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A GLIMPSE INTO THE EVOLUTION OF STRATEGY IN BUSINESS

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***Abstract:** The postwar gradual transformation of businesses from supply-led to demand-led organizations led them to identify/design and implement new methods capable to match their resources and aims in order to fructify business opportunities in the markets. The importance of strategic plans, in particular, and of strategy, in general, in the business activity started to be increasingly recognized in the beginning of the 1950s. Since the emergence of its roots in the 1960s, the field of strategic management has undergone a rapid and impressive development in the business world. After the fall of the European communist regimes, the globalization era raised multiple challenges to businesses all over the world, such as uncessant change and technological disruptions. This is why strategy has become a must for any business organization, irrespective of its size or industry. The goal of the paper is to briefly present the evolution of strategy in the business domain, starting from the military science. To such end the author utilised a qualitative research method. The results of the paper show that there are various approaches related to the strategy concept. Based on a comprehensive literature review, the paper illustrates some of the most important characteristics of this concept. Also, the study demonstrates that strategy represents a key element for today's business organizations.*

***Keywords:** strategy, business, business organization, strategic management, United States of America.*

***JEL Classification:** L19, M00.*

1. Introduction

The Second World War raised numerous challenges to military leaders as planning and allocating various resources imposed especially an effective organization and efficacious management. The wartime experience boosted the scientific research and called for a deeper interdisciplinarity in order to better combine the technical, social and economic systems (Witzel, 2012).

The postwar gradual transformation of businesses from supply-led to demand-led organizations led them to identify/design and implement new methods capable to match their resources and aims in order to fructify business opportunities in the markets. The importance of strategic plans, in particular, and of strategy, in general, in the business activity started to be increasingly recognized in the beginning of the 1950s (Newman, 1951). General Electric, one of the largest American corporation, was among the first business organizations which introduced strategic planning in those years (Gluck, 1985).

Since the emergence of its roots in the 1960s, the field of strategic management has undergone a rapid and impressive development in the business world (Toma et al., 2016a; Toma et al., 2016b), mostly in the United States of America (USA). After the fall of the European communist regimes, the globalization era (Toma, 2005) raised multiple challenges to businesses all over the world, such as uncessant change (Toma and Marinescu, 2015) and technological disruptions (Toma and Tohănean, 2018). This is why strategy has become a must for any business organization, irrespective of its size or industry.

The goal of the paper is to briefly present the evolution of strategy in the business domain, starting from the military science. To such end the author utilised a qualitative research method. This study is structured as follows: the second chapter comprises the literature review. The research methodology is shown in the third chapter of the paper. The fourth chapter illustrates the results and discussion. The conclusions are displayed in the last chapter of the study.

2. Literature review

The last decades have witnessed numerous analyses, discussions and debates over the term of strategy. Consequently, it has increasingly become a topic of interest for both researchers and practitioners worldwide. The concept of strategy derives from the Greek word *strategia* (generalship), being used for the first time in the military art (Toma and Grădinaru, 2016).

There are several approaches related to strategy concept. In this regard, Whittington (2000) identified profit maximization approaches (e.g., classical, evolutionary) and pluralistic approaches (e.g., processual, systemic) . Despite the lack of consensus regarding the meaning of strategy, it is defined as follows:

- “the basic long-term goal of an enterprise, the adjustments of route made to reach the goal and the necessary allocation of resource” (Chandler Jr., 1962, p.13).
- “the art which allows, independently from all technology, mastery of problems posed by any dual, in order to allow that very technology to be used with maximum efficiency. Thus it is the art of the dialectic of force or more exactly the art of the dialectic of wills using force to solve their conflict” (Beaufre, 1964, p.16).
- “the art of making war upon the map, and comprehends the whole theater of war” (Jomini, 1971, p.62).
- “is concerned with the development of a viable match between the opportunities and risks present in the external environment and the organization’s capabilities and resources for exploiting these opportunities”(Hofer, 1973, p.3).
- “the analog of the biologist's method of "explaining" the structure and the behavior of organisms by pointing out the functionality of each attribute in a total system (or strategy) designed to cope with or inhabit a particular niche” (Rumelt, 1979, pp.197-198).
- “the use of the engagement for the goal of the war” (von Clausewitz, 1989, p.128).
- “management’s action plan for achieving the chosen objectives” (Thompson Jr. and Strickland III, 1987, p.18).
- “a plan..., a ploy..., a pattern..., a position..., a perspective” (Mintzberg, 1987, pp.11-17).
- “a deliberate search for a plan of action that will develop a business’s competitive advantage and compound it” (Henderson, 1991, p.5).
- “the use that is made of force and the threat of force for the ends of policy” (Gray, 1999, p.17).
- “a plan that aims to give the enterprise a competitive advantage over rivals through differentiation” (Luecke, 2005, p.xiv).
- a mean ”by which long term objectives will be achieved” (David and David, 2017, p.40).

