Innovation and entrepreneurship:** Migrants often bring new skills, ideas and entrepreneurship that can contribute to innovation and growth in the host country.

Negative consequences:

- **Pressure on resources:** Large-scale migration can put pressure on public services such as health, education and housing, leading to resource depletion and increased competition for scarce services.
- **Social tensions:** Migration can sometimes lead to social tensions, especially if the local population perceives migrants as competing for jobs or resources. This trend is particularly evident in economic downturns, which substantially reduce state resources for areas critical to society, such as social systems, health, labour market, etc.

- **Integration challenges:** Economic migrants can face challenges in integrating into the host society, such as language barriers, cultural differences and discrimination, which can lead to social isolation and exclusion. Against this background, in some societies in EU Member States, there is a growing extremist current in favour of anti-migrant and anti-migrant behaviour in favour of migration and migrants, by invoking their access to the resources of these countries.

3. World economy - dependent on innovation and exponential development of technologies.

In this context of unprecedented development of information technologies, there will be greater economic polarisation between developed countries that promote innovation and technological development and less developed countries that are unable to invest sufficient funds in education and, consequently, in the development of innovative technologies and R&D. In this context, the divide between economically developed and poorer countries will become even more marked in the coming period, with the phenomenon of economic migration from poorer to economically developed countries, including EU Member States, set to increase.

Thus, globally, the trend of investing in research and development and the adoption of emerging technology will continue at an accelerated pace, which will continue to drive economic growth. New technologies such as artificial intelligence, blockchain and renewable energy will play a significant role in the global economy. Against this backdrop, developed country governments as well as developed country companies will exponentially increase financial and economic resources to develop and generate new innovative ideas, products and technologies. Public-private partnerships between government institutions, private companies, academia and other institutions can also facilitate the transfer of knowledge, technologies and resources to accelerate the innovation process.

To facilitate innovation, governments can provide tax incentives and subsidies to support companies and start-ups that develop innovative new technologies. In this context, investment in lifelong learning can help prepare a skilled and innovative workforce able to capitalise on the opportunities offered by technological progress. This coupled with the cultivation of an organisational culture that encourages creativity, critical thinking and risk-taking can stimulate innovation and the uptake of emerging technologies.

Another very important element is the accessibility and sustainability of emerging technologies, in terms of ensuring access to technology and innovation for all citizens and creating socially and environmentally sustainable solutions, which are essential elements in the long-term development of innovation and technological development.

4. Digitalisation and digital transformation of the economy and of central and local public administration

The manifestations of the digitalisation and digital transformation process that will lead to the automation of production processes are:

- Using digital technologies to automate repetitive and monotonous tasks, such as processing data and information, managing stock or communicating with customers;
- Implement new technologies, such as artificial intelligence (AI), the internet of things (IoT), blockchain or virtual reality, to improve existing products, services and processes or to create entirely new products and services;

- Big data and information analytics: collecting and analysing vast amounts of data to derive valuable insights and make accurate, timely and informed decisions;
- Cloud computing: using IT resources and services available over the Internet, such as storage, computing or applications, to improve the efficiency and accessibility of information;
- Artificial intelligence and machine learning: the use of algorithms and technologies to learn and perform complex human tasks such as speech recognition, image analysis or personalised recommendations;
- Business model change, in the sense that companies can move away from traditional business models in favour of digital models, such as subscription-based services, e-commerce platforms or partnering with other digital companies;
- Digitalising customer relations by using digital channels such as websites, social networks, mobile apps or email to better and more efficiently interact with customers, collect feedback and provide personalised technical support;
- Transforming organisational culture by adopting a digital mindset and promoting innovation, collaboration and adaptability within the organisation to adapt to the changes promoted by the digitisation process.

Due to the unprecedented development of information technologies, economic power will shift to multifaceted and amorphous networks that will influence the actions of states and the international community. In this context, a 'dictatorship' of large multinational corporations operating in the IT&C area will be realised, which will have the ability to influence the political and social environment in order to obtain significant economic benefits.

At the same time, the adoption of digitisation and the digital transformation of the economy and of central and local public administration will lead to the laying-off of staff, as well as the hiring of staff with advanced digitisation and IT skills.

In this context, the integration of third-country migrants into production in EU Member States will become increasingly complicated, given that the vast majority of them come from economically underdeveloped countries with a low rate of digitisation. In this respect, the integration of migrants into digitally developed societies requires significant financial and educational resources to prepare them to meet the demands of the labour market.

5. Polarisation trends in the world economy through the shift from "globalised economy" to "autonomist economy".

The US Administration's recent policy of unilaterally imposing duties and tariffs on imports of goods and services from third countries, including EU Member States, will lead to a decline in exports to the US, while at the same time redirecting supply to other areas of economic potential. If the transatlantic economic relationship does not normalise, EU Member States will have to find new business partners elsewhere and the EU economy will suffer in the short to medium term.

In this context, the EU needs to accelerate the negotiation process with the US to agree on an acceptable level of tariffs and duties that does not dramatically affect the EU economy, and to take a more pragmatic approach to explain to US policy makers the benefits of a long-term transatlantic agreement that brings prosperity to both sides.

This process will also lead to greater polarisation and a widening of the gap between economically developed and poor countries, which will inevitably increase economic migration from disadvantaged to economically developed areas, including EU Member States.

The following measures are needed to close the economic and social gaps worldwide:

- Quality and accessible education for all, with the aim of ensuring that all citizens have equal opportunities to develop their skills and competences;
- Effective social inclusion policies that support disadvantaged and marginalised groups to access health, education, housing and employment services;
- Invest in infrastructure in poor and underdeveloped areas to boost economic development and job creation;
- Promoting entrepreneurship and enterprise among disadvantaged communities to increase local employment opportunities and economic growth;
- Implement fair tax policies that progressively tax incomes and ensure that financial resources are redistributed in a way that minimises inequalities.

In this context, the necessary measures must be taken at EU level to support poor countries which are sources of migration into the European Union, with the aim of retaining potential economic migrants at source. To this end, companies from EU Member States should be encouraged at EU level to invest in these states, including by granting tax incentives, with the aim of creating jobs which will ultimately result in the retention of potential migrants in their countries of origin.

In order to achieve long-term economic development, relevant assessments must be made of the need for skills in short supply in the European Union in order to attract to the EU the specialists who are in high demand on the labour market. Jobs in highly specialised fields are usually needed at EU level, and highly educated migrants with higher education qualifications and the potential for professional development are needed.

6. Trends in the diffusion of economic power between states.

Long-term economic forecasts, i.e. to 2030, show that Asia will overtake North America and Europe in terms of global economic power in terms of GDP, population size and technological investment. Thus, by 2030, China is expected to be probably the largest economy, overtaking the US. It is also predicted that the world economy will be increasingly linked to the performance of developing countries, more so than that of the traditional West. Thus, in addition to China, India and Brazil, relevant regional players such as Colombia, Indonesia, Nigeria, South Africa and Turkey will become particularly important for the global economy. At the same time, the European, Japanese and Russian economies are likely to continue their relatively slow decline.

This trend towards the diffusion of economic power between states runs counter to the economic interests of the US and the EU Member States (the traditional West) and will materialise in the outbreak of economic wars that will have an impact on international relations and economic migration.

7. The changing economic paradigm against the backdrop of global demographic developments.

According to UN studies, by 2030 the world's population is expected to reach 8.5 billion people. At the same time, the number of megacities will double by 2030, and about two-thirds of humanity will live in urban centres. By 2030, more than one billion people on the planet will be over 65, as life expectancy increases and living standards improve worldwide. The ageing population brings real problems not just in the West but also in Asia and Latin America. European governments are already facing higher costs for care for the

elderly, the consequences of demographic and labour force decline. One possible solution to this challenge in the medium and long term may be to encourage migration to take up jobs, while at the same time reducing social protection to boost labour productivity.

The analyses carried out highlighted four demographic trends that have the potential to fundamentally change the economic and political conditions of most countries, as well as the relations between them. These trends are: population ageing - a radical change for both the West and most developing countries; a still significant but declining number of young societies and states; migration, which will increasingly become a cross-border issue; and increasing urbanisation - another radical change, which will boost economic growth but could put new pressures on food and water resources.

Ageing countries will face an uphill struggle to maintain living standards. Demand for skilled and unskilled labour will stimulate global migration. Due to rapid urbanisation in developing countries, the volume of urban construction for housing, office space and transport services over the next 40 years could be roughly equal to the entire volume of such construction in the world's history.

In this context, effective policies are needed at EU level to address labour shortages by encouraging selective migration, in the sense of bringing migrants with the necessary qualifications and skills to the EU labour market.

8. The lack of critical resources is leading to population migration out of deficit areas, including to the European Union.

According to UN analyses, demand for food, water and energy will increase by about 35, 40 and 50 per cent respectively as a result of global population growth, climate change and the consumption patterns of an expanding middle class ('consumer society').

Climate change analysis suggests that the severity of existing hydrometeorological patterns will intensify, with wet areas becoming wetter and dry and arid areas becoming drier. Much of the decrease in precipitation will occur in the Middle East and North Africa, as well as western Central Asia, southern Europe, southern Africa, and southwestern USA. We are not necessarily heading towards a world of scarcity, but policy makers and their private sector partners will need to be proactive to avoid such a future. Many countries will probably not have the means to avoid food and water shortages without massive external help. Addressing the problems of one commodity will not be possible without affecting supply and demand for the others. Agriculture depends to a large extent on access to adequate sources of water as well as chemical fertilisers. Hydropower is an important source of energy for some regions, while new energy sources, such as biofuels, threaten to worsen the potential for food shortages. There is as much scope for negative trade-offs as there is potential for positive synergies. Agricultural productivity in Africa, in particular, will require radical change to avoid shortages. Unlike Asia and South America, which have seen significant improvements in agricultural output per capita, Africa has barely returned to 1970s levels.

In fact, the African continent is currently facing a food shortage caused both by the sharp increase in population growth and by climate change, which has led to the loss of large areas of agricultural land. A major risk of migration is the decision by the US Administration to substantially reduce donations for the purchase of agricultural products for African countries, which will exacerbate food shortages. This will have a direct impact on the migratory phenomenon in the African region, which will lead to the migration of a large part of the population to other areas, including the European Union.

In this context, the European Union will have to substitute the contribution that the US is making in support of African nations affected by food shortages, in order to maintain the migratory flow in the African region and discourage migratory flows from these disadvantaged areas to the European Union.

9. Conclusions

Economic migration is influenced by several factors, such as the dependence of the world economy on innovation and the exponential development of technologies, especially IT&C, digitalisation and digital transformation of the economy and central and local public administration, polarisation trends in the world economy through the shift from a 'globalised economy' to a 'self-sustaining economy', trends of diffusion of economic power between states, the change in the economic paradigm against the background of demographic developments at global level, the lack of critical resources needed leads to population migration from areas of shortage, including to the European Union.

In this context, it is necessary to implement a pragmatic migration policy at EU level, in the sense that it is necessary to use this phenomenon to provide the skilled labour needed by companies in Western Europe. To this end, it is necessary to ensure the conditions for integrating economic migrants into Western societies, as well as to manage these migratory flows so as not to exceed certain quotas that jeopardise economic and social stability in EU Member States.

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DIVERSIFICATION OF FRUIT MARKETING MARKETS - AS A BASIC FACTOR IN THE SUSTAINABILITY OF THE SECTOR

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Abstract: *Agriculture plays an essential role in society, the environment and the economy, contributing significantly to the social and economic well-being of a country. One area of major importance in this sector is horticulture, in particular fruit production, which influences both the economy and the health of the population and environmental sustainability. This sector covers the entire value chain from production and processing to distribution and marketing, including both fresh and processed fruit. The diversification of fruit markets is a key factor in ensuring the sustainability of this sector. Throughout the value chain, producers face challenges such as price volatility, international competition and climate change. This paper examines the importance of accessing new local, national and international markets and the impact of this diversification on the economic stability of producers. To achieve the proposed objective, several materials, studies, comprehensive research and analysis related to this important link of the national economy, statistical data, international rankings were analyzed. The research results demonstrate that through effective distribution strategies, marketing innovation and adoption of quality standards, producers can reduce business risks and optimize their revenues. The study emphasizes that smart diversification of markets not only contributes to the financial stability of producers, but also to the sustainable development of the whole fruit sector.*

Keywords*: market diversification, fruit sector, sustainability, export, agriculture.*
JEL Classification: *Q1, Q10, Q12, Q17.*

1. Introduction

In the context of globalization and the increasing challenges faced by the agricultural sector, market diversification has become an essential element to ensure the sustainability of the fruit sector. Fruit producers face fluctuations in demand, unpredictable climatic conditions, price fluctuations and fierce competition, both internally and externally. Under these conditions, access to a wide range of local, regional and external markets is no longer just an opportunity for growth, but a strategic necessity for economic stability and sustainable development of the sector. Market diversification contributes not only to increasing producer incomes, but also to reducing risks and strengthening agricultural value chains. This paper aims to highlight the importance of this diversification as a fundamental pillar in maintaining the competitiveness and long-term viability of the fruit sector.

2. Basic content

Agriculture is an essential pillar of the Moldovan economy, contributing about 10% to the gross domestic product (GDP), generating about 45% of total exports and providing employment for about 30% of the working population (Statistical Yearbook of the Republic of Moldova, 2021). Although the agricultural sector has considerable natural and human potential, its development is often limited by scarce economic resources. There are also major discrepancies in the level of technical equipment, labour productivity, use of fertilizers and degree of innovation. However, through the implementation of coherent modernization policies, the adoption of well-founded measures and strengthened cooperation between authorities, producers and exporters, it is possible to revitalize and sustainably develop agriculture. This process can make a significant contribution to national economic progress

and improve the living standards of the population (Iatisin, 2023; Stratan, Iatișin and Ceban, 2023; Stratan and Iatișin, 2022).

According to the data of the National Bureau of Statistics on all forms of ownership, a total of 2.50 million ha of agricultural land was registered in the country on January 1, 2024. Utilized agricultural area in agricultural year 2023 was 1870.5 thousand ha (about 76% of total agricultural land), of which 1600.8 thousand ha (86.4%) belonged to privately owned farms and 269.7 thousand ha (43.9%) to publicly owned farms. Multi-annual plantations account for 265.7 thousand ha, which is about 11% of the total area of agricultural land. In the private sector, multiannual plantations amounted to 228.4 thousand ha or 86%, and in the public sector only 14%. The land occupied by fruits, nuts, fruit bushes and strawberry bushes constituted 120.2 thousand ha, and that under vineyards 120.5 thousand ha. Only 13.3 thousand ha of the area of multiannual plantations are irrigated (Statistical Yearbook of the Republic of Moldova, 2021).

The fruit sector occupies a central place in the agricultural economy, playing an important role in ensuring food security and income generation. The fruit sector is characterized by its high economic value, due to the diversity of cultivated species, constant market demand and the multiple possibilities for valorization, including processing. Compared to other agricultural crops, fruit offers greater flexibility in marketing, as it can be sold fresh or processed into juices, jams, jellies, jams, compotes or dried fruits. This characteristic allows for the expansion of sales channels and an increase in added value, thus contributing to the economic consolidation of the sector and the development of domestic and foreign markets (Balan, Manziuc and Pește anu, 2018).

At national level, fruit growing generates income for thousands of households and commercial farms, providing jobs in production, processing, packing and distribution. By expanding production capacity, modernizing plantations and increasing product quality, fruit can become an important vector for local economic development, especially in rural areas. In addition to the direct economic aspect, fruit growing also helps to protect the environment by maintaining biodiversity, reducing soil erosion and making use of hilly or less fertile land unsuitable for other agricultural crops. Fruit consumption is also promoted in public health policies, which supports long-term demand and provides market stability. Thus, the fruit sector should be seen not only as a source of income for farmers, but as a strategic pillar in the sustainable development of agriculture and the rural economy.

The dynamics of the areas planted with fruit are tending to decline slowly, as a large part of the orchard areas are out of date (they are being cleared on a massive scale) and the planting of new orchards is mainly based on more intensive technologies, which is timely and much more competitive for farmers and for accessing new markets. Thus, in 2023 the area of orchards amounted to 130.7 thousand ha being decreased by 2.2% compared to 2022, this trend has been recorded since 2000, when the area of plantations amounted to 135.9 thousand ha, Figure 1.

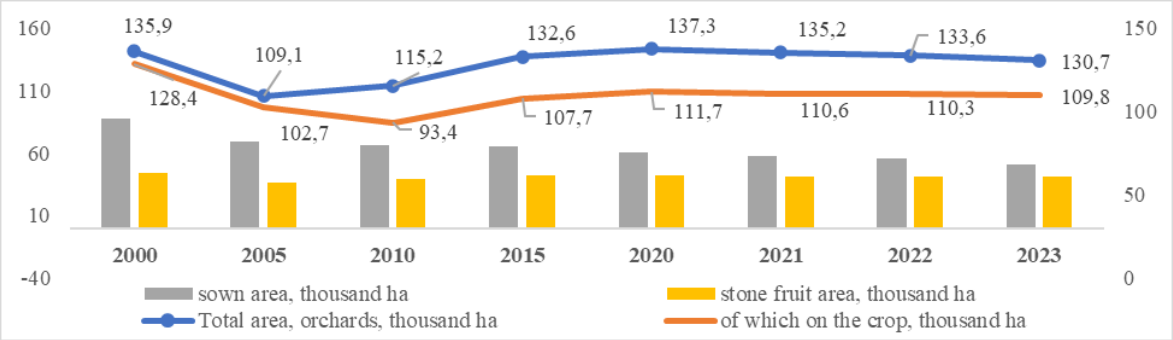

Figure 1. Area of orchards, all categories of households, thousand ha
Source: Elaborated by the author using the data from the National Bureau of Statistics, https://statistica.gov.md/files/files/publicatii_electronice/Anuar_Statistic/2024/16_AS.pdf

The fruit-growing sector is a basic sector that generates employment, agricultural production for export and is a source of income for rural localities. In 2023, the orchard areas in the country amounted to 130.7 thousand ha, of which 109.8 thousand ha are under fruit set, where the largest share is held by seed fruit 38.9% (50.8 thousand ha), followed by stone fruit 31.1% (40.7 thousand ha). The volume of production differs from one species to another, given the biological peculiarities of the crop fruiting. In the species of apple, walnut, fruiting shrubs and strawberry it has been increasing from year to year, with the highest values in 2016 and 2018. These results confirm that the production volume is increasing from year to year due to the implementation of new modern technologies. In the year 2023 the global fruit harvest amounted to 741.4 thousand tons being 17.6% more than in 2022 (global harvest amounted to 630.2 thousand tons). In the structure of the production volume for 2023 we note, that the seeded species have the largest share of 71% (about 525.9 thousand tons), stone species 26.2%. In the year 2023 both the production volume and the average productivity per hectare increased, Figure 2.

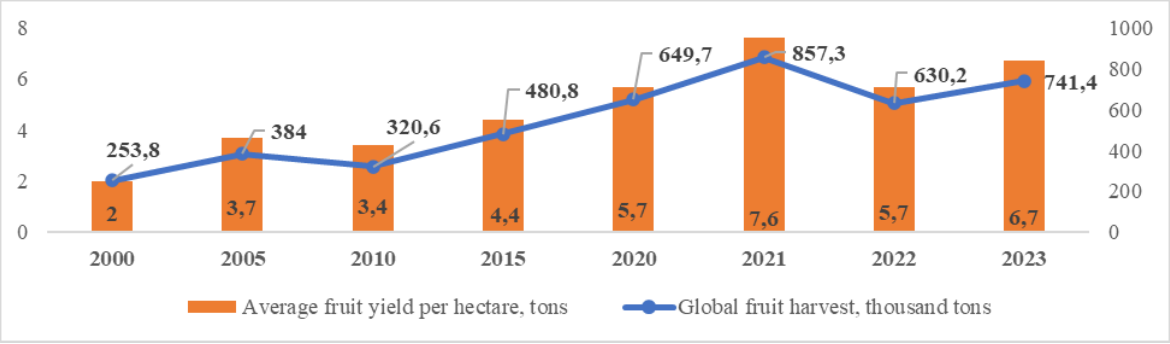

Figure 2. Overall harvest and average harvest per ha of fruit in households of all categories
Source: Elaborated by the author using the data from the National Bureau of Statistics, https://statistica.gov.md/files/files/publicatii_electronice/Anuar_Statistic/2024/16_AS.pdf

If we analyze in territorial profile, we observe that most orchards are located in the northern part of the country, occupying an important position in the fruit-growing sector, ranking first in the country in terms of the size of the area of orchards and the volume of fruit produced in the country, see Table 1.

Table 1. Area and overall yield of multiannual plantations on agricultural enterprises and peasant (farmer) households, by territorial profile, 2020-2023

	2020		2021		2022		2023	
	plantation area, ha	global harvest, thousand tons	plantation area, ha	global harvest, thousand tons	plantation area, ha	global harvest, thousand tons	plantation area, ha	global harvest, thousand tons
Chisinau Municipality	748	1,4	694	2,9	709	1,6	677	1,9
Northern Zone	27096	208,8	26112	3376,7	25291	221,3	23735	277,7
Centrer Zone	20141	63,5	21137	929,6	20986	81,8	20467	100,8
Suth Zone	8487	30,7	8121	41,7	8032	33,3	8071	33,4
U.T.A. Gagauzia	3187	8,6	3266	15,3	3250	5,8	3238	0,3

Source: Elaborated by the author using the data from the National Bureau of Statistics, https://statistica.gov.md/files/files/publicatii_electronice/Anuar_Statistic/2024/16_AS.pdf

According to Table 1, we observe that the northern area has a high potential for the development of fruit growing, due to the high natural fertility of soils and climatic conditions of the region. In 2023, in the northern area of the Republic of Moldova, about 288 thousand tons of fruit will be produced, which accounts for 65.4% of the total volume of fruit produced in the country. This indicator is decisive for the whole economy and demonstrates the importance of the sector for the northern region and the national economy in general. Thus, it is estimated that the fruit sector in the northern region in the next period will maintain a growing trend, and by 2025 the volume of fruit will increase by 38.1% (747 thousand tons) on account of new orchards, modernization of technology and the entry of new orchards into fruitfulness (ADR Nord, 2020).

As a result of the analysis carried out, in the internal context of the fruit sector development in the Republic of Moldova a number of positive trends have been registered, reflecting significant progress in the field.

Increased productivity per hectare has led to an increase in the total volume of production. In this context, the export of fresh fruit has been the main driver of the sector's development in recent years, playing a key role in strengthening its position on foreign markets.

According to the data provided by the National Bureau of Statistics, the annual per capita consumption of fruit and vegetables per capita grew by 12% in 2018-2023, reaching 244.8 kg, which exceeds the minimum threshold of 144 kg recommended by the World Health Organization. However, the consumption of horticultural products by the population continues to offer opportunities for development, in particular by ensuring their availability in

the off-season and increasing the accessibility of local products in retail networks. Seizing these opportunities is essential to ensure a balanced and sustainable development of the sector (Statistical Yearbook of the Republic of Moldova, 2021).

Fruit growing is a major structural element in the national economy. It generates significant multiplier effects along value chains, positively influencing other sectors of the economy. Furthermore, economic agents in the fruit sector are an important source of employment and income, especially in rural areas, thus contributing to social cohesion and regional development (Balan, Manziuc and Pește anu, 2018; ScriGroup, 2025).

The analysis of the distribution of horticultural production in the Republic of Moldova shows us, that the consumption of fruit by the population is important, as it has a significant share, followed by export which is developing rapidly (as it increases competitiveness and local fruit can compete with those of competitors). The processing sector has a stable development and serves as a means of risk mitigation in case of overproduction and utilization of unprofitable fruit production that is intended only for processing (Stratan, Iatișin and Ceban, 2023; Stratan and Iatișin, 2022).

In the external context of the development of the fruit sector of the Republic of Moldova we note a significant development in recent years, characterized by the diversification of markets, increasing export volumes and adaptation to international quality requirements. The total volume of agri-food exports in the analyzed period 2011-2024, had an increase in dynamics compared to the growth of the total volume of exports of the Republic of Moldova, which proves certain competitive advantages of agri-food exports compared to exports from other sectors of the national economy (Boico, 2025). This can also be seen from the share of agri-food exports in the total volume of exports which increased from 43.2% in 2011 to 45% in 2024. Regarding horticultural products the Republic of Moldova is a net exporter. By categories, nuts, fresh fruits, dehydrated fruits and canned vegetables and fruits, including juices, have a positive balance of international trade (Institutul Național de Cercetări Economice, 2025).

The export of horticultural products, fruits, nuts and berries in 2017 amounted to 221.6 million dollars, in 2023 about 266.1 million dollars, and in the third quarter of 2024 a value of 292.7 million dollars (Ioniță, 2024). In the year 2023, based on the analyzed data, we observe that, grapes held a fairly significant share in the export, namely 24.9%, apples about 23.5%; plums 15.3%; plums 15.3%; walnuts 15.2%; cherries 8.2%; pomelos 1.2%; apricots 1.1%; other fruits 10.5% (Figure 3). This result was possible due to favorable factors such as the increase in purchase prices and the diversification of both the types of fruit exported and the markets, the reduction in internal consumption, available stocks from previous production.

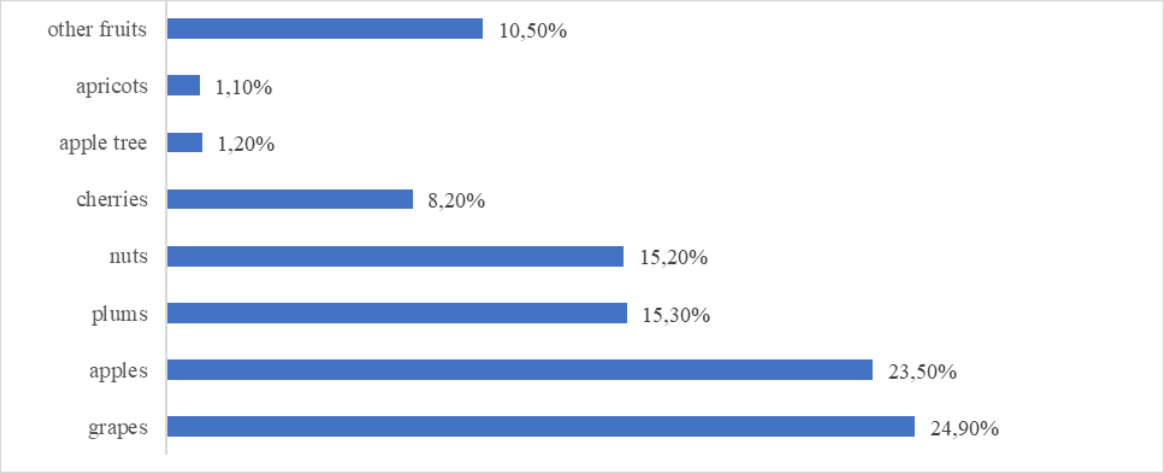

Figure 3. Export of fruits, nuts and berries, % (year 2023)
Source: Elaborated by the author, according to the data, https://ionita.md/2024/11/29/179-analize-economice-agricultura-principala-ramura-de-export-a-moldovei/

In 2024, the export of fruits registered an increase, being the same compared to previous years (about 18% in value and about 16% in quantity), the most essential increases being apricots, fresh grapes, apples and fresh pears. However, the export of apricots marked a historic success, with a volume of about 12 thousand tons being exported, 56% of which reached the EU market. At the same time, Moldovan plums managed to consolidate their position on the EU market, registering an increase in exports to 79.2% (Agroexpert, 2024; MADRM, 2025; Institutul Național de Cercetări Economice, 2025). Also, apple exports are increasing by about 10% compared to the previous year, due to the efforts of promotion and adaptation to market requirements.

Over the last two decades, exports have been the main driving force for the development of the horticultural sector in the Republic of Moldova, while at the same time consolidating as a priority activity to ensure its sustainability. The value of horticultural exports, both fresh and processed, has followed an upward trend. However, these values have varied significantly from year to year, influenced by climatic factors - such as droughts, early frosts, heavy rains or hail - both at national level and in other major producing regions, as well as by geopolitical factors, including the imposition of embargoes or restrictive import duties.

A key element of foreign trade in horticultural products is the continued diversification of markets. This strategy not only allows products to be better exploited in the markets that offer the best rewards, but also contributes to making the sector more resilient to geopolitical or economic risks. At the same time, this positive development of the horticultural sector is due to investments in modern technologies, product quality and favorable trade agreements with international partners (Institutul Național de Cercetări Economice, 2025). The European Union has suspended import duties and quotas for seven categories of Moldovan agricultural products, including tomatoes, garlic, table grapes, apples, cherries, plums and grape juice, thus facilitating access to the European market for Moldovan products (MADRM, 2025). In addition, the Republic of Moldova has signed the Free Trade Agreement with the European

Free Trade Association (EFTA) and has made progress in updating the Free Trade Agreement with Turkey, contributing to the diversification of export markets (Botnaru, 2024).

According to data of the Ministry of Agriculture and Food Industry of the Republic of Moldova and the National Bureau of Statistics in 2024 about 67.4% of exports went to the European Union (EU). Romania became the main export market for Moldovan fruits with a share of 23.5%, closely followed by the Russian Federation 22.9%, Germany 8.8%, Poland 8.1%, Belarus 5.4%, the Netherlands, France, Ukraine and Switzerland. In total, Moldova exported fruit to more than 60 countries (MADRM, 2025).

Despite all this progress, the Moldovan fruit sector faces significant challenges, the loss of the CIS market has negatively affected apple exports, which have decreased by about 50% compared to 2021 (Cancelaria Guvernului Republicii Moldova, 2020; Institutul Național de Cercetări Economice, 2025). To fully capitalize on the export potential, investment in modern technologies, diversification of the variety assortment and strengthening cooperation between producers are needed. Also, adapting to the stringent requirements of international markets and promoting Moldovan products remain key priorities for the sustainable development of the sector (Moldova Fruct, 2022).

Diversification of fruit marketing markets is therefore a key strategic vector in strengthening the sustainability of the horticultural sector in Moldova. In the context of an agricultural economy deeply influenced by external factors, orientation towards multiple markets with varied requirements and more favorable price structures not only ensures a significant reduction in commercial risks, but also an increase in the sector's competitiveness. Increasing access to markets in the European Union, the Middle East, Asia and Africa reflects not only technological and logistical progress, but also the ability of the horticultural sector to adapt to international quality standards. Moreover, this diversification has a multiplier effect on the rural economy, by fostering income stability for farmers, promoting sustainable investment and job creation. The continued expansion of the network of outlets is therefore an indispensable element in building a resilient, modern agricultural sector in line with the principles of sustainable development.

3. Conclusion

The current international context offers favorable prospects for the development of the fruit sector in the Republic of Moldova, but capitalizing on these opportunities depends crucially on the ability of domestic producers to adapt to the dynamics of global trade. Adaptation involves both alignment with international quality and food safety standards, as well as receptiveness to innovation and integration of international trade regulations into business strategies. In this framework, institutional support and collaboration with external partners become key factors for strengthening competitiveness.

Given the strategic importance of the fruit sector in the national agricultural economy, the sustainable capitalization of the existing potential must be treated as a national priority. Exporting fruit not only contributes to the economic development of the horticultural sector, but also to increasing the resilience and sustainability of Moldovan agriculture as a whole. In this respect, the continued diversification of markets, linked to demographic and global economic trends, is a fundamental condition for maintaining the competitiveness of Moldovan products.

In order to support this process, strategic measures are needed, such as: strengthening producers' associations for effective integration into international value chains; expanding the

export portfolio by penetrating emerging markets with high potential; developing the logistics and marketing infrastructure; implementing international certification systems; stepping up horticultural research activities; and promoting the 'Fruit from Moldova' brand consistently on foreign markets. These lines of action can make a decisive contribution to transforming the fruit sector into a pillar of sustainable economic development and integrating the Moldovan economy into the international agricultural circuit.

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FIRM CHARACTERISTICS AND SUSTAINABILITY REPORTING

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Abstract: *This study examines the impact of firm characteristics on sustainability reporting of manufacturing firms in Nigeria using regression analysis to investigate the effect of board size, firm profitability, and firm size on sustainability disclosure practices. The findings reveal that board size has a significant positive effect on the quality of sustainability reporting, with a coefficient of 4.106078 and a t-statistic of 0.0000, supporting the theoretical expectation that larger boards enhance oversight and accountability. Conversely, firm profitability exhibits an insignificant negative effect on sustainability reporting, with a coefficient of -0.207832 and a t-statistic of 0.8356, suggesting that highly profitable firms may deprioritize sustainability reporting in favor of short-term financial performance. Firm size, however, demonstrates a significant positive relationship with sustainability reporting, with a coefficient of 5.884901 and a t-statistic of 0.0000, implying that larger firms, due to regulatory scrutiny and stakeholder expectations, disclose more comprehensive sustainability information. These findings contribute to the existing literature on corporate governance and sustainability reporting, offering insights for policymakers, regulators, and corporate managers in Nigeria.*

Key words*: sustainability reporting, firm characteristics, Stakeholder Theory.*
JEL Classification*: M10.*

1. Introduction

Sustainability reporting has become increasingly significant worldwide as regulators, investors, and stakeholders demand greater disclosure of firms' environmental, social, and governance (ESG) performance. Global initiatives such as the Global Reporting Initiative (GRI), the International Sustainability Standards Board (ISSB), and the United Nations Sustainable Development Goals (SDGs) have set standards to harmonize sustainability reporting (Luo & Tang, 2023). Developed economies in North America, Europe, and parts of Asia have made ESG disclosures mandatory for listed firms though reporting practices remain uneven across regions due to differing regulatory and governance structures (Ng et al., 2023). Europe leads in institutionalizing sustainability reporting, with the Corporate Sustainability Reporting Directive (CSRD) requiring extensive ESG disclosures. In North America, investor demand has driven the adoption of frameworks such as the Sustainability Accounting Standards Board (SASB) Standards (SASB), while several Asian countries—including China, Japan, and India—are tightening their disclosure policies with varied levels of industry compliance (Ibrahim et al., 2024). Latin America shows gradual progress, largely influenced by multinational corporations, whereas developing economies face enforcement challenges (Cardoso & Faletto, 2024).

In Africa, ESG reporting is gaining traction, particularly in South Africa, Kenya, and Egypt, where regulators have begun encouraging sustainability disclosures (Adegbite et al., 2020). South Africa stands out as a pioneer, with the Johannesburg Stock Exchange (JSE) mandating integrated reporting under the King IV framework. However, across much of the continent, adoption is slowed by weak enforcement, low corporate commitment, and competing socio-economic priorities (Maroun & Cerbone, 2024). In Nigeria, sustainability reporting is still emerging, promoted by bodies such as the Financial Reporting Council of Nigeria (FRCN), the Securities and Exchange Commission (SEC), and the Nigerian Exchange Group (NGX), which have introduced voluntary disclosure guideline (Shaba, 2024). Despite

these efforts, challenges such as limited expertise, financial constraints, and weak enforcement hinder widespread adoption (Durrani et al., 2024; Olaleye & Igbekoyi, 2020; Osifo & Fasua, 2017).

Nevertheless, global reporting trends and growing stakeholder demand for transparency are pressuring Nigerian firms to strengthen their ESG disclosures. Improved compliance not only enhances governance and stakeholder confidence but also aligns local practices with international standards (Okoye et al., 2025). This study, therefore, seeks to explore how firm characteristics—such as board size, profitability, firm size, and the presence of audit committees—affect the quality and comprehensiveness of sustainability reporting in Nigeria

2. Sustainability Reporting

Sustainability reporting refers to the practice of companies disclosing information on their environmental, social, and governance (ESG) performance. This type of reporting encompasses how firms manage their economic, environmental, and social impacts and their contributions to sustainable development. Sustainability reports often include data on greenhouse gas emissions, energy usage, waste management, labour practices, community engagement, and corporate governance structures (Bosi et al, 2022).

Environmental Dimension

The environmental dimension of sustainability reporting focuses on a company's impact on the natural environment. This includes aspects such as energy consumption and efficiency, greenhouse gas emissions, water usage and management, waste management, and biodiversity and land use (Abeysekera, 2022). Energy consumption and efficiency reporting involves disclosing the total energy used, sources of energy (renewable vs. non-renewable), and measures taken to improve energy efficiency Greenhouse gas emissions disclosure includes information on direct (Scope 1), indirect (Scope 2), and other indirect (Scope 3) emissions, along with strategies for reducing emissions and mitigating climate change impacts (Fasua & Osifo, 2020).

Social Dimension

The social dimension addresses the impact of a company on its employees, customers, communities, and other stakeholders. Key aspects include labour practices and decent work, human rights, community engagement, product responsibility, and health and safety (Govindan et al., 2025). Labor practices and decent work reporting includes information on employment policies, labour rights, workplace safety, diversity and inclusion, employee training and development, and fair compensation (Katselidis, 2023).

Governance Dimension

The governance dimension focuses on the structures and processes by which a company is directed and controlled. Important aspects include corporate governance, risk management, ethics and integrity, and stakeholder engagement. Corporate governance reporting includes information on the composition and structure of the board of directors, roles and responsibilities, board diversity, and mechanisms for ensuring accountability and transparency (Salehi, 2023).

Economic Dimension

Economic performance reporting includes data on financial health, profitability, and long-term economic sustainability of the company. This includes revenue, profits, dividends, and economic value generated and distributed; indirect economic impacts reporting covers the

broader economic impacts of the company's operations, such as job creation, infrastructure development, and contributions to local and national economies (Oncioiu et al., 2020). Recent trends in sustainability reporting emphasize the integration of these dimensions to provide a holistic view of a company's performance (Zik-Rullahi & Jide, 2023).

3. Firm Characteristics

Firm characteristics refer to the attributes or features of a company that can influence its operations, strategic decisions, and reporting practices, including sustainability reporting. Understanding these characteristics is crucial for analysing how different companies approach sustainability and the factors that drive their disclosure practices (Douye & Gospel, 2023).

Firm Size

Firm size is one of the most significant characteristics affecting sustainability reporting. Larger firms are more likely to engage in sustainability reporting due to their greater resources, visibility, and stakeholder pressure (Friske, 2023). Large firms often have more complex operations and broader environmental and social impacts, prompting them to disclose more detailed sustainability information. Additionally, larger firms are more likely to face scrutiny from regulators, investors, and the public, driving them to adopt comprehensive sustainability reporting practices to maintain their reputation and manage risks (Di Tullio et al., 2025).

Profitability

Profitability is another critical characteristic influencing a company's approach to sustainability reporting. More profitable firms typically have more resources to invest in sustainability initiatives and reporting processes (Dissanayake et al., 2025). High profitability can enable companies to adopt advanced technologies, implement best practices in sustainability, and produce detailed reports. Furthermore, profitable firms may view sustainability reporting as a means to enhance their reputation, attract investors, and differentiate themselves in the market (Ogunbukola, 2024).

Industry Type

The industry type significantly impacts a company's sustainability reporting practices, as different industries face varying levels of environmental and social risks. Industries with high environmental impacts, such as oil and gas, mining, and manufacturing, are often subject to stricter regulations and higher stakeholder expectations for transparency in their sustainability practices (Suhatmi et al., 2024). Consequently, firms in these industries tend to provide more extensive sustainability disclosures to address regulatory requirements and stakeholder concerns.

Board Size

Board size is an important characteristic that can influence a firm's sustainability reporting. Larger boards often have a greater diversity of skills, perspectives, and expertise, which can enhance the board's ability to oversee and support comprehensive sustainability reporting (Githaiga & Kosgei, 2023). A larger board may also be better equipped to handle the complexity of sustainability issues and ensure that these matters are adequately integrated into the company's strategic planning and reporting processes (Valcozzena et al., 2025).

Audit Committee Presence

The presence and effectiveness of an audit committee play a pivotal role in ensuring the accuracy, reliability, and transparency of sustainability reporting. An audit committee's oversight extends beyond financial reporting to include non-financial disclosures, particularly those related to environmental, social, and governance (ESG) practices (Komal et al., 2022).

Research has shown that firms with active and well-composed audit committees, especially those with a higher proportion of members holding recognized financial certifications such as CPA, ACCA, or CFA, are more likely to produce comprehensive and credible sustainability reports (Zaman et al., 2021).

Ownership Structure

Ownership structure, including the distinction between publicly traded and privately held firms, influences sustainability reporting practices. Publicly traded companies are generally subject to more stringent reporting requirements and greater scrutiny from investors, regulators, and the public (Ligorio et al., 2025). This increased scrutiny drives publicly traded firms to adopt more comprehensive sustainability reporting practices to meet regulatory requirements and manage stakeholder expectations. In contrast, privately held firms may face less external pressure to disclose sustainability information and may adopt less formalized reporting practices (Amoako et al., 2022).

Legitimacy Theory

Legitimacy Theory, first advanced by Dowling and Pfeffer in 1975 and rooted in Weber's notion of social legitimacy, posits that organizations operate under a "social contract" whereby they must align their actions with societal values to gain approval and ensure survival. Since legitimacy is dynamic and can shift with changing expectations, firms often use sustainability and corporate social responsibility disclosures to demonstrate conformity and manage legitimacy gaps. This explains why companies adopt sustainability practices such as ESG reporting and alignment with frameworks like GRI, ISSB, and the SDGs. The extent of such disclosures is shaped by firm characteristics—large, profitable, highly leveraged, or high-impact industry firms are more likely to engage in legitimacy-driven reporting due to higher public scrutiny and regulatory pressures. Overall, the theory highlights how sustainability practices and reporting serve as strategic tools for organizations to maintain societal acceptance and protect long-term viability.

Stakeholder Theory

Stakeholder Theory, developed by R. Edward Freeman in 1984 through his work *Strategic Management: A Stakeholder Approach*, emphasizes that businesses should not only focus on maximizing shareholder value but also consider the interests of all parties that can affect or are affected by their operations, such as employees, customers, suppliers, communities, governments, and investors. The theory rests on the premise that long-term business success depends on creating and sharing value among stakeholders, guided by both strategic and ethical responsibilities. It highlights that firms operate within dynamic networks of relationships, making effective stakeholder management a necessity for sustainable growth. In relation to sustainability, Stakeholder Theory provides a strong foundation as it requires organizations to balance economic, social, and environmental goals by addressing the concerns of diverse stakeholders. This is evident in sustainability reporting frameworks like the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), which stress stakeholder engagement. Furthermore, the application of the theory varies across firm characteristics such as size, industry, ownership structure, culture, leadership, and financial capacity. For example, large firms in environmentally sensitive industries often face greater stakeholder pressure to adopt sustainable practices, while ownership structures and leadership commitment influence how stakeholder-oriented strategies are prioritized. Thus, Stakeholder Theory not only shapes the understanding of

corporate responsibility but also establishes a direct link between sustainability practices and firm-specific attributes.

Institutional Theory

Institutional Theory, first introduced by Meyer and Rowan (1977) and later expanded by DiMaggio and Powell (1983), explains how organizations are influenced not only by efficiency concerns but also by social, cultural, and institutional pressures. The theory emphasizes that firms often adopt practices to gain legitimacy rather than to improve performance, with institutional isomorphism—coercive, mimetic, and normative pressures—driving organizations toward similar behaviors. In the context of sustainability, companies adopt environmental, social, and governance (ESG) practices to comply with regulatory requirements, respond to stakeholder expectations, and emulate industry leaders, thereby enhancing their legitimacy and reputation. Firm characteristics further shape the degree of adoption, as larger firms, companies in environmentally sensitive industries, and publicly listed organizations face stronger pressures than smaller or privately owned firms. Geographic location, age, and reputation also play significant roles, with firms in highly regulated regions or with established market presence more likely to adopt sustainability as a means of maintaining legitimacy or differentiating themselves. Thus, Institutional Theory highlights that sustainability practices are not solely driven by profit motives but by institutional demands and firm-specific attributes that influence how organizations align with societal expectations.

3. Empirical Review

Board Size and Sustainability Reporting

Diwe-Tochukwu and Okafor (2024) investigated this relationship among listed oil and gas firms in Nigeria, focusing on indicators such as return on assets, earnings per share, and return on equity. Employing an ex post facto design and panel regression analysis using data from 2009 to 2022, their study revealed that sustainability reporting positively and significantly affects return on assets and earnings per share, though it showed no significant influence on net profit margin and return on equity. Similarly, Whetman (2018) demonstrated a positive impact of sustainability reporting on financial performance, particularly return on equity, return on assets, and profit margin, though this relationship was more pronounced in firms with lower institutional ownership. Broader empirical evidence reinforces these findings, with Girón et al. (2021) and Chowdhury et al. (2020) establishing a strong correlation between profitability and sustainability disclosures, especially when measured through return on assets and net profit margin. Nigerian studies, such as those by Asuquo et al. (2018) and Kumo et al. (2023), confirmed that more profitable firms are inclined to disclose comprehensive sustainability information. Similar trends are noted globally, as Buallay (2020) and Islam et al. (2020) found that firms in banking and manufacturing sectors often leverage sustainability reporting to enhance legitimacy and reputation.

Firm Profitability and Sustainability Reporting

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Firm Size and Sustainability Reporting

Firm size has also been widely recognized as a determinant of sustainability reporting. Fadilah et al. (2022) examined the impact of firm size and age on sustainability disclosure and earnings management among Indonesian mining companies and found that both variables positively influenced sustainability reporting. Their results further showed that while the economic dimension of sustainability reporting was positively linked to earnings management, the environmental dimension had a negative association, and the social dimension had no significant effect. Supporting these results, Antara et al. (2020) established that firm size and environmental performance positively and significantly affect sustainability reporting among LQ45 index-listed companies in Indonesia. More recent evidence from Nigeria by Ayuba et al. (2024) revealed that firm attributes such as size, leverage, liquidity, and board size significantly enhance the quality of sustainability reporting in oil and gas companies, while firm age exerted a negative influence. These findings collectively suggest that larger firms, as well as those with stronger governance and financial attributes, are more likely to engage in extensive and higher-quality sustainability disclosures.

Audit Committee Presence and Sustainability Reporting

The role of audit committee presence and attributes in shaping sustainability reporting has also attracted scholarly attention. Lewa et al. (2025), using data from non-financial companies across ten sub-Saharan African countries, found that audit committee independence positively influences sustainability reporting, while director compensation ratio exerts a negative effect. This highlights the importance of committee independence in enhancing disclosure credibility. In a related study, Meutia et al. (2023) investigated audit committee attributes among Indonesian commercial banks and observed that while financial expertise had a negative relationship with sustainability disclosure, attributes such as independence, committee size, meeting frequency, and auditor type were positively associated with the extent of reporting. Similarly, Wahome et al. (2025), focusing on East African listed firms, established that audit committee attributes such as gender diversity, financial expertise, meeting frequency, and optimal size significantly strengthen sustainability disclosure by ensuring diversity of perspectives, accuracy, and enhanced oversight. Collectively, these studies underscore that strong and well-structured audit committees play a crucial role in improving the credibility, quality, and transparency of sustainability reporting.

4. Descriptive Statistics

Table 4.1 Descriptive Statistics of Variables

	SR	BS	FP	FS	ACP
Mean	4.558376	10.41624	0.094281	17.71866	61.55717
Median	5.000000	10.00000	0.047719	18.09898	60.00000
Maximum	8.000000	18.00000	6.174312	22.41941	90.00000
Minimum	1.000000	4.000000	-2.359536	10.95599	33.33333
Std. Dev.	1.585294	2.967398	0.541881	2.529488	10.99324
Skewness	0.039250	0.213896	7.437980	-0.690301	-0.098442
Kurtosis	2.534094	2.569112	87.99808	3.344243	3.076443
Jarque-Bera	1.832353	3.026162	61118.99	16.61831	0.366147
Probability	0.400046	0.220230	0.000000	0.000246	0.832707
Sum	898.0000	2052.000	18.57337	3490.575	12126.76
Sum Sq. Dev.	492.5787	1725.868	57.55254	1254.069	23686.87
Observations	197	197	197	197	197

Source: Author's computation with E-Views 10 (2025)

Table 4.1 presents the descriptive statistics for the five variables: Sustainability Reporting (SR), Board Size (BS), Firm Profitability (FP), Firm Size (FS), and Audit Committee Presence (ACP). The mean values were 4.56, 10.42, 0.09, 17.72, and 61.56 respectively, with corresponding medians of 5.00, 10.00, 0.05, 18.10, and 60.00. Maximum values were 8.00, 18.00, 6.17, 22.42, and 90.00, while minimum values stood at 1.00, 4.00, -2.36, 10.96, and 33.33. Standard deviations, reflecting variability, were 1.59 (SR), 2.97 (BS), 0.54 (FP), 2.53 (FS), and 10.99 (ACP).

The skewness results show SR, BS, and FP were positively skewed, while FS and ACP were negatively skewed. Kurtosis values ranged from 2.53 to 3.34, except for FP which was extremely high (87.99), indicating non-normality. The Jarque-Bera test confirmed normal distribution for SR, BS, and ACP ($p > 0.05$), while FP and FS showed deviations from normality. Overall, most variables exhibited normality, with 197 valid observations out of 200.

Pearson Correlation Matrix Analysis

Table 4.2

	SR	BS	FP	FS	ACP
SR	1.000000				
BS	0.110858	1.000000			
FP	-0.055847	-0.034766	1.000000		
FS	0.041523	0.312917	-0.129082	1.000000	
ACP	0.113743	-0.029434	0.027679	0.083670	1.000000

Source: Author's computation with E-Views 10 (2025)

Table 4.2 shows Pearson correlation matrix for the variables as contained in the analysis. The correlation coefficients show a relationship between firm characteristics on the nature and extent of sustainability reporting as contained in the analysis. The correlation coefficients showed a positive relationship between SR and (BS (0.110858), FS (0.041523)

and ACP (0.11374) while FP (-0.055847) has negative correlation. Hence, most of these results are in conformity with the hypotheses with regard to the relationship between the firm characteristics and extent of sustainability reporting as contained in the analysis. This implies a co-movement in same direction among the variables.