The above-mentioned definitions allow the identification of several characteristics of the strategy concept. On this line, it might be outlined that:

- In its beginning, strategy was defined in the military science.
- Strategy represents a complex and multidimensional concept.
- Strategy is both theory, art and practice.

- Strategy is used in various domains from politics and military science to education and business.
- Strategy includes setting long-term goals, establishing the proper actions to attain them, and allocating the needed resources to perform the actions.
- Strategy makes the connection between goals (the outcomes) and resources (the means).
- Any strategy takes into consideration both the internal (e.g., resources) and external (e.g., opportunities) environment.
- Strategy is not limited to planning.
- As a process, strategy has three phases: design/formulation, implementation and control/evaluation.
- The main dimensions of strategy are the outcomes and the process.
- Most definitions of strategy share several common terms such as long term goal, objectives, competitive advantage or plan.

3. Research methodology

To accomplish the purpose of the paper, the author utilized a qualitative research method based on a desk research. In the first phase of the scientific research process he searched for secondary sources of data. The author discovered a plethora of articles and books related to the topic of strategy. Then, he collected and systematized the information. In the third phase, he analysed and synthesized the data. Finally, the author concluded his study.

4. Results and discussion

In its beginning, strategy was linked to war. On this line, Sun Tzu and Carl von Clausewitz, two of the most prodigious and influential military thinkers, wrote fundamental works (von Clausewitz, 1989; Sun, 2002). The Chinese author elaborated “The Art of War”, a book that has had a great influence on both military and business thought. In a nutshell, Sun Tzu concluded that:

- “(1) Strategy is a subtle and complex technique that is conceived over a certain amount of time (time as resource).
- (2) Strategy's aim is to avoid an engagement at all costs. If it occurs, the engagement must be quick.
- (3) The choice of the most appropriate moment, not just the conserving of resources, is very important.
- (4) Strategy allows for greater possibility of foreseeing events and trends, and can make possible the macroreadings of history, so critical to sound strategy.
- (5) Surprise is primarily a tool, not a hindrance.
- (6) All resources are critical: Engage the enemy with armed force only when he cannot be overcome by any other means and then only as a last resort; victory as gained in the shortest possible time, at the least possible cost in lives and effort, and with infliction on the enemy of the fewest possible casualties.” (Paquette, 1991, p.46).

On his turn, the German author wrote “On War”, a book that has greatly contributed to the development of strategic thinking and set out the role of strategy (Kornberger, 2013). Von Clausewitz advocated six principles of strategic effectiveness needed for reaching military success as follows:

- “1. Advantage of terrain.
2. Surprise.
3. Attack from several sides.
4. Aid to theatre of war by means of fortifications.
5. Assistance of the people.
6. Use of great moral forces.” (Horwath, 2006, p. 3)

The approaches of these two military thinkers provide both differences and similitudines regarding the strategy concept (Table no. 1).

Table no. 1. Differences and similitudines between von Clausewitz and Sun Tzu

Characteristics	von Clausewitz	Sun Tzu
Conception	Instant	Longer period
Role of surprise	More a hindrance	More a tool
Duration of engagement	Prolonged	Short
Flexibility	Limited	Critical
Foreknowledge	Limited	Critical
Emphasis	Tactics	Strategy
Key elements	a) Moral elements; b) Physical elements; c) Mathematical elements; d) Geographical elements; e) Statistical elements	a) Tao; b) heaven; c) Earth; d) the general; e) method
Strategy lessons	<ol style="list-style-type: none"> 1. Prepare by obtaining the right data and using your imagination. 2. When planning, beware of Pyrrhic victories and the fallacies of hope. 3. Expect the unexpected. 4. Stand united, but divide opponents. 5. Surprise your opponents. 6. Prevent confrontation wherever possible. 	