Unit Root Tests

The study employed the Augmented Dickey-Fuller (ADF) test to check for unit roots in the variables SR, BS, FP, FS, and ACP, given its effectiveness in addressing correlated errors. Table 4.3 presents the unit root test results at both levels and first differences for the variables.

Table 4.3: Summary of ADF Unit Root Test

Variable	(ADF) Statistics	At Level 5% critical value	Prob.	Stationarity Order
SR	-5.653781	-2.875898	0.0000	I(0)
BS	-5.040869	-2.876200	0.0000	I(0)
FP	-6.860342	-2.877363	0.0000	I(0)
FS	-3.398743	-2.876047	0.0121	I(0)
ACP	-6.701477	-2.875972	0.0000	I(0)

Source: Author's computation with E-Views 10 (2025)

The Augmented Dickey-Fuller (ADF) test results in Table 4.3 show that all variables—sustainability reporting (SR), board size (BS), firm profitability (FP), firm size (FS), and audit committee presence (ACP)—are stationary at level, with respective statistics of -5.653781 (0.0000), -5.040869 (0.0000), -6.860342 (0.0000), -3.398743 (0.0121), and -6.701477 (0.0000). Since all probabilities are below 0.05, the variables are integrated of order zero, I(0). This validates the use of panel least squares regression for analysis and hypothesis testing. Accordingly, regression with 197 observations was employed to examine the relationships among the variables.

Estimation of Panel Least Square Results

Table 4.4: Estimation of Panel Least Square Results

Dependent Variable: SR
Method: Panel Least Squares
Date: 02/17/25 Time: 21:41
Sample: 2014 2023
Periods included: 10
Cross-sections included: 20
Total panel (unbalanced) observations: 197

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BS	0.054477	0.040112	1.358145	0.1760
FP	-0.139263	0.210180	-0.662590	0.5084
FS	0.007968	0.047589	0.167432	0.8672

ACP	-0.015933	0.010327	-1.542794	0.1245
C	4.843666	1.002973	4.829310	0.0000
R-squared	0.027058	Mean dependent var		4.558376
Adjusted R-squared	0.006788	S.D. dependent var		1.585294
S.E. of regression	1.579904	Akaike info criterion		3.777658
Sum squared resid	479.2505	Schwarz criterion		3.860988
Log likelihood	-367.0993	Hannan-Quinn criter.		3.811391
F-statistic	1.334903	Durbin-Watson stat		0.484855
Prob(F-statistic)	0.258438			

Source: Author's Computation, 2025.

The pooled OLS technique, though widely used, is restrictive because it assumes uniform regression coefficients across all cross-sectional observations and time periods. This approach ignores potential heterogeneity among firms and across time. Table 4.4 presents the panel least squares regression results examining the relationship between firm characteristics and sustainability reporting. The coefficient for board size (BS) was 0.05477 with a t-statistic of 1.3582 and a p-value of 0.1760, suggesting a positive but statistically insignificant effect on sustainability reporting. Similarly, firm profitability (FP), firm size (FS), and audit committee presence (ACP) showed coefficients of -0.139263, 0.007968, and -0.015933, with p-values of 0.5084, 0.8672, and 0.1245 respectively—indicating no significant effects. The model's R-squared value was 0.0271, meaning it explained only about 3% of the variation in sustainability reporting. A key limitation of the pooled OLS model is its failure to account for firm-level differences, as it treats all 20 firms in the study as identical. This lack of recognition of heterogeneity reduces the robustness of the findings. Therefore, to address these shortcomings, it was necessary to employ alternative models such as the fixed effects (LSDV) and random effects analyses, which better capture individual firm variations.

Fixed Effects Model

Table 4.5: Summary of Fixed and Random Effects Models Results

Fixed Effects Model					Random Effects Model				
Dependent Variable = EPS					Dependent Variable = DACC				
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
BS	0.0739	0.0180	4.1060	0.0000	BS	-0.0555	0.0447	-1.2422	0.2157
FP	-0.0269	0.1297	-0.2078	0.8356	FP	-0.0308	0.1295	-0.2383	0.8119
FS	0.2742	0.0466	5.8849	0.0000	FS	0.1325	0.0942	1.4067	0.1611
ACP	0.0015	0.0007	2.2855	0.0084	ACP	-0.0002	0.0075	-0.0269	0.9785
C	0.3765	2.7173	0.1386	0.8900	C	2.8019	1.7822	1.5721	0.1176
R-Squared			0.674242		*R-Squared*			0.0161	
F-Statistic			15.56824		*F-Statistic*			0.7890	
Prob(F-statistic)			0.000000		*Prob(F-statistic)*			0.5335	
Durbin-Watson stat			1.736687		*Durbin-Watson stat*			1.1877	

Source: Authors' computation (2025).

To ascertain the actual model from which conclusion is to be drawn, this study used the Hausman test which is meant to test the hypotheses that:

Table 4.6. Extract from the Hausman Test Result

Correlated Random Effects - Hausman Test
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	58.52161	4	0.0205

Source: Author's Computation, 2025.

Examining the Chi-square values of the cross- section random in Table 4.5.1, the probability values of the Chi-square statistics is 0.205. This probability is greater than 5%, this implies that, we accept the null hypothesis (H_0) and reject the alternative hypothesis (H_1). Consequently, we conclude that fixed effect model is appropriate to accept for analytical reason.

From results of Table 4.5.1, it is shown that (BS) exerts a positive effect on SR. Effect is statistically significant as revealed by probability of the t-Statistic of 4.106078 (0.0000) which is less than the 5% level of significance. FS and ACP also exert positive effects on SR. Effects are statistically significant as depicted by probability of the t-Statistic of 5.884901(0.0000), and 2,285501 (0.0084) respectively (> 5%). FP exerts statistically insignificant negative effect on SR at probability of the t-Statistic of -0.207832 (0.8356) respectively (> 5%). In its overall, the models are statistically significant as shown by the statistical significance of its F-statistic (0.00000).

5. Discussions of Findings

The study investigated the impact of firm characteristics on the nature and extent of sustainability reporting among Nigerian manufacturing firms. The results demonstrate that certain firm attributes significantly influence sustainability disclosure practices.

The first hypothesis tested whether board size affects sustainability reporting. Findings revealed a significant positive relationship, indicating that an increase in board size enhances the quality of sustainability reporting. This outcome aligns with prior studies (Krasodomska et al., 2024; Triwacananingrum et al., 2024; Saha & Khan, 2024). However, the effect may also be shaped more by regulatory requirements such as SEC codes, NSE rules, or international frameworks like GRI, which compel firms to disclose regardless of board size. The second hypothesis examined the effect of firm profitability. Results showed an insignificant negative relationship, suggesting that higher profitability does not necessarily translate into better sustainability reporting. This finding contrasts with earlier research (Girón et al., 2020; Bully, 2019; Benjamin et al., 2017). The outcome may reflect the tendency of Nigerian firms to prioritize short-term profitability over long-term sustainability, viewing disclosure as an added cost with no immediate financial benefits. Weak enforcement of reporting standards may also explain this behavior. The third hypothesis assessed the influence of firm size, and the results showed a significant positive effect on sustainability reporting. Larger firms tend to

disclose more, consistent with prior studies (Zaman et al., 2023; Dutta & Basu, 2022; Lee & Lim, 2022). This may be attributed to greater visibility, stakeholder expectations, and regulatory scrutiny faced by bigger firms.

6. Conclusion and Recommendations

This study concludes that board size and firm size positively influence sustainability reporting among Nigerian manufacturing firms, while profitability has an insignificant negative effect. The findings emphasize that external regulatory frameworks and stakeholder pressures play a critical role in shaping disclosure practices, especially in contexts where enforcement is weak. It recommends that management should strengthen sustainability reporting in Nigeria, regulators must enhance compliance mechanisms.

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SUSTAINABLE INNOVATION AND BUSINESS GROWTH OF SELECTED DEPOSIT MONEY BANKS IN LAGOS STATE, NIGERIA

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Abstract: *Sustainable innovation is the combination of green and flexible practices that leads to sustainable business growth. In this study, the effect of this on Deposit Money Banks (DMBs) in Lagos Mainland, Nigeria was studied using Institutional and Stakeholder Theories. The study investigated the effect of regulatory issues, digital banking, green financial products, and employee engagement on profitability, efficiency, and customer loyalty. The Structural Equation Modelling (SEM) was used to analyse data of 216 bank employees. The results indicated that digital banking enhanced operational efficiency, whereas green financial products increased the level of customer loyalty. Engaged employees contributed positively to the profitability and significantly to no significant effect on efficiency, and negatively correlated to loyalty. Profitability was also determined by the regulatory issues. There was robust predictive power as the model was able to explain 81.1% of customer loyalty and 64.0% of operational efficiency. The research added to empirical evidence within a developing economy and recommended that banks should approach innovation at strategic levels to meet the expectations of stakeholders to steer the growth of business.*

Keywords*: Sustainable Innovation, Digital Banking, Green Finance, Employee Engagement, Business Development, Deposit Money Banks, Nigeria.*
JEL Classification*: M10.*

1. Introduction

Sustainable innovation is progressively turning to be a business success factor, as business organisations are now combining environmental and social interests into their operations plans in order to experience both financial expansion and environmental ecosystem conservation (Ellen MacArthur Foundation, 2019). The Deposit Money Banks (DMBs) are one of the key aspects of enhancing economic growth and financial inclusion in Nigeria (Chiefajugwe, 2019). Following the trends in the world, the Central Bank of Nigeria (CBN) adopted Sustainable Banking Guidelines in 2019 that promoted green finance and socially responsible activities among the DMBs (CBN, 2019). Innovation in technology, such as mobile banking, blockchain and others, has also boosted efficiency and customer experience to ensure customer loyalty and profitability (Iwedi, 2024; Uddin & Rahama, 2023).

Nevertheless, DMBs have difficulties adopting sustainable innovations. The common barriers are economic instability, poor infrastructure, poor regulation and unwillingness to adapt (Adebayo & Eze, 2023; Nwankwo & Adeniyi, 2019). Also, the presence of informal financial systems erodes confidence in formal banking, hence inhibiting customer-oriented innovations (Ogunbayo, 2020). The current literature has emphasized sustainability, but there has not been much research establishing a relationship between sustainability and business performance, such as customer loyalty, financial growth and employee engagement in Nigeria. This is facilitated in this study by examining the impacts of green financial products,

digital banking, and employee involvement on the growth of business in Nigerian DMBs, as well as a discussion of important barriers to implementation.

Statement of the Problems

The problems surrounding the adoption of sustainable innovations in Deposit Money Banks (DMBs) in Mainland Lagos, Nigeria, continue, even in the era of a greater focus in the world on the need to achieve banking and corporate responsibility through sustainable innovations (Geovanna et al., 2022; Kandasamy et al., 2022; Kneipp et al., 2019). These challenges encompass poor regulations and government controls, unstable economy, poor digital infrastructure, and low participation of workers (Adewole et al., 2024; Adebayo & Eze, 2023; Awoniyi, 2022; Aduaka & Awolusi, 2020). Most DMBs find green technologies and digital banking non-viable in terms of finances and worsened by the infrastructural challenges like unreliable electricity and poor internet connectivity (Kala, 2023). Despite the evidence that green products and digital services boost both profitability and levels of customer satisfaction and employee motivation, little evidence establishes their strategic effect on business growth in the Nigerian banking industry (Nimitha & Goveas, 2024; Khushbu & Agarwal, 2024).

This research addressed this gap by investigating the effects of sustainable innovations such as green financial products, digital banking adoption, employee engagement, operational efficiency, long-term profitability, and overall business growth within the context of technological, economic, and human resource limitations within Nigerian DMBs.

Objectives of the Study

i. Identify the key barriers to sustainable innovation adoption and their effect on the perceived long-term profitability of the selected Deposit Money Banks (DMBs) in Mainland Lagos.
ii. Investigate the effect of digital banking adoption and operational efficiency in selected deposit money banks (DMBs) in Mainland Lagos.
iii. Assess the relationship between green financial products such as green loans, eco-friendly investments and perceived customer loyalty of the selected Deposit Money Banks (DMBs) in Mainland Lagos.
iv. Examine how employee engagement in sustainable initiatives moderates the relationship between sustainable innovation and business growth of the selected Deposit Money Banks (DMBs) in Mainland Lagos.

Research Hypotheses

$H0_1$: Regulatory challenges and economic volatility are not the major hindrances to sustainable innovations adoption in the selected Deposit Money Banks (DMBs) and these barriers do not affect the perceived long-term profitability of these banks

$H0_2$: Digital banking adoption has no significant effect on the operational efficiency of the selected Deposit Money Banks (DMBs) in Mainland Lagos

$H0_3$: There is no significant relationship between green financial products such as green loans, eco-friendly investments and perceived customer loyalty in the selected Deposit Money Banks (DMBs) in Mainland Lagos

$H0_4$: Employee engagement in sustainable initiatives does not significantly moderate the relationship between sustainable innovation and the business growth of the selected Deposit Money Banks (DMBs) in Mainland Lagos

2. Literature Review

Concept of Sustainable Innovation

Sustainable innovation launches new ways to tackle environmental and social issues while strengthening economic activities (Rennings, 2000). This methodology connects business growth with environmental care, social duties, and profitable operations. A recent study confirms that customers desire business sustainability, pushing employers to deliver products that match this demand. For instance, banks improve sustainability through new financial and digital offerings that benefit underserved communities and create better access which drives resource efficiency and social progress (Ojo et al, 2021).

Banks in Nigeria boost their market position and match worldwide practices through sustainable methods like providing renewable energy financing and teaching people about money management (Akinpelu & Adebayo, 2022). The Central Bank of Nigeria leads banks to adopt lending techniques and invest in areas that protect the environment and contribute to social development through its 2020 regulations. Studies indicate sustainable innovation helps banks maintain more loyal customers and improve their brand value since people now seek sustainable financial services (Eze et al., 2022). Sustainable innovation represents both a mandate from regulatory bodies and a chance for Nigerian banks to grow their business while helping the nation improve.

Barriers to Sustainable Innovation Adoption in Nigerian Deposit Money Banks

The regulatory uncertainties, economic volatility, and poor technological constructions act as considerable obstacles to the use of sustainable innovations amongst Nigerian Deposit Money Banks (DMBs) (Adebayo & Eze, 2023; Uddin & Rahman, 2023). The implementation of Sustainable Banking Principles (SBPs) has been introduced by the Central Bank of Nigeria, but due to the absence of regulatory clarity, implementation is inconvenient, especially in the case of smaller banks that are not used to sustainability principles (Uddin & Rahman, 2023). The instability of the economy, which is shown by inflation, unstable exchange rates, and unstable interest rates, further deters making long-term green investments (Khan et al., 2021). Furthermore, some banks fail to migrate into using sustainable banking digital capacities, including mobile banking, paperless transactions, or energy-efficient platforms, because of a weak internet connection, unreliable electricity, and high maintenance/upgrade charges (Kala, 2023; Kandasamy et al., 2022). It is important to overcome these obstacles by offering clarity on policy, economic changes and investment in technology so that DMBs can work towards their long-term sustainability and profitability objectives.

Employee Engagement in Sustainable Initiatives

Engagement of the employees is crucial in the accomplishment of sustainability objectives and implies cognitive awareness, emotional devotion, and operational efforts (Genghini, 2023; Robinson et al., 2021). At a cognitive level, the employees will understand the relevance of sustainability in their occupation; at an emotional level, they can feel personally accountable (Peattie & Belz, 2010; Khan et al., 2021). Behaviourally, they can take actions in the form of energy saving, reduction of wastes and participation in training (Adebayo & Eze, 2023). This engagement is enhanced by training, which is also observed within the case of Hong Kong (Law, Hills, & Hau, 2015). Productive and motivated employees enhance productivity, save money, and make customers develop trust in them, particularly in the sphere of banking (Kandasamy et al., 2022).

Sustainable Innovation Practices in Nigerian Banks

Digital Banking

Digital banking reformulates conventional financial services as convenient and web-based applications that allow customers to access a bank anywhere safely and cheaply (Malyshev, 2023). Mobile banking and, in particular, digital wallets in Nigeria have contributed to financial inclusion, and technologies such as ATM, USSD, agent banking, and neo-banks have helped to maximise access in all parts of the country (Central Bank of Nigeria, 2020; Akinpelu & Adebayo, 2022). Agents and neo-banks are for no-networked territories, but Pay Stack and Flutterwave have created safe digital transactions that enhance the digital economy (Ojo et al., 2021).

Green Finance Product

Green financial products: green loans, bonds, and insurance of environmental input projects confirm a central region of sustainability innovation that banks in Nigeria currently actively exploit. In response to the CBN Sustainable Banking Guidelines that were issued in 2019, such institutions as Access Bank or First Bank have also launched green loans, focusing on the areas of solar energy, sustainable agriculture, and green infrastructure, with typically favourable terms, such as low rates and grace periods (Access Bank, 2020; First Bank, 2021; Adebayo & Eze, 2023). The latter are green bonds and green insurance, such as those which can be listed on the FMDQ Securities Exchange (Adewole et al., 2024). Inspired by the increased understanding of environmental issues and the fact that environmental awareness is a significant focus among the majority of Millennials and Gen Zers, banking companies such as GTBank and Access Bank are broadening their green products to satisfy the needs of ESG-like customers, increase brand loyalty, and attract sustainable investments both locally and globally (Nielsen, 2015; World Economic Forum, 2020).

Concept of Business Growth

Business growth is simply a performance measure indicating the development of the firm in terms of growth in operations, customers, and revenue (Seclén, Navarrete & Sansores, 2016). In the case of banks, they develop their growth through the factors of product innovation, customer satisfaction, and operational efficiency. Customers will spend and borrow certain amounts of money using economic conditions as their guide (Oniore & Okoli, 2019). By providing sustainable lending services such as green loans, banks facilitate growth because they generate higher profitability and decreased risk (Hannon et al., 2021; Adebayo & Eze, 2023). Greater productivity and customer satisfaction are achieved due to efficiency during operation, such as through reduced costs and motivated employees (Exactbuyer, 2024). Nigeria is also experiencing an enhancement in utilisation of digital banking, which is contributing to growth and expansion in reach, lower costs and a higher customer base loyalty (Adewole et al., 2024; Ogbonna et al., 2024). The customer loyalty and profitability in the long term are boosted by delighted customers who interact with sustainable and digital services as depicted by retention rates and Net Promoter Scores (Fornell, 2020; Ndugbe et al., 2022).

Theoretical Framework

Institutional Theory

A theory by Meyer and Rowan in 1970s and extended by DiMaggio and Powell (1983), institutional theory describes how organisations adjust to societal norms, regulatory and stakeholder standards in order to gain legitimacy. According to Scott (2001) and Nga &

Tam (2024), organisations such as banks engage in sustainability practices because there are entities that force them to do so regardless of the economic and infrastructural challenges. Researchers such as Lounsbury (2007) and Hsu et al. (2013) demonstrate how organisations react to these pressures by coming up with new strategies through which they improve competitiveness. Nonetheless, Haveman (1993) criticises the theory due to the neglect of the role played by innovation in independently influencing the organisational behaviour, especially the developing nations such as Nigeria. However, the Institutional Theory is still applicable in addressing how Deposit Money Banks (DMBs) in the Nigerian banking system can participate in the sustainability initiatives as dictated by the societal and regulatory pressures and also utilise innovative ideas to meet the implementation challenges.

Stakeholder Theory

The introduction of the Stakeholder Theory by Freeman (1984) implies that organisations should look at expectations of all stakeholders, prior to acting. The introduction of green financial products in the cases of Nigerian DMBs (sustainable investments and eco-loans) reflects the fact that they respond to emerging environmental concerns and customer needs. Banks can also improve trust and loyalty by matching the interests of customers who care about the environment, in particular with financial services (Nga & Tam, 2024; Ndugbe et al., 2022). Nevertheless, critics, such as Harrison et al. (2015), also blame the theory on the inability to clarify how to prioritise among competing stakeholder interests, i.e. how to reconcile profitability with environmental responsibility. This limitation notwithstanding, Stakeholder Theory provides practical value in elaborating how DMBs may generate loyal and satisfied customers on sustainability-related financial innovations.

Conceptual Model

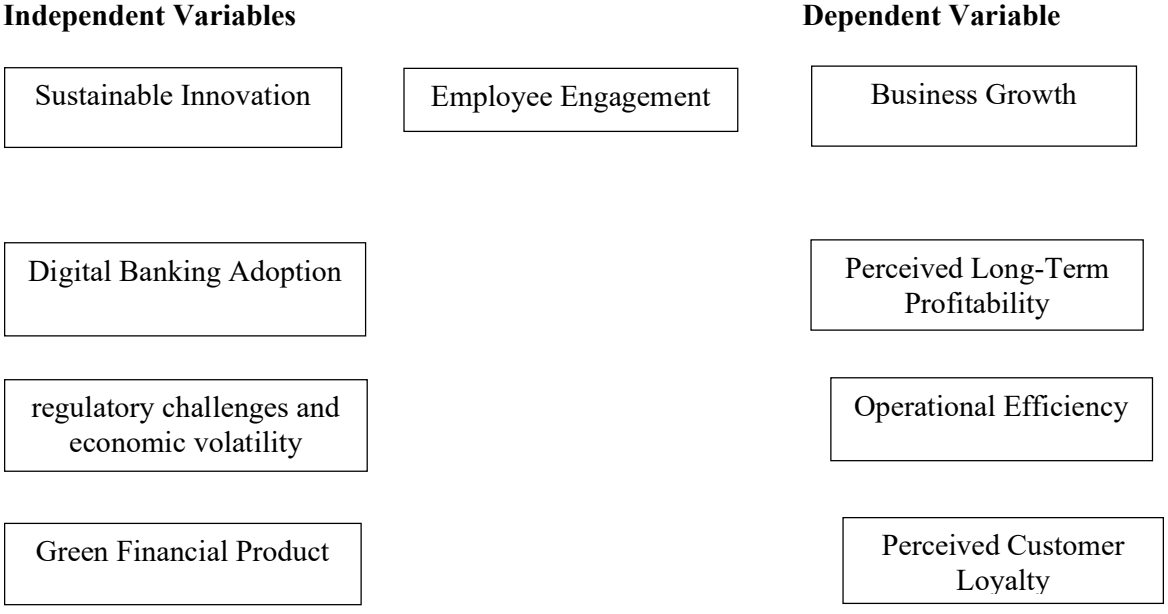

Figure 1. Researcher Conceptual Model

The model shows the relationship between sustainable innovation (independent variable), business growth (dependent variable), with employee engagement in sustainable initiatives as a moderating variable. The model proposed sustainable innovation, like barriers to adoption, digital banking adoption, and green financial product influences business growth in the form of perceived long-term profitability, operational efficiency, and perceived customer loyalty. Employee engagement in sustainable initiatives serves as a moderating variable between sustainable innovation and business growth.

Empirical Review

Sustainable Innovation and Business Growth

A body of literature reports a positive connection between sustainable innovation and organisational performance, usually on a small scope. Research like the one by Giovanna et al. (2022) emphasises human capital, overlooking the interactions of HR and stakeholder management in their overall impact. Kneipp et al. (2019) replicated the same findings in Brazil, although it had low generalisability. Liu et al. (2024) associated green innovation with environment-oriented rewards, yet ignored regulation and long-term economic costs. Manasseh (2024) demonstrated the effectiveness of technological innovation in banking in emerging economies and did not take into consideration the factors of socio-economic variances. Raman & Pickering (2025) considered financial and regulatory obstacles; they did not check the local social barrier. Saygili et al. (2022) researched ESG in Turkey, yet they did not find qualitative expertise. Obiekwe et al. (2020) focused on digital banking instruments in Nigeria and lacked the sustainability of practices. Predominantly, the current literature is limited to holistic, contextual and future-oriented perspectives; particularly concerning cultural, technological, and regional aspects of emerging economies.

Effect of Regulatory Challenges and Economic Volatility on Perceived Long-Term Profitability

The studies have proved the fact that excessive regulation combined with economic uncertainty and poor technology infrastructure burdens the profitability of Nigerian Deposit Money Banks (DMBs). Osakwe et al. (2022) discovered in their research that Central Bank of Nigeria regulations helped support bank stability but created higher operating costs while limiting loans, which damaged profitability. The research team used secondary statistics from 2000 to 2018 taken from CBN Statistical Bulletin to analyse Return on Assets (ROA), Turkey's Monetary Policy Rate (MPR), Treasury Bill Rate (TBR), Lending Rate (LR), and Cash Reserve Ratio (CRR) values. According to their model, banks need to pay more to operate and cannot make as many loans when limits like high interest rates and reserve requirements are enforced. The results confirm the work of Oladejo et al. (2023) by showing that monetary controls over liquidity and interest rates lead banks to spend more on operations and earn less money in revenues. However, there is a need to pursue more diligent, disaggregated, and context-sensitive research that would allow identifying the actual effect of the monetary policy on the functioning of Nigerian banks.

Effect of Digital Banking Adoption and Operational Efficiency of Selected Deposit Money Banks (DMBs)

Research shows digital banking is improving in Nigeria slowly, but there are pertinent issues. Aduaka & Awolusi (2020) studied the impact of electronic banking on profitability in

the Nigerian banking industry from 2010 – 2017 using primary and secondary data drawn from the bank's staff, customers and the bank's audited financial statement. Drawing from descriptive and inferential statistics and multiple regression analysis, the analysis established the positive impact of electronic banking channels, particularly card products, on the profitability of banks and with ATMs as the second important channel. Additionally, the study shows that e-banking services contribute to patronage retention and loyalty by the customers and that this is influenced by service quality, security, reliability and efficiency for the utilisation of the e-banking services

Similarly, Awoniyi (2022) examined digital banking adoption trends in Nigeria, especially regarding Mobile and Internet banking tools within an extended Technology Acceptance Model (TAM). The model includes perceived usefulness alongside ease-of-use security measures and banking rules to boost digital banking adoption in Nigeria. However, more research is needed as those studies fail to properly examine platform features, collect small datasets, and neglect how these methods affect specific user groups. Research with complete data will help to better understand how Nigerians embrace digital banking to encompass the patterns of why or why not people adopt digital banking in Nigeria.

The Relationship between Green Financial Products on Perceived Customer Loyalty in Deposit Money Banks (DMBs)

Research indicates that Deposit Money Banks (DMBs) that have green financial products such as eco-loans and sustainable investments are effective in attracting customer loyalty. Nimitha & Goveas' (2024) study shows that customers prioritise environmental sustainability and tend to stay loyal to banks that practice green banking. Their research shows companies can run their operations better while holding onto customers by offering green loans, mobile banking and eco-friendly debit cards. They show how banks build trust with customers when they clearly explain their sustainability efforts as part of their communication strategy. Also, the study of Khushbu & Agarwal (2024) explored the relationship between green banking practices and customer loyalty using a mixed-method approach to gather data and proved that eco-loans and sustainable investment funds make customers view them more positively. Similarly, Njoku et al. (2022) researched how green innovations, especially solar panels and green conferences, affected Nigerian bank stakeholder satisfaction. The research proves customers believe banks that adopt green innovation demonstrate responsibility, which boosts both customer bond and team commitment. In spite of these insights, there are gaps. Not many studies examine the long-term effect of green products, the difference in adopting the product by customers, and the role of the digital platform in advocating green services. Effective communication and resistance to green banking research are also scanty, particularly in Nigeria.

Employee Engagement in Sustainable Initiative and the Relationship Between Sustainable Innovation and Business Growth of Deposit Money Banks (DMBs)

Studies indicate that employee engagement in Deposit Money Banks (DMBs) contributes to operational efficiency and business results. Sule et al. (2024) researched the impact of green staff involvement on business performance at Southeast Nigerian DMBs. Green employee participation creates better operational results that improve both innovation and company results. In the Temel et al. (2022) study, the research aimed to uncover the factors of employee participation (EP) and how they aid in fostering organisational

sustainability. A survey data dataset containing 305 full responses is used in the research, which is analysed by Friedman tests, Kruskal–Wallis tests, correlation analysis, and centrality measures. However, the study finds that all the EP factors are indispensable to the sustainability of organisations, though not all are of equal importance. On the whole, there is a need for more, multi-regional, and longitudinal studies to realise the actual influence of employee engagement on business development in the banking industry.

3. Methodology

Research Design

The study is a descriptive survey research designed to explore the effect of sustainable innovations on business growth in selected Deposit Money Banks (DMBs) in Mainland Lagos, Nigeria. This approach is effective for collecting data from a wide population, describing respondents' characteristics, and evaluating the relationships between key variables.

Population of the Study

The population of the study consists of the management and employees of selected Deposit Money Banks (DMBs) operating in Mainland Lagos State. In particular, Guaranty Trust Bank (GTB) in Ikeja consists of 18 management employees and 124 employees, which makes a total of 142 personnel. Access Bank in Surulere has 11 management employees, 105 employees, and a total staff of 116. The first bank in Agege has 10 management staff and 98 employees, which makes 108 workers. Zenith in Yaba has 14 management and 108 employees, making it 122 staff. In total, the research focuses on 53 management personnel and 435 employees, making a total population of 488 personnel in the four branches of DMB, which were selected. As obtained from each bank's Human Resources Department as of October 2024. This approach ensures that each bank is represented in a specific area, allowing for a comprehensive analysis of sustainable innovations and their effects on business growth.

Sample Size and Sampling Technique

For this study, the researcher used the Cochran formula (1977) to calculate the sample size. The formula is stated thus:

$$n = \frac{N(Z^2)X\ P\ X\ (1-P)}{E^2\ X\ (N-1) + (Z^2)\ X\ P\ X\ (1-P)}$$

where:

n = the desired sample size

N = the total population size (488 staff in this case)

Z = the Z-score which is the confidence level at 95% or 1.96

P = the estimated proportion of the population. Assuming P is 0.5

E = the margin of error. Assuming 5% or 0.05

$$n = \frac{488(1.96^2)X\ 0.5\ X\ (1-0.5)}{0.5^2\ X\ (488-1) + (1.96^2)\ X\ 0.5\ X\ (1-0.5)}$$

$$n = \frac{488\ X\ 3.8416\ X\ 0.25}{0.0025\ X\ 487 + 3.8416\ X\ 0.25}$$

$$n = \frac{488\ X\ 0.9604}{1.2175 + 0.9604}$$

$$n = \frac{468.6752}{2.1779} = 215.19$$

Adjusted sample size is 216

A stratified sampling technique was employed to select the sample size for each bank in the strata.

Table 1: Sample Size Distribution Across the Selected Banks

S/N	Selected Banks	Management Staff	Employees	Management Staff and Employees	Sample Size Determination
1	Guaranty Trust Banks Agege	18	124	142	$\frac{142}{488} x\ 216 = 62.8$
2	Access Bank	11	105	116	$\frac{116}{488} x\ 216 = 51.3$
3	First Bank	10	98	108	$\frac{108}{488} x\ 216 = 47.8$
4	Zenith Bank	14	108	122	$\frac{122}{488} x\ 216 = 54$
	Total	53	435	488	216

Source: Researcher Survey, 2024

Research Instrument

The study employed a structured questionnaire as the primary data collection instrument, which was divided into two parts. The first section, Section A, is composed of questions targeting demographic and background aspects of the respondents. The core measures of the study (sustainable innovation and business growth) were through in section B. The questionnaire was adapted from previously validated instruments found in the literature and appeared on a five-point Likert scale, from Strongly Disagree to Strongly Agree. The items in this section were used to operationalise independent, dependent and moderating variables. All rated on a five-point Likert scale.

Pilot Study

Before the distribution of the questionnaire, a pilot study was carried out. For this, twenty (20) questionnaires were distributed to twenty (20) people from this population who were not included in the final sample. This initial study has the objective to evaluate how many of the questions understood by participants understood, how participants engaged with the survey and how they responded to the mechanism for answering.

Validity and Reliability of the Research Instrument

The researcher's supervisor examined the questionnaire to ensure it included all relevant variables, thus confirming its content validity. To assess the instrument's reliability, Cronbach's alpha was used to evaluate its internal consistency. This test helps to determine the level of consistency across various items, ensuring that all parts of the questionnaire measure the same underlying construct.

Method of Data Analysis

The study employed Structural Equation Modelling (SEM) to explore relationships among variables such as regulatory challenges, economic volatility, digital banking adoption, green financial products, employee engagement, and business growth. After data cleaning and descriptive analysis, Confirmatory Factor Analysis (CFA) validated the measurement model. Model fit was assessed using Chi-square, CFI, and RMSEA indices. Path coefficients

revealed direct and indirect effects among constructs, while moderation was tested using interaction terms.

4. Results and Discussion

Partial Least Squares Structural Equation Modelling Results

The constructs used in the study include REV (Regulatory Challenge and Economic Volatility), DBA (Digital Banking Adoption), GFP (Green Financial Products), EE (Employee Engagement), PLP (Perceived Long-Term Profitability), OPE (Operational Efficiency), and PCL (Perceived Customer Loyalty). To improve the measurement model's reliability and validity, items with low factor loadings (below 0.60), specifically DBA4, DBA5, EE4–EE8, GFP1, GFP3–GFP6, and OPE1, were removed from the analysis.

Internal Consistency, Reliability, and Convergent Validity (AVE) Results

Cronbach's Alpha, rho_A, Composite Reliability (CR), and Average Variance Extracted (AVE) were used to determine the reliability and validity of the constructs. All the values of Cronbach's Alpha were above the 0.70 threshold and varied between 0.713 and 0.937, showing strong internal consistency. The Operational Efficiency and Perceived Customer Loyalty obtained the highest reliability. The majority of rho_A values surpassed the 0.70 threshold, although Regulatory Challenge and Economic Volatility (0.676) measured just below the norm, yet close to an acceptable margin. Excellent construct reliability was supported by the value of Composite Reliability (0.833-0.955). The convergent validity of all AVE scores was above 0.50. The Operational Efficiency and many more, including the Perceived Long-Term Profitability and Employee Engagement, exceeded the standard, with a high AVE (0.841). Overall, the constructs portrayed high scores in reliability and validity, which shows that the measurement model was appropriate in studying sustainable innovation in the sample. (See Table 4.).

Table 2: Internal Consistency Reliability and Convergent Validity (AVE)

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
DBA	0.713	0.749	0.833	0.626
EE	0.888	0.917	0.892	0.546
GFP	0.784	0.875	0.843	0.575
OPE	0.937	0.938	0.955	0.841
PCL	0.913	0.914	0.935	0.743
PLP	0.809	0.788	0.855	0.545
REV	0.836	0.676	0.854	0.597

Source: Researcher Computation (SMARTPLS), 2025

Discriminant Validity

The discriminant validity was measured by Heterotrait-Monotrait Ratio (HTMT) with less than 0.85 representing a satisfactory level. All the HTMT values in the study were below the threshold, which proves that there was a considerable difference between the constructs. An example of this is the HTMT between Digital Banking Adoption and Employee Engagement (0.767) and Green Financial Products and Perceived Long-Term Profitability (0.675), and all of these show enough discriminant validity. The most significant was 0.843

between Employee Engagement and Regulatory Challenges, which was near the limit but still within the acceptable range. On the other hand, few constructs, such as Digital Banking Adoption and Regulatory Challenges (0.039), exhibited low correlation, indicating their uniqueness. In general, the findings confirm that the constructs are empirically different, which proves the validity of the model. (See Table 3)

Table 3: Heterotrait-Monotrait Ratio (HTMT) (< 0.85)

	DBA	EE	GFP	OPE	PCL	PLP	REV
DBA							
EE	0.767						
GFP	0.711	0.821					
OPE	0.053	0.092	0.105				
PCL	0.081	0.098	0.092	0.838			
PLP	0.764	0.820	0.675	0.115	0.121		
REV	0.039	0.843	0.780	0.113	0.110	0.696	

Source: Researcher Computation (SMARTPLS), 2025

Testing of Hypothesis and Discussion of Findings

Hypothesis One ($H0_1$): Regulatory challenges and economic volatility are not the major hindrances to sustainable innovations in the selected Deposit Money Banks (DMBs), and these barriers do not affect the perceived long-term profitability of these banks.

Regulatory challenges and economic volatility had a statistically significant positive effect on the perceived long-term profitability ($\beta = 0.606$; $t = 8.647$; $p = 0.001$). This means that the regulatory and economic barriers affect profitability towards the adoption of sustainable innovation to a considerable extent. Hence, $H0_1$ (null hypothesis) is rejected.

Hypothesis Two ($H0_2$): Digital banking adoption has no significant effect on the operational efficiency of the selected Deposit Money Banks (DMBs) in Mainland Lagos

Digital banking adoption to operational efficiency was also found as significant and positive ($p = 0.001$), and the path coefficient ($t = 0.444$) was much higher. This shows that the operational efficiency of banks under study is greatly enhanced by digital banking adoption; therefore, the null hypothesis ($H0_2$) can be rejected.

Hypothesis Three ($H0_3$): There is no significant relationship between green financial products such as green loans, eco-friendly investments and perceived customer loyalty in the selected Deposit Money Banks (DMBs) in Mainland Lagos

The result showed a significant and positive correlation between green financial products and perceived customer loyalty (β 0.544; $t = 9.541$; $p = 0.001$). This implies that customer loyalty in the banking industry is highly affected by green financial efforts. Thus, the null hypothesis is rejected, $H0_3$.

Hypothesis Four ($H0_4$): Employee engagement in sustainable initiatives does not significantly moderate the relationship between sustainable innovation and the business growth of the selected Deposit Money Banks (DMBs) in Mainland Lagos

Moderation analysis reveals that Employee engagement played a significant role in the relationship between sustainable innovation and two important measures of business growth; viz, perceived long-term profitability ($\beta = 0.146$; $t = 2.283$; $p = 0.022$) and perceived customer loyalty ($\beta = -0.205$; $t = 5.407$; $p = .001$). Nevertheless, the moderation effect on operational

efficiency was not significant (β = 0.088; t = 1.127; p = 0.260). $H0_4$ is therefore partially rejected.

Model Predictive Power (R^2 Value)

The structural model was quite strong and moderate in predictive power. The model explained Perceived Long-Term Profitability (R^2 = 0.419), Operational Efficiency (R^2 = 0.640) moderately, and Perceived Customer Loyalty with a high R^2 of 0.811. This shows that sustainable innovation activities have a great impact on the profitability, efficiency and customer loyalty in the banking sector of Nigeria.

Table 6: R Square Value

Constructs	R^2 Value
PLP	0.419
OPE	0.640
PCL	0.811

Source: Researcher Computation (SMARTPLS), 2025

Table 7: Path Coefficient Estimates

Constructs	Coefficient	Standard Deviation	T-Statistics	P-Values
REV -> PLP	0.606	0.070	8.647	0.001
DBA -> OPE	0.444	0.092	4.830	0.001
GFP -> PCL	0.544	0.057	9.541	0.001
Moderating Effect (EE -> PLP)	0.146	0.064	2.283	0.022
Moderating Effect (EE-> OPE)	0.088	0.078	1.127	0.260
Moderating Effect (EE-> PCL)	-0.205	0.038	5.407	0.001

Source: Researcher Computation (SMARTPLS), 2025

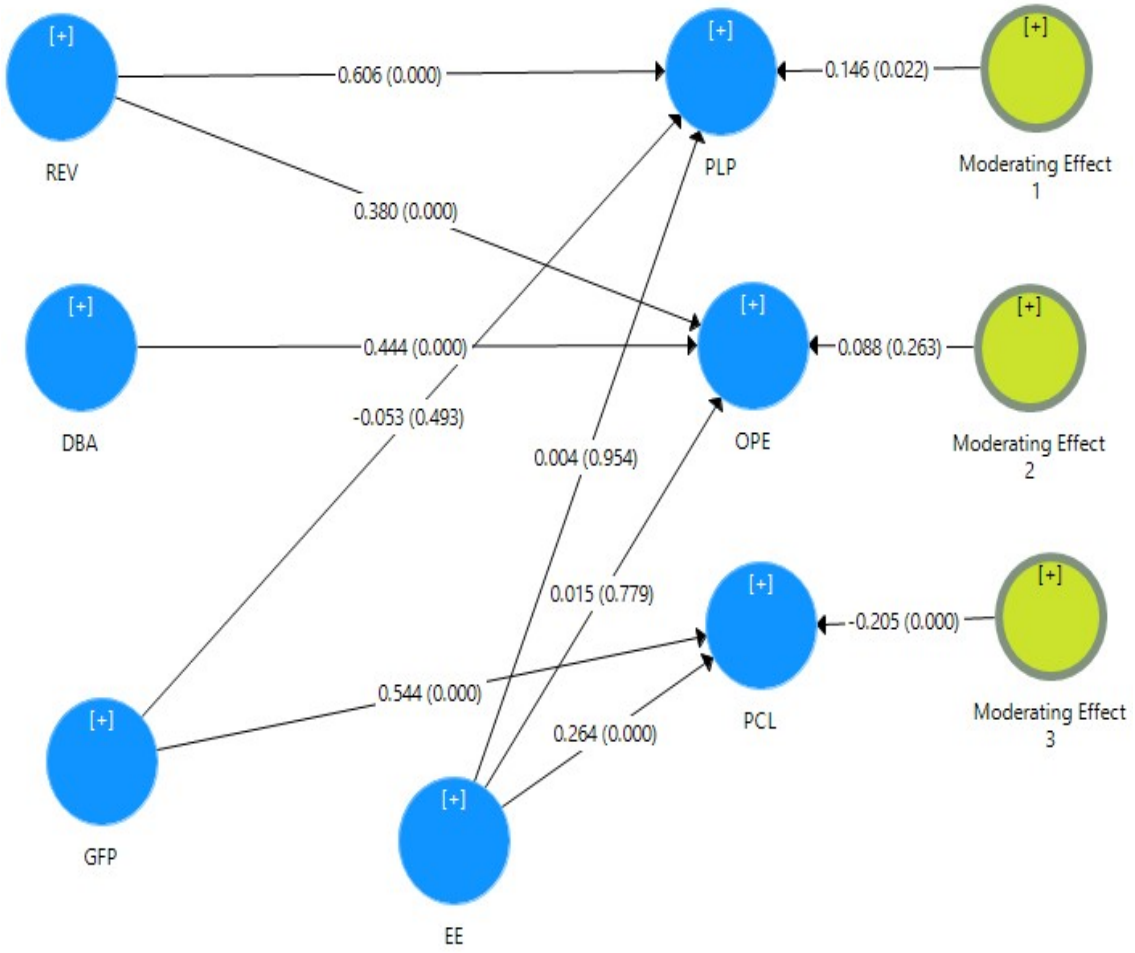

Figure 2: Bootstrapped Structural Model.

Discussion of Findings

The structural model showed that there was a strong positive correlation between the main sustainable innovation variables and business outcomes within the Nigerian banking sector. Economic volatility and regulatory challenges had a significant effect on long-term showing how 41.9% of the variance in the long-term profitability can be attributed to it (R^2 = 0.419). This confirms the argument that banks take their profitability perspectives under the influence of external pressure, similar to what Institutional Theory or other authors, such as findings by Osakwe et al. (2022) and Oladejo et al. (2023), have mentioned about how regulations impose pressure but also shape behaviour.

The adoption of digital banking influenced operational efficiency positively, and the R^2 indicating the level of explanatory power was 0.640, implying that digital banking adoption provided a strong explanatory power. This is congruous with the previous research findings (Aduaka & Awolusi, 2020; Awoniyi, 2022) that demonstrated that digital tools improve the quality of work by lowering the incidence of mistakes, expenditure, and latency. Institutional Theory and Stakeholder Theory buttress this result with their focus on the

importance of digital platforms in satisfying the expectations of the customer, workers, and controls.

High customer loyalty was also significantly influenced positively by green financial products, where the predictive power (R^2) was high (0.811). This confirms the results of Nimitha & Goveas (2024), Khushbu & Agarwal (2024), and Njoku et al. (2022), who identify the connection between green services and improved customer trust and customer loyalty. The conclusion is coherent with the Stakeholder Theory, which demonstrates how satisfaction of the environmental requirements enhances the connections between the stakeholders, and Institutional Theory, according to which banks react to regulation and social requirements of sustainability.

Moderation analysis revealed that employee engagement played a significant role in improving the association between sustainable innovation and profitability, had a limited impact on operational efficiency (beta = 0.088; p = 0.260) and adversely influenced customer loyalty. Such mixed results indicate that employee engagement enhances profitability but could not necessarily adhere to customer experiences; thus, there must be certain implementation gaps within the organisation. This is consistent with the literature (Sule et al., 2024; Temel et al., 2022) and corroborates the significance of the real employee involvement in advancing sustainable innovation through the prism of the Institutional and Stakeholder Theories.

5. Conclusion and Recommendations

The research presented examined the role of sustainable innovation in business growth among a sample of Deposit Money Banks (DMBs) within Mainland Lagos, Nigeria based on two theories, Institutional and Stakeholder theories. It concluded that regulatory and economic pressures may promote profitability in the case of innovative responses among banks, whereas digital banking stimulates operational efficiency and green financial products promotes consumer loyalty. Mixed results were noted with regard to employee engagement which promoted profitability and not efficiency and influenced loyalty negatively. These results are supportive of the idea that innovation, technology, and stakeholder needs must be embraced by DMBs that aspire to flourish in the long term in a dynamic environment.

Recommendations

Based on the findings and conclusions made in this research study, the following are the recommendations to be made:

i. Digital platforms should be upgraded and cybersecurity improved, and customers should be informed about their advantages to boost efficiency and adoption levels
ii. Engage employees in the sustainability aspects by training them and defining what they are to do in order to increase the outcomes of innovation and business performance.
iii. Policymakers should reduce some of the stringent and overly restrictive policies that affect banks' innovation so that the banks would be in a position to expand, keeping them compliant and financially stable.
iv. Establish regular performance reviews of sustainable innovation efforts to ensure alignment with business goals and adapt strategies as needed.

Contributions to Knowledge

The study contributes to the body of knowledge on sustainability because it provides empirical knowledge that is scarce on the Nigerian banking sector and applies a combination

of Institutional and Stakeholder theories to capture the main factors of sustainable innovation. It presents the previously unexplored relationships, such as the moderating role of employee engagement and the impact of green products on customer loyalty, and generates a good predictive model that can be applied in further studies of service-oriented sectors.

Limitations and Suggestions for Further Research Studies

This study is associated with certain limitations. It was limited to Lagos Mainland Deposit Money Banks, and therefore could not be generalised to other regions or other financial institutions such as microfinance and non-bank institutions. It is cross-sectional in design as well; it limits the understanding of the long-term sustainability implications. The study had a narrow spectrum because the constructs excluded such measures as corporate governance, leadership style, digital literacy, and consumer education, which may also affect the results of sustainability. Also, due to its sector-based findings, the model may be further improved by its application to other economic sectors like manufacturing or healthcare. Finally, some of the items of measurement (e.g., EE1, PLP5, REV1, REV5, REV6) revealed low factor loadings, which might have an impact on the construct accuracy; these items can be refined or removed in future studies to enhance the model reliability.

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AI-BASED COMMUNICATION STRATEGIES: REVOLUTIONIZING INTERNAL AND EXTERNAL INTERACTIONS IN CONTEMPORARY ORGANIZATIONS

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Abstract: *The rapid development of Artificial Intelligence (AI) is fundamentally transforming the way organizations communicate, both internally and externally. While traditional communication models focused on the transmission and reception of messages between sender and receiver, AI introduces new dimensions that enable process automation, content personalization, and predictive information analysis. This transformation opens significant opportunities for optimizing organizational interactions, increasing communication efficiency, and enhancing relationships with employees, customers, and other stakeholders.This paper explores how AI-based communication strategies influence organizational practices, focusing on employees and managers perceptions regarding the use of AI tools. The main objective of the study is to assess the level of comfort, trust, perceived benefits, and perceived risks associated with using AI in organizational communication. Specifically, the research aims to provide a clear picture of how these tools are integrated into daily activities and the overall perception of employees and managers regarding their usefulness and ethical implications. Methodologically, the study adopts a quantitative approach based on a structured questionnaire applied within a company in the FMCG industry, which is in the process of developing and integrating artificial intelligence technologies. The questionnaire was designed to capture respondent's perceptions of AI tools effectiveness, their comfort level in using them, and potential risks related to automation or the replacement of human interactions. Data analysis combines descriptive statistics with qualitative interpretations, providing a comprehensive perspective on how AI is perceived and used within the organization. The results indicate that respondents perceive AI tools as valuable support in streamlining internal and external communication, facilitating the flow of information, saving time, and providing decision-making support in daily activities. At the same time, there are significant concerns regarding ethics, transparency, and potential misinterpretations generated by automated systems. These findings highlight the need for a strategic and responsible approach to AI implementation, balancing technological efficiency with human and cultural considerations. By integrating theoretical perspectives with empirical findings, the paper demonstrates that AI is not only a technological tool but also a strategic factor capable of supporting innovation, organizational change, and the optimization of communication processes. The study offers practical recommendations for organizations regarding the responsible adoption of AI tools and highlights future research directions, including the assessment of long-term impacts on organizational culture and labour relations.*

Keywords: *Artificial Intelligence (AI), Organizational Communication, Internal Communication, Employees Perception, Communication Strategy.*

JEL Classification: *O33, M12, M15, D83.*

1. Introduction

The rapid evolution of Artificial Intelligence (AI) has positioned it as one of the most disruptive forces reshaping organizational practices across various industries. From automating operational tasks to predictive analytics, AI is redefining how organizations create value and make decisions. In this context, internal communication emerges as a critical pillar, where AI introduces new dynamics of efficiency, personalization, and resilience.

Traditionally, organizational communication has relied on classical models of information exchange between employees and departments. However, the increasing complexity of work environments and modern organizational demands require communication strategies that are more adaptive, flexible, and technology driven. AI technologies, such as chatbots, virtual assistants, natural language processing tools, and

internal data analytics systems, enable organizations to enhance the speed, accuracy, and relevance of internal communication processes.

Nevertheless, integrating AI into internal communication also raises significant challenges. These include concerns related to data privacy, algorithmic bias, lack of transparency, organizational resistance, and employee fears regarding the replacement of essential human interactions.

The purpose of this article is to investigate how AI-based communication strategies transform organizations' internal practices, focusing on employees' and managers' perceptions regarding the efficiency, ethics, and impact of these tools. By analyzing responses obtained through a questionnaire, the paper highlights respondents' comfort level when interacting with AI tools, their perception of the tools' usefulness, and the main challenges associated with implementing AI in internal communication. Thus, AI is presented not only as a technological instrument but also as a strategic factor capable of supporting change and innovation within organizations.

2. Theoretical Framework

The study of communication in organizations has traditionally been rooted in classical theories that conceptualize the process as the transmission of information between a sender and a receiver. The Shannon and Weaver model (1949), for instance, defined communication as a linear process of encoding, transmitting, and decoding messages, with an emphasis on reducing "noise" that might distort meaning. Later approaches, such as Schramm's (1954) interactive model, incorporated feedback loops and recognized communication as a two-way, reciprocal exchange. These foundational perspectives remain influential, but they largely reflect pre-digital contexts and cannot fully capture the complexities introduced by Artificial Intelligence (AI).

As organizations entered the digital era, communication theories evolved to account for the richness and immediacy of new media. Media Richness Theory (Daft & Lengel, 1986) posited that the effectiveness of communication depends on the capacity of the medium to convey cues, provide feedback, and support personal focus. The proliferation of digital platforms expanded this view, highlighting how communication technologies can either facilitate or constrain organizational collaboration (Dennis, Fuller & Valacich, 2008). With the advent of AI, the richness of communication no longer depends solely on the medium itself but also on the predictive and adaptive capabilities embedded in algorithms.

The adoption of AI-driven communication can also be understood through the lens of technology acceptance and diffusion theories. The Technology Acceptance Model (TAM) developed by Davis (1989) emphasized perceived usefulness and ease of use as determinants of technology adoption. Subsequent models, such as the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003), expanded this framework by including social influence and facilitating conditions. In the context of AI, these theories suggest that employee and stakeholder trust is crucial for adoption, particularly given concerns about opacity, bias, and privacy (Barocas, Hardt & Narayanan, 2019). Similarly, Rogers' (2003) Diffusion of Innovations theory explains how new technologies spread within organizations and societies, with adoption influenced by relative advantage, compatibility, complexity, trialability, and observability. AI adoption in communication thus depends not only on technical performance but also on organizational culture and leadership support.

From a crisis and change management perspective, communication has been widely studied as a critical resource for resilience and adaptation (Pearson & Clair, 1998; Coombs, 2019). Theories such as Situational Crisis Communication Theory (SCCT) emphasize the role of message framing, timing, and credibility in managing uncertainty and protecting organizational reputation (Coombs, 2007). AI adds new dimensions to this process by enabling real-time monitoring of stakeholder sentiment, predictive analytics for risk detection, and automated responses to emerging issues (Bok, 2021). However, such capabilities also raise ethical dilemmas, as excessive reliance on automation may undermine authenticity, transparency, and accountability in organizational messaging (Floridi et al., 2018).

Synthesizing these theoretical perspectives highlights the dual role of AI in organizational communication. On the one hand, AI enhances the efficiency and personalization of interactions by extending classical communication models with automation, prediction, and adaptive learning. On the other hand, it raises questions of trust, ethics, and organizational readiness that align with technology adoption and crisis management theories. This framework provides the conceptual foundation for analyzing AI-driven communication strategies as both technological innovations and social practices embedded within organizational contexts.

At the external level, AI is transforming the way organizations interact with customers, partners, and the wider public.

A relevant example is represented by AI-enhanced CRM platforms, which use machine learning algorithms to personalize communication with clients. Studies show that these systems can anticipate individual needs and preferences, thereby increasing customer retention and loyalty (Li & Wang, 2021).

At the same time, natural language processing (NLP) tools enable organizations to monitor online conversations in real time and to quickly identify signals of reputational crises (Coombs, 2019). In the FMCG sector, predictive analytics have been employed to anticipate demand fluctuations and to adjust communication and marketing campaigns according to market dynamics (Bok, 2021).

AI thus amplifies organizations' ability to be proactive and to adapt messages to dynamic contexts, strengthening external relationships and credibility in competitive markets.

3. Methodology

To analyse employees and managers perceptions regarding the use of Artificial Intelligence (AI) tools in internal communication, a questionnaire was administered to a sample of 150 employees from various departments of an FMCG company in Romania. The sample included 50 managers and 100 specialists and other employees, allowing us to capture both the perspectives of decision-makers and those directly involved in daily activities. This structure enabled us to understand how different hierarchical levels perceive the benefits, risks, and comfort associated with using AI in communication.

The questionnaire was designed based on several main hypotheses:

Hypothesis 1 (Benefits) – managers perceive the benefits of AI-based communication as greater than employees.

Hypothesis 2 (Comfort & Trust) – managers feel more comfortable and have greater trust in using AI.

Hypothesis 3 (Concerns) – employees express greater concern regarding the replacement of human roles and data privacy.

Hypothesis 4 (Correlations) – the perception of benefits is positively correlated with comfort and trust levels and negatively correlated with concerns.

Based on these hypotheses, the questionnaire was structured around three main dimensions - benefits, comfort and trust, and concerns in order to cover all relevant aspects of interaction with AI tools.

The questions were formulated as closed-ended items, using a five-point Likert scale ranging from "strongly disagree" to "strongly agree."

This approach enabled the collection of consistent and comparable data, facilitating the analysis of perceptual differences between employees and managers.

The combination of these questions provided a clear and detailed overview of how artificial intelligence is perceived and used in internal communication, while also highlighting the main challenges and opportunities associated with its implementation within the organization.

4. Data Processing

The data collected through the questionnaire were compiled and analysed using descriptive statistical methods. The purpose of this analysis was to identify general trends regarding employees' and managers perceptions of the use of Artificial Intelligence (AI) tools in organizational communication. The analysis was conducted at the level of the entire sample, without focusing on interdepartmental differences, emphasizing instead the average values and corresponding trends.

For each item measured on the Likert scale (from 1 – "Strongly Disagree" to 5 – "Strongly Agree"), means and standard deviations were calculated to capture the overall level of agreement among participants with the proposed statements.

The results were grouped according to the four initially defined dimensions (Benefits, Comfort and Trust, Concerns, and Relationships (Correlations) each corresponding to a previously formulated hypothesis. This structure allowed for a coherent interpretation of the data and an integrated analysis of how employees and managers relate to the adoption of AI-based solutions in internal communication processes.

Furthermore, to provide an overall perspective, the average scores of each dimension were compared to highlight the areas where perceptions were more positive or more cautious.

Data Analysis and Hypothesis Interpretation

Hypothesis 1 – Benefits

Hypothesis: Managers perceive the benefits of AI-based communication as significantly greater than employees.

Table 1. Dimension 1 – The Benefits of AI in Internal Communication

Item	Employees – Ave Score	Managers – Ave Score
AI improves internal communication	3.9	4.6
AI saves time in activities	4.2	4.7
AI facilitates coordination between departments	3.8	4.5

Source: Author work

Interpretation

The data presented in *Table 1* illustrate how employees and managers perceive the benefits of AI in internal communication. Overall, managers provided higher ratings than employees for all three items, suggesting a stronger appreciation of the positive impact of AI on organizational activities. Managers believe that AI significantly improves internal communication, saves time, and facilitates coordination between departments, with average scores ranging between 4.5 and 4.7.

Employees, on the other hand, gave more moderate evaluations, with values between 3.8 and 4.2, which may reflect more limited use of AI tools or lower familiarity with them in their daily work. The difference between the two groups may be explained by managers' more direct and frequent access to AI technologies, their additional training, or their greater experience in using automated systems.

Overall, the data suggest that both groups hold a positive perception of AI's benefits, but managers are the ones who observe and value its effects on communication efficiency and internal coordination to a greater extent. This highlights the importance of experience level and access to technology in shaping how AI's benefits are perceived within the organization.

Thus, the results indicate that managers have a more favourable perception of the benefits brought by AI compared to employees, confirming Hypothesis 1. While employees acknowledge the advantages of AI, they assess them more moderately. This difference may be explained by the fact that managers tend to notice AI's broader strategic and organizational impact, whereas employees focus more on their individual experience.

Hypothesis 2 – Comfort and Trust
Hypothesis: Managers feel more comfortable and have greater trust in using AI than employees.

Table 2. Dimension 2 – Comfort and Confidence in Using AI in Internal Communication

Item	Employees – Ave Score	Managers – Ave Score
I feel comfortable using AI	3.6	4.4
I trust AI's accuracy	3.4	4.2
I would recommend AI to colleagues	3.7	4.5

Source: Author work

Interpretation

The data regarding comfort and confidence in using AI show significant differences between employees and managers. Managers' report a high level of comfort in using AI, with an average of 4.4, and a strong degree of confidence in its accuracy, with an average of 4.2, whereas employees provide more moderate evaluations, ranging from 3.4 to 3.7. Additionally, managers appear more likely to recommend AI to colleagues, with an average of 4.5, compared to employees, whose average is 3.7.

This difference can be explained by managers greater experience in using AI tools, easier access to training and resources, and the familiarity and confidence they have developed over time. Employees, who are likely at the earlier stages of interacting with the technology, show a more moderate level of comfort and confidence, which is also reflected in their willingness to recommend AI to colleagues.

Overall, the data suggest that although both groups have a positive perception of AI, managers exhibit a more confident and comfortable attitude toward its use, which may influence the implementation and adoption of AI technologies at the organizational level.
In conclusion, managers feel more comfortable and confident in using AI, while employees show moderate reservations but are generally open to using it. These results support Hypothesis 2, indicating that managerial experience and familiarity with the technology influence the level of comfort and confidence.

Hypothesis 3 – Concerns
Hypothesis: Employees will exhibit more concern regarding the replacement of human roles and data privacy than managers.

Table 3. Dimension 3 – Concerns and Risks

Item	Employees – Ave Score	Managers – Ave Score
AI could replace human interactions	4.1	3.2
Concerns about data privacy	4.3	3.5

Source: Author work

Interpretation

The data regarding concerns and risks associated with the use of AI in internal communication indicate that the perception of potential negative effects is moderate. For the statement about the possibility of AI replacing human interactions, most respondents fall in the neutral or slightly positive range, with a similar number expressing higher or lower concern, resulting in an average score of 3.2. This suggests that employees are aware of possible changes in interaction patterns but do not consider them a major risk.

Regarding concerns about data privacy, responses are slightly more inclined toward agreement, with an average of 3.5, indicating a moderate level of concern about how AI systems handle data. Employees thus show heightened attention to information protection and associated risks, although these are not perceived as critical threats.

Overall, the data suggest that while there is awareness of potential AI risks in internal communication, these risks are moderate and do not exceed a level of reasonable concern, which may facilitate the adoption of the technology within the organization, provided that adequate security and transparency measures are in place.

Employees are more concerned about AI risks than managers, confirming Hypothesis 3. These concerns reflect anxiety related to changes in their roles and information security, whereas managers, from a strategic perspective, perceive the risks as more controllable.

Hypothesis 4 – Relationships between dimensions (Correlations)
Hypothesis: The perception of benefits is positively correlated with comfort/trust levels and negatively correlated with concerns.

To test Hypothesis 4, we compared the average responses for the three main dimensions of the study: Benefits (D1), Comfort and Confidence (D2), and Concerns and Risks (D3). The analysis is based on the trends observed in the average scores for employees and managers, providing a qualitative interpretation of the relationships between the dimensions.

Table 4. Average Scores of the Dimensions for Employees and Managers

Dimmensions	Description	Employees – Mean	Managers – Mean
D1 - Benefits	Perceived Benefits of Using AI (e.g., Productivity, Collaboration)	3.97	4.59
D2 – Comfort and Trust	Level of Comfort and Confidence in Using AI	3.57	4.37
D3 – Concerns and Risks	Level of Concern Regarding AI-Related Risks	4.20	3.35

Source: Author Work

The direction of the relationships between dimensions is based on the comparison of mean scores:

- **Positive correlation:** both dimensions increase or decrease together.
- **Negative correlation:** one-dimension increases while the other decreases.

Table 5: Comparative Relationships Between Dimensions

Relationship Between Dimensions	Employees – Type of Relationship	Managers – Type of Relationship	Comparative Observation
D1 – Benefits ↔ D2 – Comfort/Confidence	Moderate Positive	Strong Positive	The correlation is stronger among managers, indicating a more coherent perception of AI's value.
D1 – Benefits ↔ D3 – Concerns/Risks	Weak Negative	Strong Negative	Managers more clearly associate the benefits with a decrease in concerns, while employees are more cautious.
D2 - Comfort/Confidence ↔ D3 – Concerns/Risks	Moderate Negative	Negative	In both groups, confidence increases as perceived risks decrease, but the relationship is stronger among managers.

Source: Author work

Interpretation

D1 – Benefits ↔ D2 – Comfort/Confidence: The analysis shows that, for employees, the perception of AI benefits is moderately associated with their level of comfort and confidence, suggesting that technological advantages—such as increased efficiency and improved collaboration—positively influence, but not uniformly, how they feel when using AI. Managers, on the other hand, exhibit a strong positive correlation, indicating a clear link between recognizing benefits and personal comfort, likely due to greater experience or decision-making responsibilities that allow them to understand AI's concrete impact on organizational processes.

D1 – Benefits ↔ D3 – Concerns/Risks: For employees, the relationship is weakly negative, signalling that while they acknowledge AI's advantages, perception of risks persists to some extent—for example, concerns about data privacy or job impact. Managers show a strong

negative correlation, suggesting that for them, an increase in perceived benefits is clearly associated with a reduction in concerns, reflecting a clearer and more confident perception of AI's constructive role.

D2 – Comfort/Confidence ↔ D3 – Concerns/Risks: The relationship is moderately negative for employees and clearly negative for managers. This confirms the expectation that as confidence and comfort in using AI increase, perceived risks decrease. However, the stronger intensity among managers indicates that experience and familiarity with implementation processes significantly reduce fears, whereas employees remain more cautious.

The analysis of relationships between dimensions confirms Hypothesis 4: the perception of benefits is positively correlated with comfort and confidence and negatively correlated with concerns, although the strength of these correlations differs between groups. Managers exhibit stronger and more coherent relationships between AI benefits, comfort/confidence, and reduced concerns, indicating a clear and confident perception of AI's role. Employees show a moderate correlation, maintaining a more cautious attitude where advantages and risks coexist.

Overall, the results suggest that as AI benefits become evident and comfort levels increase, concerns decrease. Additionally, the differences between employees and managers highlight the need for internal communication and training strategies aimed at strengthening employees' confidence and reducing uncertainties related to AI use in daily activities.

General interpretation of results

The analysis of the data collected through the questionnaire highlighted several relevant aspects regarding employees and managers perceptions of the use of artificial intelligence (AI) tools in internal communication. Firstly, it is confirmed that managers perceive the benefits of AI to a greater extent than employees. The latter acknowledge the advantages of digital tools, such as time-saving, process optimization, and improved coordination between departments; however, their level of appreciation is moderate, reflecting a more cautious approach. Managers, due to their responsibilities and visibility over organizational impact, provide more positive and consistent evaluations, suggesting a strategic perception of the value added by AI.

Regarding comfort and trust in using AI, the data show that managers feel more confident and familiar with these tools, while employees exhibit moderate reservations. Nevertheless, the majority of respondents are open to using AI and experimenting with new technologies in their daily tasks. This trend indicates that, although there is a level of caution, the overall perception is positive and favourable toward the adoption of AI in internal communication processes.

The dimension of concerns reveals notable differences between the two groups. Employees are more worried about the potential replacement of essential human interactions and data privacy, whereas managers perceive these risks as more manageable. This result reflects employees' anxiety regarding changes in their roles and the impact of digital technologies on information security, while managers adopt a more organizational perspective focused on process control.

The correlation analysis between dimensions confirms that the perception of AI benefits is strongly positively associated with comfort and trust levels and negatively correlated with concerns. In other words, employees and managers who recognize greater benefits tend to feel more comfortable using AI and exhibit fewer fears. This suggests that

proper training, clear communication of advantages, and direct experience with AI tools can reduce resistance and concerns related to technology adoption.

Overall, the results indicate a favourable perception of AI, especially among managers, while also highlighting the need to address employees' concerns to ensure a sustainable and responsible integration of digital tools in organizational communication. Gradual implementation, supported by training and practical success examples, can contribute to increasing employees' comfort, trust, and engagement, thus strengthening organizational change oriented toward efficiency and innovation.

In the current context of digital transformation, communication strategies driven by artificial intelligence are not limited to the internal sphere but profoundly redefine the external interactions of organizations as well.

Using intelligent chatbots, companies can provide 24/7 customer assistance, simultaneously manage large volumes of inquiries and deliver personalized responses that enhance satisfaction and loyalty (Haider & Kayani, 2020). Advanced AI-based analytics enable the personalization of customer experiences and the development of targeted marketing strategies that strengthen consumer engagement and message relevance (Rust & Huang, 2021).

AI also plays an essential role in public relations management through public sentiment analysis and the monitoring of collective perceptions, thereby contributing to the prevention and proactive management of reputational crises (Kaplan & Haenlein, 2019).

In the area of sales and marketing, predictive models can identify customer segments, optimize campaigns, and support dynamic pricing decisions, offering a strategic perspective on consumer behaviour (Chui, Manyika, & Miremadi, 2016). Moreover, automated analysis of feedback collected through digital tools enables organizations to implement continuous improvement processes based on real data and adaptive learning (Davenport & Ronanki, 2018).

Thus, AI-driven external communication becomes a dynamic, customer-centred process that integrates, in real time, public information, behaviours, and perceptions, generating an authentic relationship between the organization and its external environment.

Although the present research focused primarily on internal communication, the impact of artificial intelligence clearly extends beyond organizational boundaries. Recent studies highlight that AI-based communication tools — such as chatbots, virtual assistants, predictive analysis of consumer behaviour, and automated customer responses — significantly transform the way organizations interact with their external audiences (Roy et al., 2025; Kalogiannidis et al., 2024). These technologies enhance response speed, personalize user experiences, and strengthen organizational reputation through data-driven communication.

In this sense, the dimensions captured by the questionnaire - such as trust, adaptability, and perceived usefulness of AI — can also be extrapolated to external communication, where similar factors influence public perception, customer engagement, and the efficiency of crisis management (Florea & Croitoru, 2025; Roy et al., 2025).

From an integrated perspective, the use of artificial intelligence in both internal and external communication contributes to building more transparent, efficient, and adaptable organizations. The internal alignment of teams through AI-assisted tools is reflected in a coherent, credible, and audience-oriented external communication strategy.

Discussion

The questionnaire results clearly show that managers perceive more benefits and feel more comfortable using AI than employees, suggesting that managerial experience and visibility over strategic impact positively influence attitudes toward technology. This difference between groups can be interpreted as a signal for organizations: training and clear communication with employees can increase comfort levels and acceptance of AI, reducing fears related to role replacement or data privacy.

Additionally, the observed correlations between perceived benefits, comfort, and concerns indicate that positive experience with AI tools can be a key factor in reducing resistance to change. This suggests that AI implementation should not only be technological but also strategic and people-oriented, demonstrating advantages and actively involving employees in the process.

Furthermore, open-ended responses provide valuable insights regarding the practical use of AI: automation of repetitive tasks, information centralization, and message clarity are perceived as main benefits, while lack of transparency and concerns about data security remain significant challenges. These observations can guide internal policies, training programs, and the communication of AI within the organization to ensure smoother and ethical adoption.

However, the impact of AI is not limited to internal communication. The specialized literature emphasizes that artificial intelligence also redefines external communication by creating a continuous dialogue between the organization and its audiences. The use of intelligent chatbots and personalization algorithms enables the provision of constant support tailored to customer needs (Haider & Kayani, 2020), while automated sentiment analysis contributes to monitoring public perception and proactively managing organizational reputation (Kaplan & Haenlein, 2019). Furthermore, AI supports marketing and sales processes through advanced customer segmentation, the identification of preferences, and the adaptation of messages according to individual behaviors (Rust & Huang, 2021).

Thus, the correlations identified within internal communication — such as the relationship between perceived benefits and the level of comfort - can also be extrapolated to the external sphere. The acceptance and effectiveness of AI in interactions with external audiences depend on their trust in technology, the organization's transparency, and the extent to which automated interactions manage to maintain a balance between efficiency and empathy.

5. Conclusion

This study highlighted how employees and managers perceive the use of AI-based tools in the organization's internal communication. The results indicate that managers value AI benefits more highly and feel more comfortable and confident using these tools, while employees exhibit moderate reservations, particularly regarding data privacy and the potential reduction of human interactions.

The correlation analysis showed that the perception of benefits is directly related to comfort and trust levels and inversely related to concerns, suggesting that positive experience and adequate training can reduce employees fears. Open-ended responses confirm this trend and provide practical insights on how AI can support internal communication by automating repetitive tasks, centralizing information, and increasing process efficiency.

At the same time, the current literature shows that the same principles can also be extended to external communication, where AI contributes to improving customer experience, personalizing messages, and managing public relations more effectively. By using chatbots, predictive analytics, and segmentation algorithms, organizations can respond more quickly and accurately to audience needs, while simultaneously strengthening trust and brand image (Davenport & Ronanki, 2018; Rust & Huang, 2021).

In conclusion, AI is perceived as a useful and strategic tool for internal communication, with the potential to support organizational change and innovation. At the same time, for sustainable and widely accepted implementation, it is essential that organizations provide training, transparency, and clear communication regarding AI usage, so that benefits are maximized and fears are minimized.

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EMPLOYEE PERFORMANCE MANAGEMENT: NEW EVELOPMENTS IN THE VUCA ENVIRONMENT

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Abstract: *The article analyzes the essence, principles, implementation possibilities, and impact of performance management on companies. The general objective of the paper is to research the theoretical and methodological foundations for developing employee performance management in the context of a new business environment—the VUCA environment—illustrating the opportunities and threats to achieving organizational performance. The study examines the latest trends in performance management development, taking into account the recent changes that have affected the activity of economic agents. It further explores the performance management cycle, the main factors influencing performance, as well as the effects of performance management on companies' activities. The research methodology is complex and comprehensive, given that in writing the paper we used various research methods such as analysis, synthesis, induction, deduction, scientific abstraction, and content analysis, which supported us to advance in our research and obtain relevant results. As a result of the research conducted, we can highlight that in the context of the new VUCA environment, companies must reassess their organizational objectives, carefully analyze the factors influencing organizational performance, and develop the necessary competencies for their employees so that the company can achieve a high level of performance by effectively leveraging the potential of its employees.*

Keywords: *performance, performance management, employees, VUCA environment, competency, competitive advantage.*

JEL Classification: *M12.*

1. Introduction

The concept of performance management has undergone one of the most important developments in the field of human resource management. Performance-based pay and evaluation systems, developed in a rudimentary manner and implemented hastily, often failed to deliver the results that organizations expected from them. Performance management was built on old systems of merit assessment and management by objectives.

Performance management is a strategic and integrated process that delivers sustained success to organizations by improving the performance of the people who work within them and by developing the capabilities of individual contributors and teams. It is strategic in the sense that it addresses the broader issues faced by organizations that aim to operate efficiently within their environment, while also guiding the overall direction the business intends to pursue in order to achieve its long-term objectives.

Performance management is integrated in two ways:

- *Vertical integration* – integrating or aligning business, team, and individual objectives with core organizational competencies;

- *Horizontal integration* – integrating various aspects of human resource management, particularly organizational development, human resource development, and reward systems, in order to establish a coherent approach to employee management and development.

Essentially, performance management is a process shared between managers and the teams they lead. The concept is based on the principle of management by contract rather than

by command, although this does not exclude the need to include high performance expectations in such contracts.

2. Research methodology

The general objective of this study is to investigate the theoretical and methodological foundations for developing employee performance management in the context of a new business environment—the VUCA environment—illustrating the opportunities and threats associated with achieving organizational performance.

This paper aims to analyze the importance and fundamental role of employee performance management in creating and strengthening competitive advantages. In order to achieve the general objective of the research, the following specific objectives have been established:

O1: researching the conceptual foundations of employee performance management;

O2: identifying the essence and characteristics of employee performance management in the new business environment – the VUCA environment;

O3: identifying opportunities for strengthening employee performance management in the VUCA environment.

As research methods, we focused on using a broad and varied methodology that enabled us to obtain relevant results and achieve both the general objective and the specific objectives. In developing this study, we concentrated on employing the following research methods: analysis, synthesis, induction, deduction, abduction, content analysis, graphical methods, and tabular methods.

3. Content

Performance management is based on agreement on objectives, knowledge, skills, and ability (competency) requirements, performance improvement, and personal development plans. It involves joint and continuous review of performance in relation to these objectives, requirements, and plans, as well as the agreement and implementation of plans for improvement and further development. The basis on which performance management operates is illustrated in *Figure 1*.

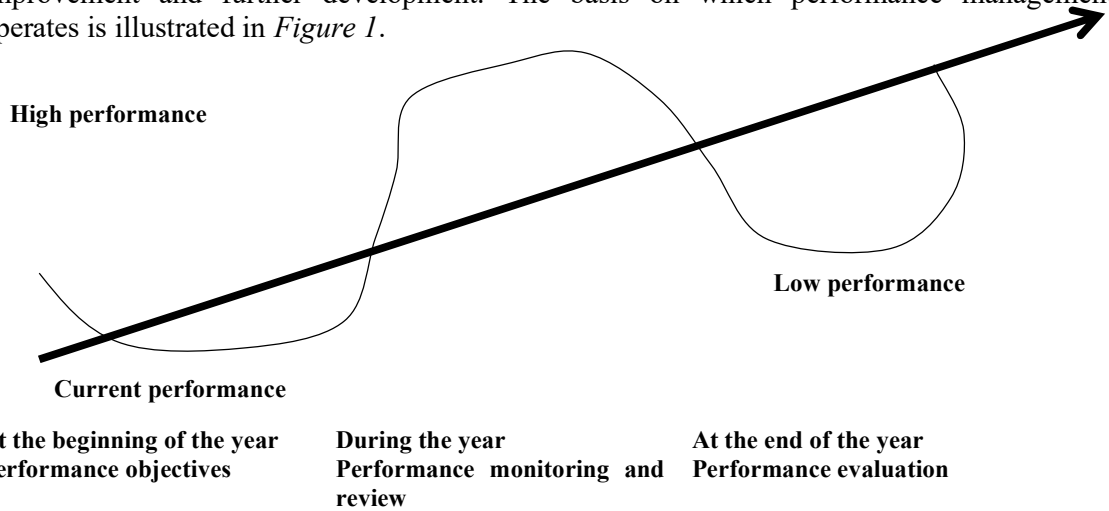

Figure 1. The stages of performance management

Source: adapted from Armstrong, M. *Performance Management: Key Strategies and Practical Guidelines*. USA: Kogan Page Limited, 2000, p. 15.

Performance management is a means of achieving better results from the entire organization, or from teams and individuals within it, by understanding and managing performance within a framework focused on planned objectives, standards, and competency requirements. It is a process for establishing a common understanding of what needs to be achieved, and an approach to managing and developing people in a way that increases the likelihood of achieving these outcomes in both the short and long term.

The fundamental purpose of performance management is to establish a culture in which individuals and groups take responsibility for the continuous improvement of business processes and for their own skills and contributions. The principles of performance management are represented in *Figure 2*.

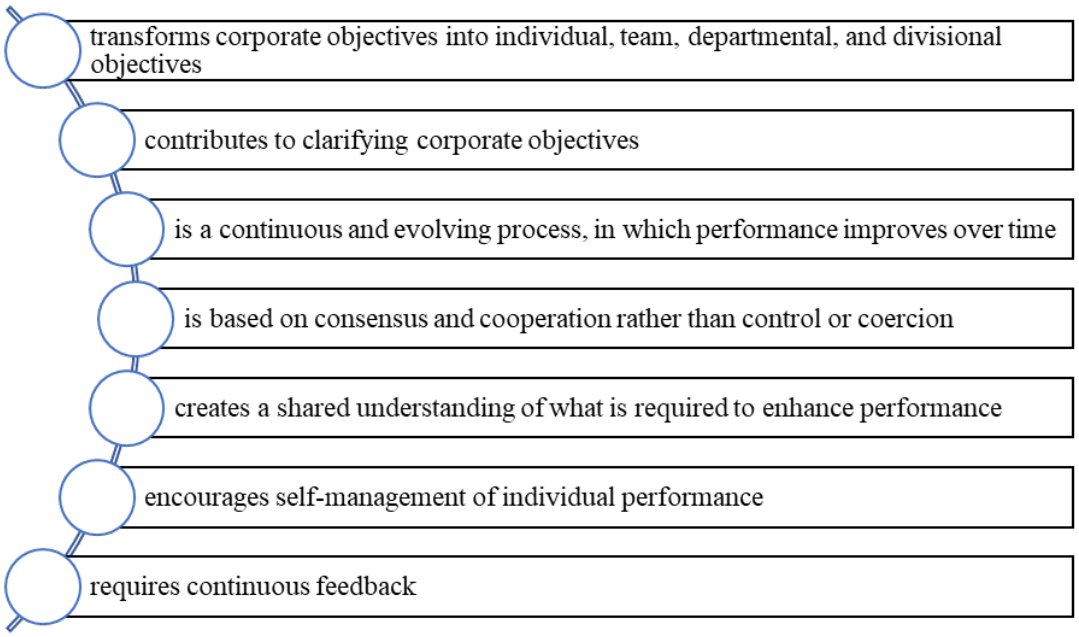

Figure 2. The principles of performance management

Source: adapted from Armstrong, M. *Performance Management: Key Strategies and Practical Guidelines*. USA: Kogan Page Limited, 2000, p. 17.

Analyzing the fundamental principles of performance management, it becomes evident that the concept is primarily concerned with improving performance in order to achieve organizational, team, and individual efficiency.

Furthermore, performance management also focuses on employee development in order to support them in achieving organizational performance. Performance improvement is only achievable if there are effective continuous development processes in place. This approach addresses both the core capabilities of the organization and the specific competencies of individuals and teams.

In the same context, performance management raises concerns about meeting the needs and expectations of all stakeholders in an organization: owners, management, employees, customers, suppliers, and the general public. In particular, employees are treated as partners in the enterprise whose interests are respected, who have a say in matters that concern them, and

whose opinions are sought and listened to. Performance management should respect the needs of individuals and teams as well as those of the organization, recognizing that these will not always coincide.

Finally, performance management addresses concerns about communication and employee engagement. At the same time, it fosters a climate in which continuous dialogue takes place between managers and their team members to define expectations and to share information about the organization's mission, values, and goals. This establishes a mutual understanding of what must be achieved and provides a framework for managing and developing people to ensure that this will be achieved.

Researchers Fletcher and Williams suggested four fundamental principles of effective performance management, namely:

1. Performance management should be administered by direct management rather than the human resources department;
2. Emphasis should be placed on shared corporate objectives and values;
3. Performance management must be tailored to each individual organization;
4. Involvement of all staff is required, not just part of the management team (Fletcher & Williams, 1992).

Although each organization that seeks to implement performance management should develop its own version tailored to its specific needs, it is useful to have a conceptual framework within which to develop and operate organizational processes. Such a framework supports the decision-making process regarding the most appropriate approach and, once that decision has been made, provides guidance to managers as well as to the individuals and teams they oversee concerning the performance management activities to be carried out.

Performance management can be described as a continuous cycle of self-renewal, as illustrated in *Figure 3*.

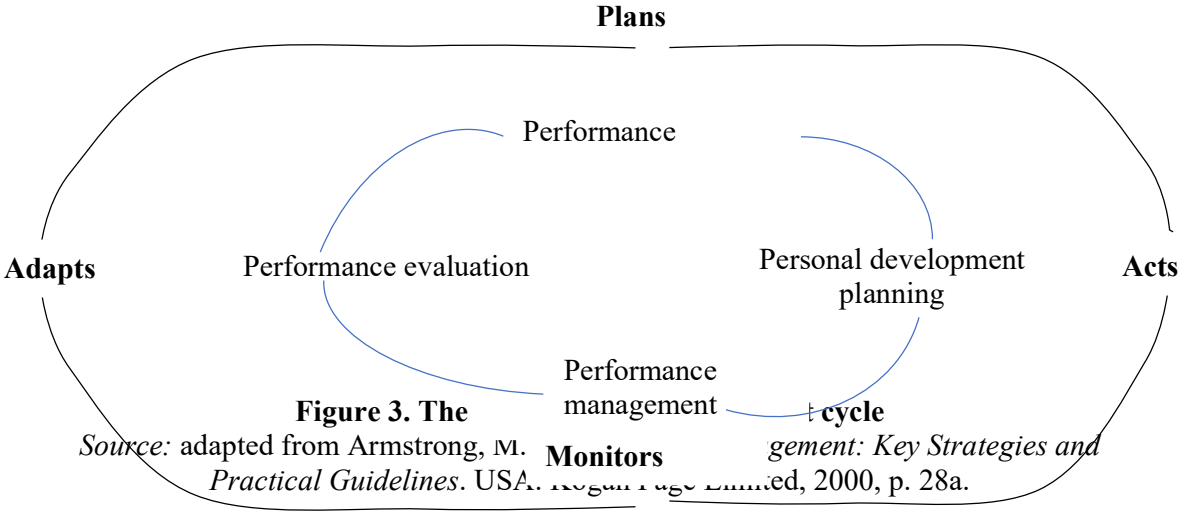

Figure 3. The **cycle**

Source: adapted from Armstrong, M. *gement: Key Strategies and Practical Guidelines*. USA. Kogan Page Limited, 2000, p. 28a.

The performance management cycle includes several defining elements, such as:

1. *The performance agreement* – defines expectations: what an individual needs to achieve in terms of objectives, how performance will be measured, and the capabilities

required to deliver the desired results. This could be described as the *performance planning stage.*

2. *Personal development plan* – outlines the actions employees intend to take to develop themselves in order to expand their knowledge and skills, increase their capacity levels, and improve their performance in specified areas. This is the *performance development stage.*

3. *Performance management* – the stage in which measures are taken to implement the performance agreement and personal development plan as individuals continue their daily work and planned learning activities. This includes a continuous process of providing feedback on performance, conducting informal progress reviews, updating objectives, and, where necessary, addressing performance issues.

4. *Performance evaluation* – the formal stage in which performance is reviewed over a period, covering achievements, progress, and issues, serving as the basis for a revised performance agreement and personal development plan. It may also lead to *performance evaluations.*

In his works, researcher Aguinis (2013) presents the *performance management cycle*, which includes four main stages:

1. *Performance planning* – in the performance planning process, the organization sets clear, measurable and relevant (SMART) objectives for the performance to be achieved by its employees. At the same time, company management must design a process for aligning individual goals with organizational goals that will support the process of achieving and enhancing organizational performance.

2. *Performance monitoring* – this stage focuses on the continuous monitoring of team activities necessary to achieve performance targets. Moreover, company management must provide effective feedback to all company employees in order to strengthen team spirit towards achieving organizational performance. Also, at this stage, adjustments must be made, as appropriate, to employee behavior and activities in order to achieve the pre-established performance level.

3. *Performance evaluation* – this stage involves the actual evaluation of the results achieved by the company's employees, which can be done through employee interviews, quantitative or qualitative assessments designed to support the process of achieving organizational performance.

4. *Performance development* – this stage focuses on identifying development and coaching needs through various professional training courses, mentoring sessions, etc. (Aguinis, 2013).

Examining the specialized literature, we can identify several key factors that influence the effectiveness of performance management within an organization, namely:

1. *Clarity of organizational objectives and their alignment with business strategy* – well-defined organizational objectives contribute to ensuring that employees clearly understand and are able to achieve them (Armstrong, 2020).

2. *Managerial skills of leadership* – company leadership is the fundamental pillar of achieving organizational performance by employees, through motivating and monitoring employees in their efforts to achieve performance (Lussier, Achua, 2016).

3. *Compensation and recognition system* – a fair, equitable, and transparent remuneration system contributes to increasing employee motivation and involvement in achieving and increasing performance levels (Dessler, 2020).

4. *Organizational culture* – an organizational culture that promotes transparency and meritocracy supports the process of improving employee performance (Schein, 2010).

5. *Adoption of modern technologies* – the use of modern technologies in the employee performance evaluation process enhances trust in the performance management system (Stone, 2013).

6. *Employees involvment in setting organizational objectives* – involving employees in the process of defining organizational objectives increases their commitment to achieving these objectives (Aguinis, 2013).

7. *Providing continuous feedback and coaching* – in order to achieve performance, employees require continuous feedback in order to monitor, adapt, and correct their performance in achieving organizational objectives (Pulakos, 2009).

Analyzing the variety of factors influencing performance management, we can highlight a two-dimensional influence on its effectiveness: an organizational influence, which largely determines performance standards, objectives, and strategies for achieving performance, and an individual influence, which depends on the capacities, skills, and abilities of individuals in their pursuit of performance.

Schematically, the two-dimensional influence on achieving effective performance management is illustrated in *Figure 4*.

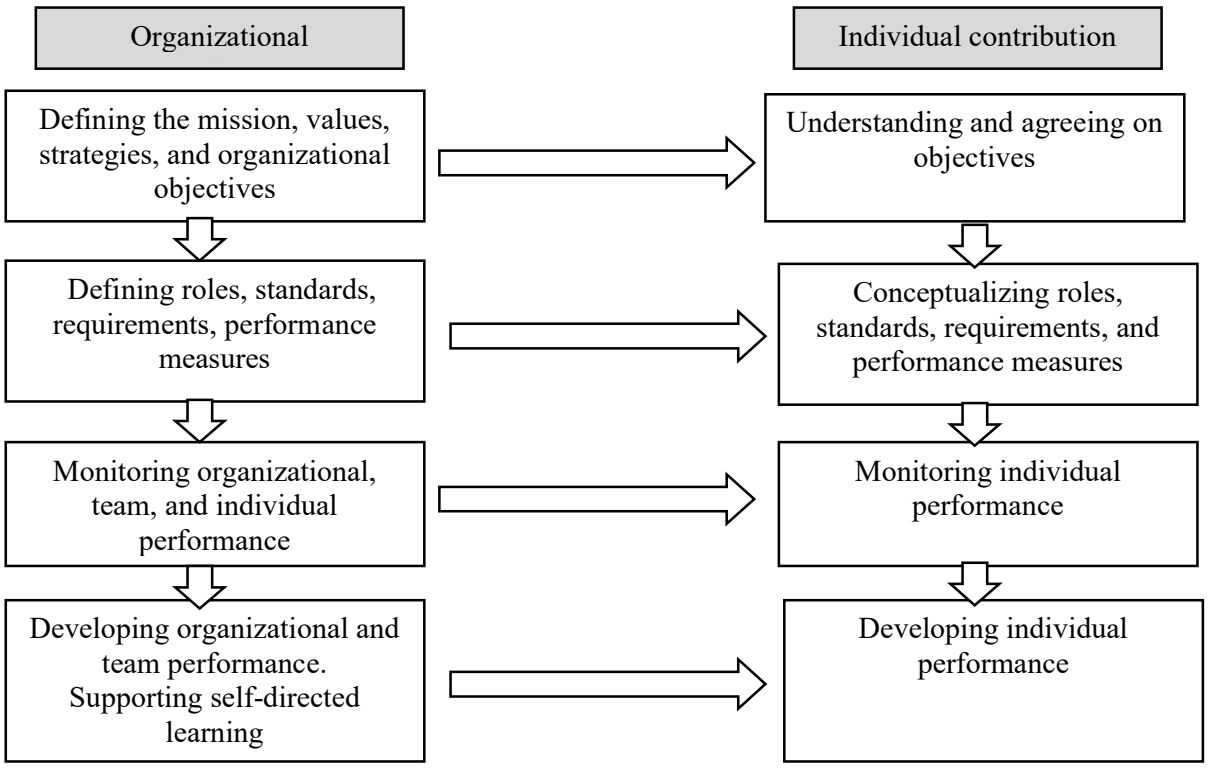

Figure 4. The two-dimensional influence of performance management

Source: developed by the author

Companies have realized that they must develop unique dynamic capabilities that strengthen their competitive advantages in order to survive in a constantly changing market environment. Consequently, they focus on human resource development, particularly on enhancing employee performance, which becomes a source of strategic advantage (Wright & Snell, 2009).

Researchers Narcisse and Harcourt (2008, p. 1152) state that "employee performance appraisal is one of the most emotionally charged activities in business life – evaluating a person's contribution and ability" (Narcisse & Harcourt, 2008). On the other hand, researchers Boxall and Purcell (2011) indicate that implementing a well-defined process for evaluating employee performance plays a crucial role in ensuring the effective functioning of a company (Boxal & Purcell, 2011).

Furthermore, Rynes et al. (2000) argue that the main challenge for companies is to evaluate the performance of their employees and consider how it can become more efficient and "valid" (Rynes, Barber & Varma, 2000). In other words, how can companies implement performance evaluation practices to improve their ability to distinguish high-performing employees from those with lower performance?

Therefore, it is essential that companies are aware of their employees' capabilities in order to be able to manage them effectively and, in turn, align them with the company's overall business strategy (Boxall & Purcell, 2011).

However, researchers Murphy and Cleveland (1991) report that many important factors regarding the research and development of a performance evaluation model are still often overlooked, which may explain why an integrated model for performance evaluation has yet to be established (Murphy & Cleveland, 1991). Furthermore, as Nguyen et al. (2015, p. 567) state, "although there have been many studies examining the impact of various factors on employee performance, very few have investigated more than three factors simultaneously" (Nguyen, Dang & Nguyen, 2015).

In the same vein, Mathis and Jackson (2011) and Armstrong (2012) argue that both internal and external environmental factors of the company, such as managerial support, employee training culture, organizational climate, and environmental dynamism, are interconnected with workplace conditions, including communication, autonomy, and the work environment. Moreover, they emphasize the second category of factors, namely those related to employees themselves, such as intrinsic motivation, proactivity, adaptability, skill flexibility, commitment, and qualification level (Mathis & Jackson, 2011; Armstrong, 2012).

In the same context, many researchers (Pulakos, 2004; Armstrong, 2012) argue that managerial support is an important condition for improving employee performance (Pulakos, 2004; Armstrong, 2012). As Morrison and Phelps (1999) point out, when employees perceive that management supports their work-related efforts, improved workplace performance is more likely to occur (Morrison, Phelps, 1999). In addition, Parker et al. (2006) found that managerial support is positively correlated with employee-related factors such as commitment and proactivity (Parker, 2006).

Similarly, Lepak et al. (2006) found that organizational climate influences employee attitudes and behaviors and, consequently, their performance levels (Lepack, 2006), while Chatman et al. (2014) report a relationship between organizational climate and adaptability, while Erkutlu (2012) argues that it also affects employees' level of proactivity.

Finally, researchers Boxall et al. (2007) emphasize that organizational culture influences employee behavior, while Roos and Van Eeden (2008) argue that it is closely related to employees' motivation levels.

At the same time, researchers Dermol and Cater (2013) state that acquiring new knowledge and skills through training leads to improved professional performance. In addition, Hale (2002) and Armstrong (2012) emphasize that training improves employees' knowledge and skills so that they can successfully cope with new daily challenges related to their job and, therefore, improve their performance at work.

Furthermore, Song et al. (2011) found that training culture is related to professional autonomy.

In the same vein, Ketkar and Sett (2010) report that environmental dynamism affects company performance (Ketkar & Sett, 2010). In other words, in a dynamic environment, the workplace itself and its performance acquire unique characteristics. Finally, according to Crant (2000), employees operating in a dynamic work environment characterized by increasing job demands are prone to develop behaviors that lead to increased performance (Crant, 2000). Panayotopoulou et al. (2003) state that environmental dynamism is a factor influencing employees' adaptive capacity (Panayotopoulou et.al., 2003), while Papalexandris and Nikandrou state that "the instability of the general economic environment in which European companies operate creates difficulties in defining the necessary skills that the workforce should possess" (Papalexandris & Nikandrou, 2000, p. 400).

Noe et al. (2006, p. 162) define job autonomy as the extent to which "the workplace allows the employee to make decisions about how to perform their work" (Noe et al., 2006, p. 162). They also state that job autonomy is positively associated with employee performance. More specifically, the researchers emphasize that job autonomy reflects the degree of freedom and independence that employees have in making decisions about how to accomplish their tasks. Thus, employees with higher levels of job autonomy demonstrate greater flexibility in their work as they are able to choose how to perform their tasks more effectively, thereby, enhancing their performance (Morgenson et.al., 2005). Moreover, Parker et al. (2006) found that job autonomy is also positively correlated with employee commitment and proactivity (Parker et al., 2006). Furthermore, Dysvik and Kuvaas (2011) report that there is a relationship between professional autonomy and employee performance, which is moderated by intrinsic motivation (employee-related factors) (Dysvik & Kuvaas, 2011).

Regarding the work environment, Kopelman et al. (1990) report that the work environment significantly influences the productivity and performance of employees (Kopelman et.al., 1990). Furthermore, Fawcett et al. (2008) argue that the work environment affects employees' ability to be proactive and productive (Fawcett et. al., 2008). Concerning workplace communication, Price (1997) suggests that workplace communication is linked to commitment and motivation (Price, 1997), while Chen et al. (2006) found that workplace communication is associated with commitment (an employee-related factor) (Chen et al., 2006). In addition, Bush and Frohman (1991) report that workplace communication represents an essential factor that can lead to higher levels of company performance (Bush & Frohman, 1991).

In the same vein, Armstrong (2012) argues that workplace communication is a crucial factor, which is related to the overall performance of employees (Armstrong, 2012).

In the context of the new business environment, employees are required to continuously update of their skills, abilities, values, behaviors, and attitudes. The VUCA environment,

characterized by increased uncertainty, complexity, and ambiguity, requires employees to aquire new competencies relevant to this environment, which would enable them to effectively fulfill their tasks under such conditions. The new competencies required of employees for effective performance in the VUCA environment are presented in *Table 1*.

Table 1. The new competencies required of employees for effective performance in the VUCA environment

New competencies	Characteristics
Adaptive strategic thinking	It involves the employee's ability to take a holistic view of tasks and quickly adapt to new changes.
Emotional intelligence	It involves the employee's ability to efficiently manage their own emotions under stress, uncertainty, and ambiguity.
Learning agility	It involves the employee's willingness to learn from new experiences and to rapidly apply skills in new contexts.
Decision-making under uncertainty	It involves developing the employee's ability to make rational and timely decisions in uncertain conditions.
Flexible leadership	It involves the ability to lead diverse and virtual teams effectively.
Critical thinking	It involves complex thinking focused on generating creative solutions.

Source: Adapted from Johansen, B. (2017). *The New Leadership Literacies: Thriving in a Future of Extreme Disruption and Distributed Everything*. Berrett-Koehler Publishers.

From the analysis of the data presented in the table, it can be observed that within the VUCA environment, company employees must adapt rapidly to new changes, demonstrate analytical spirit, critical thinking, promptness in action, and the ability to deal with complexity. All these competencies are characterized by a high level of complexity, requiring a continuous development of employees' potential.

Table 2 provides a synthetic overview of the changes in employee competencies in the classic model, on the one hand, and in the VUCA environment, on the other.

Table 2. Changes in employee competencies in the VUCA environment

Key aspects	Classic environment	VUCA environment
Knowledge	Greater emphasis on technical and formal knowledge.	Emphasis on leveraging employees' continuous learning
Hard skills	Focus on basic professional skills.	Emphasis on dynamism and rapid updating in response to emerging changes.
Soft skills	Low level of utilization: limited communication, collaboration, and empathy	High level utilization of skills: effective communication, collaboration, empathy.
Career guidance	Specialized guidance in a specific field.	Multifunctional orientation, characterized by high adaptability.

Leadership	Leadership focused on authority, excessive control.	Leadership based on collaboration, empathy, and performance.
Decision-making	Bureaucratic, highly controlled process.	Decentralized, rapid, and adaptive process.
Adaptability	Low adaptability.	High adaptability.
Innovation	Low promotion of innovation at the organizational level.	Intense promotion of innovation at the organizational level.
Digital Tools	Basic tools.	Advanced digital tools.

Source: Adapted from Bennett, N., & Lemoine, G. J. (2014). *What a difference a word makes: Understanding threats to performance in a VUCA world.* Business Horizons, 57(3), 311–317.

Analyzing the content of *Table 2*, it is evident that, in the context of new changes that have significantly influenced the business environment, employees must develop new competencies adapted to these changes. Thus, if in the classic model, business processes were more rigid, autocratic, narrow and formalized, then the new VUCA environment requires employees to master new competencies to achieve organizational performance, such as rapid adaptability, continuous learning, decentralization and advanced digital skills. Consequently, in order to increase their performance, employees are obliged to adapt in real time to the new context and to be able to identify new decision-making pathways aimed at maximizing outcomes.

Along with the evolution of the business environment, the methods of evaluating employee performance have also evolved. Thus, if from the beginning companies implemented classic methods of evaluating employee performance, currently, as a result of the VUCA environment and the multiple changes that have occurred in the business environment, companies are compelled to implement new methods of evaluating employee competencies. These approaches aim to enhance employee motivation, increase job satisfaction, and improve the overall performance outcomes of employees.

4. Conclusions

In conclusion, it can be noted that alongside the evolution of the business environment and society as a whole, researchers' concerns regarding employee performance have also evolved. These changes have affected not only the requirements regarding the competencies assessed in performance evaluations but also the evaluation methods applied in this regard. Initially, simpler methods were used, often based on single-criterion or simplistic evaluations. However, in the current VUCA environment, characterized by uncertainty, dynamism, ambiguity, companies have transitioned to modern evaluation methods. These contemporary approaches involve continuous evaluations, adapted in real time, and include continuous feedback to employees in order to maximize their performance outcomes.

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INTERNATIONAL CONDITIONS WITH EFFECT ON ROMANIAN ECONOMY

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Abstract: *The global economy is a complex system, influenced by a variety of interconnected factors. In recent years, there have been notable global economic features, but also a series of unforeseen events that have negatively influenced it. The pandemic has had a profound impact on the global economy, leading to a significant contraction of economic activity and accentuating already existing vulnerabilities. As countries implemented measures to reduce the spread of the virus, economic output has declined. In the first months of 2020, there was an unprecedented decline in the GDP of all affected countries and implicitly of global GDP, the measures initially adopted led to economic stagnation, with knock-on effects on global trade, tourism and consumption of goods and services. Conflicts and political instability have also disrupted global trade and capital flows. The most recent example is the conflict in Ukraine, which has affected energy markets and supply chains. The increase in global inflation, especially due to the increase in energy and food prices, has reduced purchasing power and affected global economic growth. Although the Romanian economy has recorded sustained economic growth in recent years, managing to reduce the gap with developed countries in Western Europe, in recent years a series of macroeconomic imbalances have accumulated, namely increased public debt, rapidly growing external debt, very high interest rates on newly contracted loans, high inflation, budget deficit, trade deficit, current account deficit, imbalances that require efficient and sustainable economic policies to be reduced and not further hamper economic development. Continuing reforms and adapting to international conditions are essential for its economic future. The paper aims to create a picture of the domestic and international economic situation with an effect on the current and prospective evolution of the Romanian economy.*

Keywords*: international trends, economic growth.*
JEL Classification*: H62, E62, E66.*

1. Introduction

The Romanian economy has experienced significant macroeconomic imbalances over the past years. As the 12th largest economy in the European Union by nominal GDP, Romania has seen robust growth rates, including a notable increase of 4.8% in 2022. This growth has primarily been driven by strong domestic consumption, rising wages, and a declining unemployment rate following the lifting of pandemic restrictions. However, the economic landscape has been marred by persistent challenges such as high inflation, currency depreciation, and fiscal deficits, which raises questions about the sustainability of this growth trajectory.

Several internal and external economic factors have influenced Romania's macroeconomic stability during this period. Domestically, issues such as government financial management, and inflation dynamics have played important roles. In 2023, the government faced a fiscal deficit of 9% of GDP, exacerbated by rising public sector wages and the economic fallout from geopolitical events, notably the COVID-19 pandemic and the ongoing conflict in Ukraine. The annual inflation rate reached an average of 12% in 2022, driven primarily by energy and food prices.

Romania's economy is intertwined with its European Union partners, with approximately 80% of its trade conducted within the EU. This integration has provided access

to vital markets and funding, yet also exposed the economy to vulnerabilities linked to global trade dynamics and geopolitical tensions. Although it was recorded a gradual recovery in external demand, concerns remain regarding the impact of geopolitical risks, which could hinder growth and exacerbate inflationary pressures.

Despite the encouraging growth trajectory, Romania has faced multiple economic challenges, particularly in 2023, where it dealt with high inflation rates, currency depreciation, and fiscal imbalances.

2. International context

The pandemic has had a profound impact on the global economy, leading to a contraction in economic activity and exacerbating existing imbalances. As countries imposed lockdowns to reduce the spread of the virus, economic output has declined. In the first months of 2020, there was a major decline in GDP across all countries. International trade has also faced disruptions, as border closures and reduced demand led to a severe decline in global trade volumes.

At the end of 2021, global output was below its pre-pandemic level. Inflation rates have risen, driven by government stimulus measures, supply chain disruptions, and the expansion of the money supply in response to the crisis.

Government responses to the pandemic have included substantial fiscal stimulus packages designed to alleviate economic hardship.

Supply chain disruptions have emerged as a negative factor for the global economy in recent years, triggered by the pandemic and continued by geopolitical tensions, namely Russia's invasion of Ukraine, rising tensions between China and Taiwan, the conflict in the Gaza Strip. These disruptions have not only affected production and logistics, but have also led to rising costs and inflation in various sectors.

According to IMF data in 2023, inflation rates increased globally, reaching a rate of 6% in advanced economies and 9.5% in developing economies. The persistence of inflation is due to a large number of factors, namely supply chain disruptions, which have exerted considerable cost pressures on economies around the world, then the increase in raw material and energy prices, which have spread to all areas of the economy, especially food, followed with some lag by wage increases that were required to cover the devaluation created by inflation, followed by an increase in demand that together with fiscal incentives from governments to support disadvantaged categories but also companies, have intensified inflationary pressures in many countries.

The recession has led firms and financiers to be cautious about new investments abroad, even as they prepare for potential capital expenditures in a “recovery” phase. Geopolitical instability, inflation, and rising interest rates continue to pose threats to global economic stability, impacting sector growth and investment profitability expectations.

Technological advancement has been a significant driver of change in economic development. The shift to a digital economy has opened up new markets and opportunities for businesses to thrive, facilitating global reach and increasing competitive dynamics. As companies adopt new technologies, traditional economies face challenges that require adaptive strategies for development.

In addition, global efforts are being made to gradually eliminate dependence on fossil fuels, while ensuring that the transition to renewable energy sources is accepted across all countries.

Before the outbreak of the coronavirus pandemic, the economic landscape in the European Union was characterised by a gradual recovery from the global financial crisis of 2008 and the sovereign debt crisis of 2012. Economic activity has been resilient, supported by various structural reforms. However, existing vulnerabilities persist, in particular high public debt in several Member States and low productivity growth in some economic sectors.

The pandemic has led to a sharp contraction in economic activity across the European Union. Initial restrictions to curb the spread of the virus have led to a collapse in economic output, with the impact varying by economic sector and region. The pandemic has initially hit industries such as tourism, travel and retail. As firms have struggled with the economic environment, labour markets have tightened, leading to rising unemployment rates and increasing uncertainty among investors.

As restrictions began to ease in 2021, economic activity began to rebound. However, the recovery has been uneven across EU countries, influenced by the different sizes of fiscal support and the economic conditions prevailing in each member state.

In response to the economic crisis, EU Member States implemented a series of fiscal measures aimed at supporting businesses and maintaining employment. The European Commission launched a recovery plan aimed at stimulating economic recovery and strengthening the resilience of the European Union economy through targeted investments in certain economic sectors, in particular innovation and digital transformation and green energy.

The Recovery and Resilience Facility was set up as an instrument to mitigate the economic and social impact of the pandemic. The Facility was designed to support Member States in implementing essential investments and reform measures as set out in their recovery and resilience plans. The Recovery and Resilience Facility plays an important role in facilitating the transitions to green energy and the digital transition by financing various initiatives, such as decarbonising transport and digitalising public services.

The European Union, through the Recovery and Resilience Facility, will strengthen infrastructure investments aimed at improving energy efficiency and the transition to low-emission production processes, in particular for energy-intensive sectors. However, ongoing uncertainty and structural changes are likely to continue to impact segments of manufacturing, particularly in energy-intensive industries.

The global economic downturn, exacerbated by an energy cost shock, has affected the ability of EU firms to maintain their market share. However, firms have been able to pass on some of the increase in import costs to export prices, largely due to the high degree of openness of the EU economy and the role of the euro as the main invoicing currency.

Inflation rates in advanced and emerging economies rose significantly in 2021, driven by high energy prices, disruptions to global production networks, and labor shortages. High energy prices have emerged as a major negative factor for the European Union economy. Rising oil and gas prices, driven by recovering demand, have put pressure on inflation rates. The European Central Bank has sought to manage inflationary pressures by coordinating effective economic policies to stabilize the economic environment while enhancing competitiveness.

The economic outlook for the European Union has been significantly influenced by various external and internal factors over the past two years. A notable impact has resulted from the ongoing war between Russia and Ukraine, which has introduced considerable uncertainty into the global economic environment. The conflict has affected the European

Union through financial and trade sanctions against Russia, which have led to rising commodity prices and trade disruptions due to the exclusion of Russian companies, especially those supplying raw materials, oil and gas.

3. Internal context

The Romanian economy has experienced significant changes in recent years, reflecting both recovery and the difficulties it must adapt to.

The global supply chain has faced numerous disruptions in recent years, exacerbated by the coronavirus pandemic and logistical constraints. Logistics disruptions, semiconductor shortages, and labor shortages have had a major impact on the timely delivery of goods, contributing to rising prices and an uneven recovery in trade. These supply chain issues have been identified as a factor affecting trade volumes and the pace of economic recovery in Romania.

Geopolitical tensions, especially the conflict between Russia and Ukraine, have complicated Romania's commercial landscape. In early 2023, oil prices almost doubled from the previous year due to various factors, including these geopolitical tensions, which have implications for inflation and overall economic stability.

Inflation has emerged as a significant economic challenge for Romania, especially after the recovery from the pandemic. By early 2022, prices had already increased by 8.2% compared to the previous year. This increase was attributed to the increase in agri-food prices, energy and transport costs, exacerbated by persistent blockages in production and supply chains, influenced by the coronavirus protection measures. The National Bank of Romania indicated that consistent increases in electricity and natural gas prices were major factors in the increase in inflation, along with the influences of fuel prices and the costs of public utility services.

The war in Ukraine has reshaped economic expectations for Romania. Initially, forecasts were optimistic, taking into account the recovery from the pandemic and the absorption of European Union funding. However, the conflict has escalated the energy crisis, further worsening inflation that was already rising due to supply chain disruptions. By the end of 2022, the annual inflation rate reached 16.8%, up from the previous year. In response to persistent inflationary pressures, the NBR, following the model of other national banks, was forced to increase the central bank’s policy rate several times during the year. Inflation remained well above the central bank’s upper target limit, largely due to the lifting of the electricity and gas price cap scheme, as well as the EU embargo on Russian oil imports in 2023.

Rising inflation, driven by rising energy prices and supply constraints, was a negative factor for Romania's economic recovery and for household purchasing power, leading to a decline in total consumption.

The presence of the untaxed "grey" sector in the economy complicates labor market dynamics, with total tax revenues remaining below 30% of GDP, one of the lowest rates in the EU.

In recent years, Romania's trade dynamics have been significantly influenced by global economic conditions, including supply chain disruptions, geopolitical tensions, and commodity price fluctuations. In 2023, Romania's imports of goods and services amounted to approximately USD 154.12 billion. Imports increased by 2.40% in 2023 compared to previous years, reflecting ongoing demand and economic recovery trends. Exports also play

an important role in Romania's economy, with the value of exported goods and services reaching significant annual figures. In 2023, exports recorded a decrease of 1.41%.

Foreign direct investment has been a critical factor in Romania's economic landscape, with net inflows reaching approximately USD 11.48 billion in 2022. This figure demonstrates interest from international investors, reflecting Romania's growth and development potential. In contrast, portfolio stocks have seen a decline, with a reported 7% decline in 2023, indicating fluctuations in investor confidence and market conditions.

Geopolitical tensions, especially the conflict between Russia and Ukraine, have also posed significant risks for the Romanian economy. The potential for an escalation of armed conflict could lead to dramatic increases in oil prices if tensions materialize.

The economic outlook for Romania remains uncertain, with forecasts indicating that continued geopolitical instability could further affect the global economy and push prices higher. The future dynamics of Romania's economy depend on both international economic conditions and local responses.

In 2023, Romania's economy presented the following main characteristics:

- GDP growth of around 2.1% in 2023, above the EU average, although lower than in previous years. This slowdown was influenced by inflation and the global economic context.
- Romania ended 2023 with a budget deficit of approximately 5.7% of GDP, above the initially assumed target, which remained a major concern for economic stability.
- The trade deficit remained significant, although there was a slight improvement compared to the previous year. Exports increased, but imports continued to exceed them.
- The current account deficit stood at around 24 billion euros in 2023 , representing approximately 8% of GDP , a slight reduction compared to 2022, when the deficit was around 26.6 billion euros .
- Import-export coverage was approximately 80%.
- The budget deficit was 5.7% of GDP, above the target of 4.4% of GDP, with a gradual reduction plan towards the 3% target according to EU criteria.
- Public debt continued to increase, reaching around 50% of GDP, but remains below the EU average.
- High inflation rate, reaching high levels in the first part of the year, but with a downward trend towards the end of 2023, reaching approximately 10.4% in December 2023.
- The unemployment rate is relatively stable, around 5.4%.
- The average net salary continued to increase, exceeding 4,000 lei, the equivalent of 800 euros.

4. Conclusion

The economic landscape in Romania over the past five years has been significantly influenced by various imbalances, particularly in the current account, budget, and trade sectors. These imbalances have had profound effects on the nation's macroeconomic stability and growth trajectory.

The persistent current account imbalance in Romania has been largely driven by a structural fiscal deficit, which has weakened the overall economic framework. The fiscal deficit has been identified as a principal factor exacerbating the current account deficit, with implications for debt accumulation and currency valuation. High levels of trade deficits, (particularly in key sectors such as food, fuels, chemicals, and manufacturing), have

contributed to a deterioration of the balance of payments. The trade imbalance has been exacerbated by strong internal demand and insufficient production capabilities to meet this demand, leading to an increased reliance on imports. Such trade imbalances can trigger economic repercussions, including potential debt crises and currency devaluation, particularly if foreign reserves are depleted due to continuous trade deficits.

Year by year, Romania faced a budget deficit, indicating a deterioration in public finance management. The budget shortfall has necessitated actions from policymakers, including potential cuts in public spending and a re-evaluation of investment plans.

Inflation has emerged as a critical concern, with core inflation driven by rising wage pressures and constrained by cautious monetary policy. The inflation rate peaked significantly in 2022, reaching 14.6%, and although it fell to 6.7% by early 2024, it remained well above regional averages, indicating underlying economic stress. High inflation rates can adversely affect consumer purchasing power and overall economic activity, further complicating the situation stemming from trade and fiscal imbalances.

Foreign direct investment inflows are recognized as significant contributors to the economic landscape of Romania and play a crucial role in influencing the country's current account, budget, and trade imbalances. A variety of macroeconomic factors (market size and growth, trade openness, economic stability) impact FDI and, consequently, the overall economic situation in Romania. The economical and political stability of a country are essential for attracting FDI. Investors often seek environments where there is a strong regulatory framework, transparency, and low corruption levels, and this can be done by involving decision-makers at the state level.

Structural reforms have been a focal point of Romania's policy response to macroeconomic imbalances. Efforts to enhance governance and improve public service delivery are essential for achieving sustainable economic growth. The government is prioritizing the transition to a carbon-neutral economy, recognizing the need to modernize its industrial base and infrastructure. The government has to implement a series of fiscal and structural reforms aimed at restoring economic stability and growth. Measures include significant cuts in public sector expenditures and tax reforms designed to enhance revenue generation, must be adopted. These efforts are crucial for addressing the macroeconomic imbalances and securing the long-term sustainability of Romania's economic development, particularly in the face of ongoing domestic and international uncertainties.

The absorption and effective utilization of EU funds, especially those from the Next Generation EU programme, are critical for Romania's economic stability and growth. These funds are tied to the successful implementation of structural reforms, including energy transition and governance improvements, which are necessary to mitigate the contractionary impacts arising from geopolitical conflicts and budget consolidation measures.

The continued inflow of EU funding and foreign investment is essential for sustaining growth and enhancing Romania's competitiveness on the global stage.

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BIBLIOMETRIC ANALYSIS OF REGENERATIVE, ORGANIC, AND ECOLOGICAL FARMING PRACTICES: IMPLICATIONS FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT IN MOLDOVA

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Abstract: *The study explores the regenerative agriculture paradigms based on a literature re-view sourced from the Web of Science database. Moldova's climate change and soil erosion underline the need for a sustainable agriculture and new farming solutions. These solutions include a paradigm shift towards circularity in agricultural practices. The purpose of this study is to explore publication trends in Moldova and interconnections within the global academic discourse on regenerative agriculture. A total of 138 articles published were analysed using bibliometric tools. The findings reveal an in-crease in scholarity interest over past years, particularly ecological agriculture that remains most extensively researched theme in Moldova. Keywords analysis and co-occurrence analysis highlights emerging themes such as biodiversity, sustainable food systems or sustainable farming. The bibliometric mapping clarifies landscape and evolution of regenerative agriculture and future directions for interdisciplinary re-search, while bibliometric co-occurrence of 3 notions is applied and further will serve for policy decisions within the country and evidence-based research planning. Through this research it is underscored the importance to embrace regenerative agriculture practices to address environmental challenges and promote sustainable development in Moldova. The article was developed within the framework of Subprogram 030101 „Strengthening the resilience, competitiveness, and sustainability of the economy of the Republic of Moldova in the context of the accession process to the European Union", institutional funding.*

Keywords: *regenerative agriculture, Republic of Moldova, bibliometric analysis, sustainability, organic farming, ecological agriculture.*

JEL Classification*: Q01, Q10, Q56, O13.*

1. Introduction

It is well-known that farming method of regenerative agriculture works to establish sustainable agricultural ecosystems through its innovative practices. The approach of regenerative agriculture (RA) exceeds traditional sustainable practices due to soil health increase involvement along with biodiversity and ecosystem services promotion. The RA principles are based on reducing soil disturbance and keeping soil coverage intact while farming systems are integrated into livestock operations. These agricultural practices show promises to resolve environmental issues affecting soil health and water availability and climate change effects. The definition of regenerative agriculture remains undefined today while its long-term effects on agricultural practices remain unclear despite increasing interest in the subject reflected in WoS literature. The world is increasingly adopting this practice because sustainable food systems and climate change mitigation need it. To succeed with the implementation of regenerative agriculture it needs to run ongoing research together with policy support and stakeholder collaboration. This will ensure the achievement of all advantages that it can bring.

The aim of this research was to explore publication trends in Moldova and interconnections within the global academic discourse on regenerative agriculture. Additionally, the research aims to provide a bridge for further interdisciplinary research. The significance of this research lies into mapping the intellectual landscape, support evidence-based decision making in sustainable agriculture in Moldova.

2. Literature review

The purpose of regenerative agriculture is to protect and restore agricultural systems. This approach aims to boost soil health, biodiversity, water cycles, and ecosystem services in agriculture.

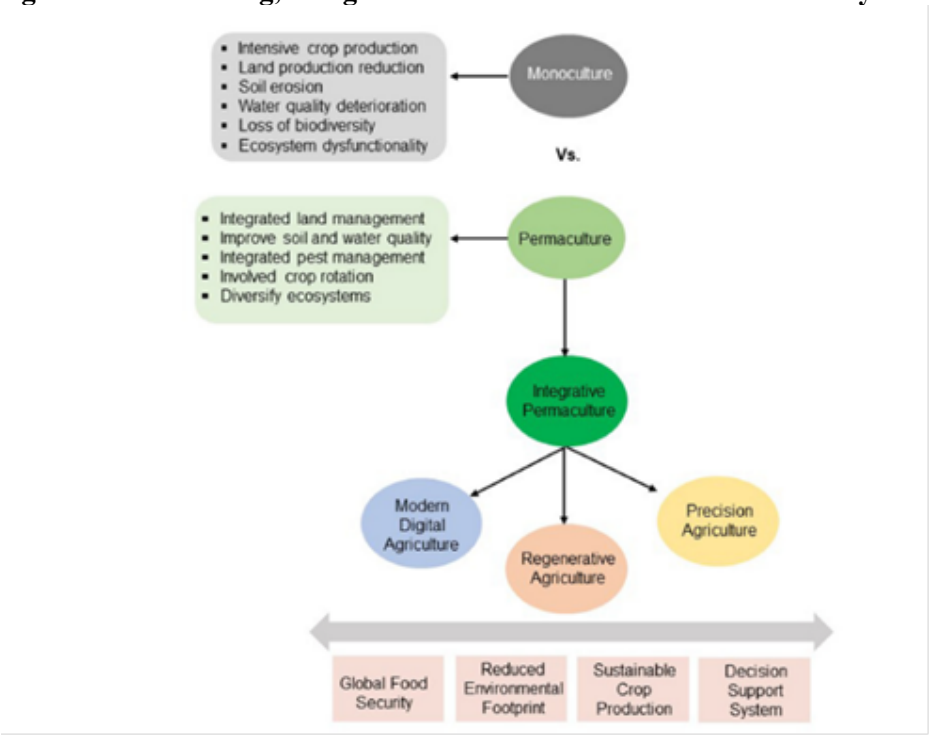
The global food system emits roughly 25% of annual anthropogenic greenhouse gases, causes a third of terrestrial acidification, and is responsible for most eutrophication of surface waters (Poore, J.; Nemecek, T., 2018). Continuing current practices such as using synthetic pesticides, artificial fertilizers, fossil fuels, and producing food waste may exceed the planet's carrying capacity (Campbell, B.M.; Beare, D.J.et al., 2017). The main challenge is to produce safe and nutritious food within this limit for a growing population. The main challenge is to produce safe and nutritious food within this limit for a growing population (Willett, W.; Rockström, J.; et. Al., 2019). Recent studies have shown that these environmental impacts persist, and as the global population continues to grow, the sustainability of conventional agricultural practices remains a major concern (Sher, A.; Li, H.; Ullah A., 2024; Wiltshire, S.; Beckage, B., 2023). According to Bradford, R., Smith, J. Lee, K. (2023), reducing environmental footprints through regenerative practices is critical for ensuring long-term food security. Referring to an analysis of 2024 it is mentioned that transitioning to sustainable farming practices is essential to mitigate climate change and maintain biodiversity (Sher, A.; Li, H.; Ullah, A. et.al., 2024).

The 4 most important policies in circular economy such as the EU Circular Economy Action Plan (EC, 2015), the Paris Climate Agreement (UN, 2015), and the Common Agricultural Policy (EC, 2019) and the European Green Deal (EC, 2025) recognize this importance. The notion of "regenerative agriculture" has gained popularity since 2010 and has surpassed other approaches such as organic farming, agroecology or conservation agriculture, but still there is a significant lack of consensus on its definition. Rodale's attempts to define it have been met with extensive disagreements among various practitioners. This challenge is not unique; similar definitional fragmentation was observed in conservation agriculture, particularly in Sub-Saharan Africa, where conflicting objectives among researchers, NGOs, and smallholder farmers limited their coherence and scalability (Giller, K.E. Witter, E., 2009). Schreefel et al. (2020) state that regenerative agriculture lacks a specific definition of soil health and biodiversity while different actors in the food system understand it differently. Soil conservation stands as the starting point for regenerative agriculture according to their proposed definition which aims to regenerate ecosystem services. According to Newton et al. (2020) the concept of regenerative agriculture remains undefined in legal and regulatory frameworks as well as common language usage. According to their suggestion, regenerative agriculture could take the form of production practices such as using cover crops integrating livestock and reducing or eliminating tillage and desired outcomes that include improving soil health and sequestering carbon and increasing biodiversity or both aspects.

The farmer-led organization Groundswell defines five fundamental principles for sustainable agriculture which include minimizing soil disturbance and maintaining constant soil cover and ensuring continuous presence of living roots and promoting diverse crop species and reintegrating grazing animals into crop systems. The five core principles of

regenerative agriculture include minimizing soil disturbance to protect soil structure and microbial ecosystems and maintaining soil coverage to prevent erosion and conserve moisture and increase organic matter (The Groundswell, 2025). The three principles of crop rotation include diversification to enhance plant biodiversity and soil health (McLennon, E.; Dari, B., 2021). The advantages of regenerative agriculture are major, encompassing improved soil fertility, increased biodiversity, reduced soil erosion, and enhanced carbon sequestration. Long-term benefits include greater resilience to drought and extreme weather, leading to stable crop yields and aiding in climate change mitigation. Studies (McLennon, E.; Dari, B., 2021) indicate that permaculture supports resilient and productive ecosystems and has evolved gradually instead of being introduced as a new concept (Figure 1).

Figure 1. Objectives for Sustainable Agriculture through Permaculture and Regenerative Farming, using Modern Tools for Global Food Security



Source: [21]

Figure 1 shows how diverse agronomic practices work together to improve soil health alongside biodiversity and ecosystem services. The set of practices includes minimizing soil disturbance and maintaining soil. The diagram shows how these practices have the potential to deliver better soil fertility and reduce erosion and increase carbon sequestration. Studies show that using no-till with cover crops boosts soil carbon storage more than either practice alone (Wiltshire, S.; Beckage, B., 2023). The agricultural approach that includes all these elements works to solve environmental problems while strengthening both productivity and resilience of agroecosystems. The practice of regenerative agriculture presents solutions which address environmental concerns and economic problems in farming. Soil health together with biodiversity and carbon sequestration improves when farmers use practices that

include maintaining soil cover and minimizing soil disturbance and integrating livestock into their operations. However, the widespread adoption of these practices faces economic and policy barriers.

It is to be mentioned that recent research indicates that the initial expenses involved in transitioning to regenerative agriculture may be challenging for many farmers, even though there are potential long-term environmental advantages (Sher, A., Li, H., 2024). There is also limited empirical data regarding the profitability of regenerative agriculture, which affects its uptake in both developed and developing areas. The definition varies, and further studies are required to assess its effect on soil organic carbon and sustainability. Ongoing discussions highlight the need for policy frameworks that facilitate regenerative practices and address the economic obstacles encountered by farmers during adoption (Wiltshire, S.; Beckage, B., 2023).

3. Materials and Methods

The topic of regenerative agriculture has attracted increased scholarly attention in recent years, and a comprehensive bibliometric analysis is required to map the intellectual landscape and support evidence-based decision-making. Bibliometric analysis was chosen as it can provide a wide range of data and overview of main key topics related to regenerative agriculture. Additionally, to maximize access to relevant literature the Web of Science database has been explored for a more selective approach and analysis of literature focused on high-impact publications. Namely, a total number of 138 papers were found for the period 1990-2025 and they were processed using bibliometrix. Using several exclusion criteria such as non-peer reviewed documents, language, irrelevant topics, duplicates, non-article types, etc. papers were selected for a systemic review.

Following a systematic literature review, the collected information was organized according to relevant parameters to facilitate thorough analysis of the regenerative agriculture paradigm. The data collection covered research problems, research gaps and research methods, keywords, research samples, platform and samples, including filters. For data analysis have been collected and analysed research topics trends, descriptive analysis and thematic evolution, keywords and co-occurrence analysis for evidence-based research planning (see Table 1).

Table 1. Methodology

Data collection	
Research problem	Limited comparative understanding of how academic research has evolved across the paradigms of regenerative agriculture; the national research dynamics among these approaches remain underexplored in scientific litterature.
Research gap	Absence of systemic bibliometric comparision using a unified analytical framework
Research method	Integrative literature review
Key word	Regenerative agriculture, organic farming, ecological agriculture
Research sample	147 article
Research platform	Web of Science

Filters	Language, years, research area, SDG, type of document
Data analysis	
Research topics trends	Recent keywords and topics gaining attention
Descriptive analysis	Document types, language distribution, scientific production
Thematic evolution	Traked emergence and development of themes over times
Keywords and co-occurrence analysis	Identified major research themes, term evolution trends

By combining these methods, the study aims to offer a comprehensive understanding of research dynamics and thematic evolution within the regenerative agriculture field in Moldova, with a focus on multi-layered bibliometric approach, thereby supporting evidence-based decisions for future research.

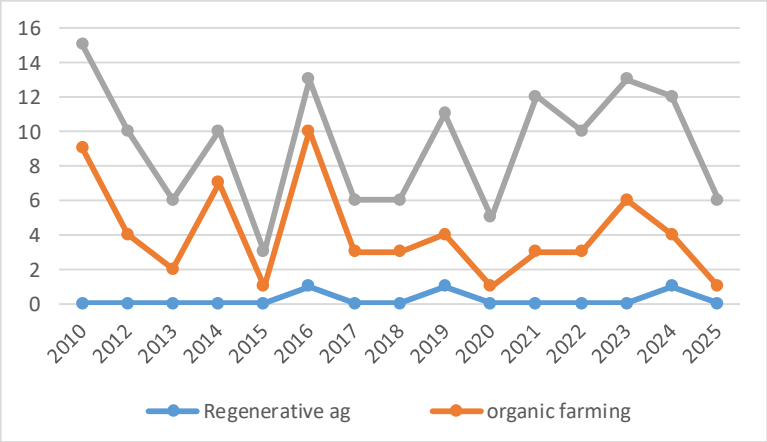
4. Results

This section outlines the evolution of variation coefficients using the previously described methodology. Quantitative analysis was conducted through bibliometric methods, which relate to info-metrics, scientometrics, and webometrics. The analysis involved identifying relevant literature in the field, using the Bibliometrix tool.

The search was conducted in the title, abstract, and keywords fields using "regenerative agriculture," "organic farming," "ecological agriculture," and "Republic of Moldova." No exclusion criteria were used at this stage. Although the period considered was 1990–2025, only the last 15 years were analysed, yielding 138 papers.

The articles offer a nuanced perspective on how Moldova's scientific community studies and discusses the shift toward a circular economy, sharing insights and proposing future research directions. Based on annual appearances of articles, it can be stated that ecological agriculture has gained rising interest in recent years based on increasing number of published articles in this field; at the same time analysing linear trend, no significant increase over time has been registered, suggesting a large and irregular trend (Figure 2). This is explained by the fact that number of articles per year doesn’t follow a strong linear pattern; additionally, Moldova moves closer to EU integration and there is an increasing alignment with EU standards. Additionally, Moldova faces soil degradation and water pollution due to conventional farming and pesticide intensive use in rural areas. Ecological agricultures bring a sustainable alternative to farmers.

Figure 2. Annual appearances of articles, 2010-2025



Source: author's contribution

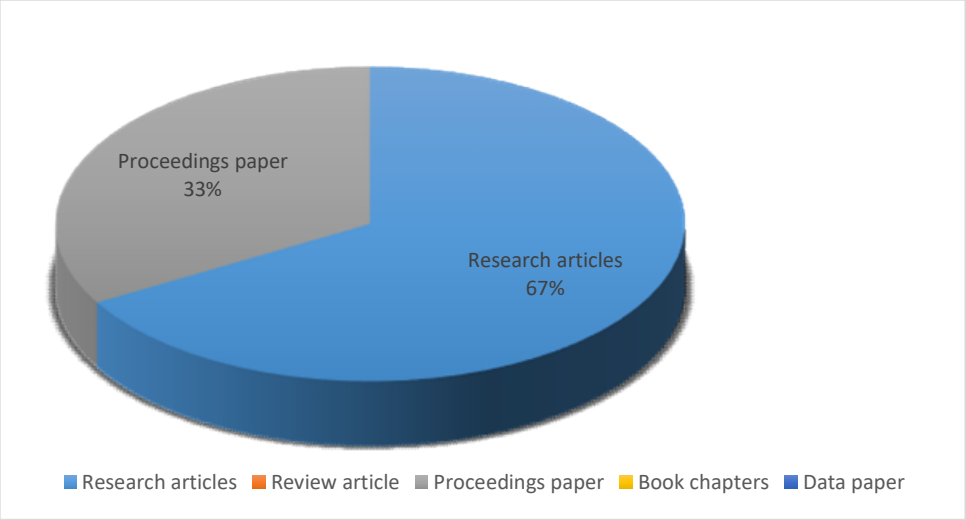
Based on the R^2 calculation for linear trend, to assess long-term changes, the following was determined:

Slope - 0,13 articles/ per year;
Intercept - -246, 2 theoretical starting value in the model;
R^2 – 0,02 or about 2% variation in the data.

The analysis shows no significant linear trend in the number of articles that were published over time (2010-2025). Low R^2 value indicates a small fraction of the variation, suggesting that other factors influence the publication rates over the time.

This analysis mainly relied on primary data from research articles from WoS database, while materials such as corrections, early access versions, and editorials were excluded at this stage based on the criteria. The findings indicate that this multidimensional and interdisciplinary field of research requires practical solutions adapted to Moldovan reality. Enhancing resource efficiency in regenerative agriculture requires combining multiple principles with technologies and sustainable practices.

Figure 3. Reviewed articles by type number of the document



Source: author's contribution

Applying exclusion criteria (corrections, early access versions, and editorials), a total number of 129 paper have been analysed further. The data suggest that the research environment focuses heavily on producing original articles and the low number of review articles indicate a gap in synthesizing existing literature, which could be a potential area of development. Book chapters, data paper, although low in number contribute to diversity in publication types across the time. Additionally, the primary language used was English.

A summary was prepared highlighting the countries most actively engaged in research on these three concepts. Four countries—Moldova, Romania, Latvia, and Bulgaria—demonstrate significant interest in regenerative agriculture. In contrast, more than eight countries, including Moldova, Romania, Germany, Poland, Bulgaria, Greece, Norway, and Slovakia, are notably involved in organic farming initiatives. Highest indicators present for ecological agriculture with more than 10 countries, in the top is Moldova, Romania, Poland, England and France. Researchers worldwide show strong interest in these areas, especially in ecological agriculture.

Focusing on research topics, we have selected further 8 main relevant papers (mostly post-2015). By applying bibliometric co-word analysis will identify which topics dominate the field of regenerative agriculture, relationships between current concepts and topic evolution. This type of analysis further will serve for evidence-based research planning and policy decisions within the country.

The first relevant studies emerged in 2016 and increased after 2020. These publications cover several journals, with multiple contributions in regional journals and a few in international ones providing a mix of local and broader international engagement in this thematic area. Table 1 shows the most common WoS keywords related to agricultural research in Moldova. The notions as "organic practices" and "subsidies" appear very frequently revealing key policy and research interests; while notions "ecological agriculture," "crop rotation," and "sustainable agriculture" focus on land management and sustainability. Last notion "regenerative agriculture" is mainly referenced through related concepts in Moldovan studies.

Table 2. Top Occurring Keywords during 2010–2025 WOS dataset reflecting regenerative, organic and ecological agriculture

Keyword	Frequency in WoS
Organic farming	3
Subsidies	3
Ecological agriculture	2
Crop rotation	2
Sustainable agriculture	2
Total (WoS dataset)	22

Source: author's contribution

According to the WoS dataset, 22 keywords were identified and are presented in Table 2, listing those that were found in at least two journals. "Organic farming" and "ecological agriculture" represent very similar concepts used in the context to describe organic farming. Additional keywords such as "no-till," "climate change," and "quality of life" appeared in individual papers, indicating a range of topics examined in separate studies. Primary themes for ecological agriculture identified from the reviewed articles cover soil health and nutrient cycling, agroecology and biodiversity, crop management and weed control, climate change, fertilizers, resource efficiency, socioeconomic impact and innovation; while for regenerative agriculture, thematic clusters include soil regeneration, carbon sequestration, agroecological design, water management, socio-ecological resilience, and measurement and indicators; for the last notion organic farming, it covers soil fertility cluster, pest and disease control, yield, biodiversity, consumer behaviour, food quality and safety and environmental impact. So, the research tends to focus on soil health, ecosystem services in ecological agriculture, while input reduction and market dynamics refers to organic farming. Last, regenerative agriculture cover carbon sequestration and regenerative soil practices and climate resilience.

The time span of the analysed publications ranges from 2016 to 2024, with most papers published in the early 2020s. Research themes cover both practical agronomic techniques and broader socio-economic or policy issues. The journals comprised the following Moldovan publications:

- multiple Moldovan case studies on organic and/or ecological agriculture;
- study on adoption of sustainable practices in Moldova;
- article on transitioning to conservation agriculture systems;
- sustainable agriculture advancements to quality of life in Moldova.

The academic literature in this field in Moldova is limited. This is explained by the fact that Moldova's sustainable agriculture sector is still developing. The increased frequency of publications after 2018 suggests growing academic and practical interest, driven by policy shifts and global trends in sustainable farming. State support measures such as subsidies along with alignment with EU standards have been reflected in these publications.

Additionally, to understand the relationships among the prevalent concepts, we constructed a keyword co-occurrence network. At this stage, each node represents a keyword, and a link between two keywords indicates they co-occurred in the same publication. The thickness of edges corresponds to the number of co-occurrences and node size reflects the overall frequency of that keyword (Table 2). We applied a minimum frequency threshold to focus on meaningful connections – keywords appearing in at least 2 papers were emphasized

in the analysis, while less frequent terms are included as smaller nodes for context. Analysing such co-occurrence patterns we have identified research themes and presented the newly 5 formed clusters representing major topic areas (Table 3).

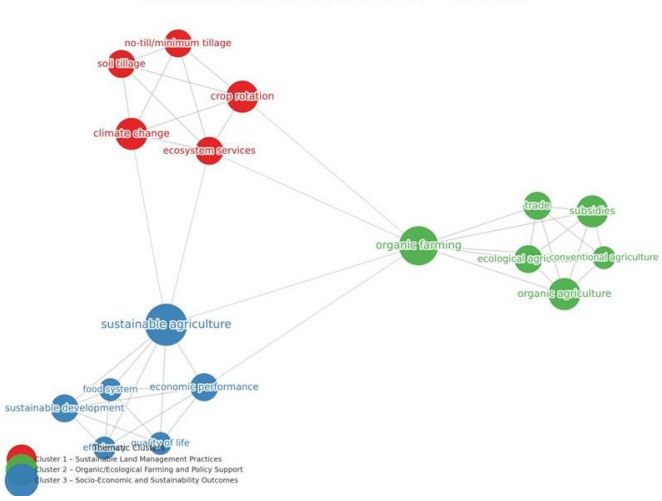
Table 3. Newly formed clusters representing major topic areas in the field of regenerative agriculture

Cluster's name	Description
Sustainable Land Management Practices	Identified keywords are related to conservation agriculture and agro-ecological practices: "crop rotation," "no-till," "soil tillage," "climate change," and "ecosystem services." This cluster highlights the agronomic and environmental aspects of regenerative agriculture. In the network, these keywords form a tightly knit group, reflecting that papers discussing tillage and rotations often also reference soil/ecosystem outcomes and climate resilience.
Organic/Ecological Farming and Policy Support	Keywords related to organic and ecological agriculture systems, along with the economic/policy factors influencing them. Key nodes here are "organic farming", "ecological agriculture," "subsidies," "trade," and "conventional agriculture." Many papers simultaneously address both the evolution of organic or ecological farming in Moldova and the related policy measures or market influences, as these topics often appear together. For instance, several studies evaluate the role of government subsidies in expanding organic agriculture and transitioning farmers away from conventional practices. The co-occurrence of "subsidies" with "organic/ecological agriculture" in multiple papers underscores that financial support is a critical theme for this community. Additionally, "trade" appears in this cluster, reflecting Moldova's interest in organic exports and market development. This thematic cluster spotlights how to promote sustainable farming systems through policy (subsidies, standards) and economic incentives, as well as challenges in competing with or converting from conventional agriculture.
Socio-Economic and Sustainability Outcomes	The terms such as "sustainable agriculture," "sustainable development," "quality of life," "economic performance," "efficiency," and "food system" present how sustainable/regenerative practices contribute to rural development goals or farmer livelihoods. This cluster suggests examination of economic viability and social impact of adopting regenerative or organic practices.

It's worth noting that these clusters are interconnected. There is considerable overlap between environmental, economic, and social facets of sustainable agriculture in Moldova's context. For example, "sustainable agriculture" as a term appears in multiple clusters, emphasizing integrated approaches. In same way, "organic farming" (Cluster 2) is

conceptually linked to soil health practices (Cluster 1) as part of regenerative approaches, something also seen in global analyses where organic and regenerative practices often converge around improving soil and ecosystem functions.

Figure 4. The keywords co-occurrence network based on occurrences of keywords within the analysed articles



Note: Edges link keywords that co-occurred in the same publications. Edge thickness reflects the number of co-occurrences (thicker = stronger association).

Figure 4 presents keyword co-occurrence network for analysed publications from WoS database by. listing every keyword and its total occurrence, including the number of co-occurrences between every pair of keywords. The map presents main thematic areas (clusters) interconnected by shared keywords. This structure presents how research in Moldova integrates agronomic innovations, policy measures, and socio-economic impacts into a broader vision of sustainable agriculture.

Analysing the development of themes over time it can be stated that indexed publications in WoS reveal that organic and ecological agriculture are well established themes in Moldova starting with 2000, while RA remains still scarcely addressed.

Table 4. Growth over time of WoS established themes in Moldova related to regenerative agriculture

Themes	Expansion	Decline
Organic agriculture	Expansion from 2003-2012 explained by state subsidies and supportive policies in the country Adoption of laws	Decline from 2009-2016 due to reduced subsidies Weak certification systems, limited technical capacity
Ecological agriculture	Dynamic development in the last couple of years due to market demand and adopted life style	-
Regenerative agriculture	Expansion from 2000-2025 but with modest levels of research	Less represented in publications

This pattern of growth observed in Republic of Moldova suggests that regenerative agriculture has potential for future growth. Organic and ecological agriculture are more frequently featured in WoS publications, which reflects a trend seen across the European continent specifically in Eastern Europe.

Additionally, Web of Science data shows that regenerative agriculture papers appear in 6 categories grouped, organic farming in 28, and ecological agriculture in 56. According to SDGs, related articles often address Zero Hunger, Good Health, Clean Water and Sanitation, Clean Energy, Responsible Consumption, Climate Action, Life Below Water, and Life on Land. For research areas, regenerative agriculture spans 4, organic farming 14, and ecological agriculture 40, including environmental sciences, ecology, agriculture, and geology.

5. Discussion

Results show that the research interest in Moldova is higher in ecological agriculture, based on annual appearances of articles published in this field in WoS. Looking at the yearly research trends since 2010, ecological agriculture has shown a consistent increase that continues in subsequent years. Relevant literature was reviewed and categorized by topic and perceptions of regenerative agriculture among researchers and practitioners to summarize scientific interest in the field. The authors found regenerative agriculture beneficial for addressing climate change alongside advanced technical knowledge. While there is no universally accepted definition, most researchers agree that its main objective is to improve soil condition [2,4,5]. In Republic of Moldova, traditional farming methods and high use of pesticide have led to severe soil degradation and water pollution, emphasizing the need for sustainable solutions. It worth mentions that ecological agriculture, can improve resource efficiency by using regenerative techniques and modern technologies. By adopting these practices, Moldova could not only protect its environment but also be closer to meeting EU integration goals.

Existing studies and research on RA in Moldova present that awareness and progress are increasing in this field and by advancing the sector it will relieve collaboration among various industries. To put these ideas into practice, it is still important to set firstly clear standards, secondly to engage with local participants, and third one is to tailor strategies to Moldova's unique context. It is to be mentioned that resource allocation is directly influenced by several variables that include geographical conditions, resource availability and environmental variables. To achieve desired outcomes, it is strongly needed the implementation of innovative management strategies, evidence-based policy frameworks and coordinated regional governance. Recent bibliometric analysis using the WoS database indicate that advances in regenerative agriculture in Moldova are primarily evaluated based on environmental metrics, particularly concerning soil health and biodiversity enhancement. Still exists a deficit in studies addressing long-term economic outcomes and social dimensions associated with regenerative practices. The prevailing agricultural paradigm in Republic of Moldova remains preponderant linear and oriented toward short term profitability that effects on long term development of regenerative practices. Achieving a circular and climate-resilient agricultural model requires the incorporation of ecological objectives into robust economic frameworks at both national and regional levels. Since economic structure of Moldovan agriculture is predominantly driven by growth and market profitability, we need to emphasize the critical need for the implementation of innovative practices to achieve ecological

sustainability and economic viability. By applying regenerative agriculture principles, it will rely on the establishment of new business models that support both environmental stewardship and financial returns.

Results from bibliometric analysis of 129 papers (using 4-word combinations) further reveal that highest concentrations of research on regenerative agriculture concentrates on environmental issues, with less studies addressing long-term economic gains or social well-being. Future research needs to focus and cover more comprehensive evaluations of profitability, productivity, resilience, and the broader socio and economic implications of regenerative practices in Moldova. Based on bibliometric assessment, analysis of the incorporation of recycled organic materials into regenerative agriculture in Moldova, reveals specific research priorities and at the same time outstanding gaps. Current publication data demonstrate a predominant focus on the environmental dimensions of regenerative practices, while the utilization and study of recycled organic remain relatively limited and unexplored in the Moldovan literature context. Bibliometric mapping suggests an emerging interest among Moldovan researchers in developing markets and regulatory frameworks for secondary organic resources. A strong interest at national level is paid for interdisciplinary collaboration and policies studies, as documented by co-authorship and citation network analyses. By advancing in deep research and fostering intersectoral cooperation, Moldova may enhance the integration of circularity principles and strengthen the adaptability of its agricultural systems, as evidenced by evolving trends in the scientific literature.

As result of the analysis of sustainable and regenerative agriculture in Moldova's has been identified following important themes: 1. conservation and regenerative practices, 2. organic and ecological farming, and 3. sustainability and socio-economic impacts. Referring to the first theme, conservation and regenerative practices, it involves methods meant to maintain soil health and biodiversity; namely has been identified studies focused on measurement of changes in organic soil and nutrient cycling. The second theme covers organic and ecological farming. Research in this area refers to comparative analysis examining challenges associated with organic farming methods. The third theme, sustainability and socio-economic impacts, examines case studies through the lens of farm profitability, food security, labor dynamics and rural development, contributing to a clear picture of an overall understanding of the potential environmental and sustainable agriculture in Republic of Moldova. Referring to the transition to regenerative agriculture in Moldova involves moving from traditional linear methods to circular systems that aim to restore ecological functions. Progress in this area relies on sharing empirical knowledge about environmental, economic, and social aspects associated with regenerative practices.

To develop practices based on regenerative agriculture in Moldova, a multidisciplinary strategy is recommended that could combine agricultural science with environmental studies, economics, and rural sociology. At the local level, it is mandatory involvement of local key stakeholders, farming communities, government agencies to help tailor viable solutions. Effective practices are shaped, and the adoption of circular economy principles is promoted through regional cooperatives and public-private partnerships.

Interconnected issues of environmental sustainability, economic feasibility and social equity are addressed by the efforts to advance regenerative agriculture in Moldova. This involves informed decision-making with comprehensive monitoring and evaluation systems and customizing interventions. The development of regenerative agriculture at the national level depends a lot on improving scientific understanding and enhancing institutional

capabilities and fostering collaboration across sectors to combine agricultural practices with current research-based methods.

6. Conclusions

This study explored the regenerative agriculture paradigms based on a literature review retrieved from the Web of Science database. The study started with data analysis to explore publication trends and interconnections within the global academic discourse on regenerative agriculture. It was determined that this subject is still underexplored and lacks understanding or knowledge about this new emerging thematic area. Based on annual appearances of articles, it can be stated that ecological agriculture has gained a gradual rising interest in recent years based on an increasing number of published articles in this field; at the same time, no significant increase over time has been registered, suggesting a large and irregular trend.

Bibliometric analysis finds that research on regenerative agriculture has increased recently, with strong connections to soil health and climate change mitigation. Systematic reviews highlight the need for a widely accepted definition of regenerative agriculture and stress the value of integrating traditional knowledge with new technology. These reviews also show that Moldovan farmers are informed and dedicated to practicing regenerative agriculture.

A structured overview of how regenerative, organic, and ecological agriculture-related research in Moldova is organized are analysed through the lens of bibliometric co-word analysis. Despite the relatively small number of publications, the co-occurrence network highlights a cohesive structure of three interlinked themes: practical regenerative farming techniques, the policy/economic mechanisms to support such farming, and the overarching sustainability outcomes expected. This suggests that Moldova's research community recognizes that achieving regenerative agriculture is a multi-faceted endeavour – requiring changes in the field, in institutions and markets, and in evaluation metrics. Such insights are valuable for guiding future research and policy. At the same time, the clusters pointed out the strong focus on subsidies and organic farming indicating that more research could be directed. Moreover, as the global literature on regenerative agriculture grows, we expect more Moldovan studies to explicitly use that framework – possibly leading to new keywords (like "soil health", "carbon sequestration", etc.) gaining prominence, much as international research has identified soil carbon and agricultural biodiversity as key regenerative agriculture themes.

Substantial research over past years in RA in Moldova have been conducted by such countries as Moldova, Romania, Latvia and Bulgaria; while for organic farming it includes more than 8 European counties and the highest indicators presents for ecological agriculture with more than 10 countries, confirming that this topic is in trend and in the near future will obtain supplementary space for research purposes.

Next, the analysis focused on research topics, primary themes for ecological agriculture identified from the reviewed articles. The research tended to focus on soil health and ecosystem services in ecological agriculture, while input reduction and market dynamics referred to organic farming. Lastly, focusing on regenerative agriculture that covered carbon sequestration and regenerative soil practices and climate resilience. The analysed research papers fell into 6 to 56 different categories, showing significant links across various fields and

applications: by this supporting directly several SDGs linking farming with environmental restoration, climate resilience and well-being.

Lastly, following a comprehensive evaluation of existing literature on RA, several key findings were identified that revealed increasing scholarly attention indicating a growing interest with core themes cantered on soil health, biodiversity, water and carbon sequestration, by this offering a comprehensive understanding of research dynamics and thematic evolution within the regenerative agriculture field in Moldova, with a focus on multi-layered bibliometric approach, thereby supporting evidence-based decisions for future research.

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