Sources: von Clausewitz, 1989; Paquette, 1991; Sun, 2002; Pars, 2013

The strategy concept penetrated rather late the business world. One of the main reasons resides in the fact that the field of management started its evolution only at the beginning of the last century. The works of Frederick Winslow Taylor and Heny Fayol gave a huge impetus to the new science of management (Toma, 2013). The need to increase efficiency led to the emergence of scientific management in the USA (Marinescu et al., 2014).

The end of the 1950s and the beginning of the 1960s witnessed the emergence of strategic management. Famous writers, especially from the USA, published several seminal works. Harry I. Ansoff (1957) launched the famous Ansoff matrix by combining existing/new products with existing/new markets. Thus, four types of strategies appeared:

- market development;
- market penetration;
- product development;
- diversification.

Also, he made the distinction among four concepts: strategy, policy, programme and standard operating procedure (Ansoff, 1965).

On his turn, Alfred D. Chandler Jr. (1962) stated that strategy comprises means (e.g., facilities) and ends (e.g., long-term goals). In his opinion, the organizational structure has to follow the strategy. In the 1970s, Kenneth R. Andrews identified four components of strategy as follows:

- market opportunity- what a business organization might do;
- corporate competence and resources- what a company can do;
- personal values and aspirations- what the people of the company want to do;
- external obligations (e.g., to society)- what a business organization should do (Andrews, 1971).

Also, he argued that the corporate strategy process comprises two phases: formulation (deciding what to do) and implementation (achieving outcomes).

The 1980s witnessed the born of a new management guru, Michael E. Porter. He asserted that “the goal of competitive strategy for a business unit in an industry is to find a position in the industry where the company can best defend itself against these competitive forces or can influence them in its favor” (Porter, 1980, p.4). In his view, the intensity of competition in a specific industry depends upon the cumulative effect of the following five forces:

- rivalry among existing firms;
- threat of new entrants;
- bargaining power of suppliers;
- threat of substitute products;
- bargaining power of buyers (Porter, 1980).

Also, Porter launched the notion of generic competitive strategies which encompasses three types: overall cost leadership, differentiation, and focus. Later, he introduced another new concept, the value chain. It comprises two types of value activities:

- primary activities: inbound logistics, operations, outbound logistics, service, marketing and sales;
- support activities: procurement, technology development, human resource management, firm infrastructure (Porter, 1985).

The late 1980s and the beginning of the 1990s brought the works of another important author, Henry Mintzberg. He differentiated five types of strategies:

- intended strategies- plans developed for the future;
- realized strategies- patterns evolved out of the past;
- deliberate strategies- fully realized strategies;
- unrealized strategies- not realized at all strategies;
- emergent strategies- realized patterns not expressly intended (Mintzberg, 1994).

Since the late 1990s there were numerous attempts to integrate other important issues, such as globalization, sustainability or technology (Bansal and Roth, 2000; Toma and Marinescu, 2013; Toma and Tohănean, 2019), in the study of strategy in business. On the other hand, researchers have emphasized the role played by various new concepts, tools, methods, and techniques in strategic management, such as Six Sigma (Toma, 2008a), social responsibility (Toma, 2008b; Marinescu et al., 2010b), quality (Cornescu et al., 2004; Toma, 2006), lean management (Naruo and Toma, 2007; Marinescu and Toma, 2008),

entrepreneurship (Zainea et al., 2020), and marketing mix (Marinescu et al., 2010a; Catană and Toma, 2021).

5. Conclusions

In its beginning, the concept of strategy was used in the military science, being mostly related to war. Only in the 1960s it penetrated the business world and, since then, has been analysed and developed in a significant number of books and articles. Thus, strategic management has become a topic of interest for both researchers and practitioners. Also, strategy has been designed and implemented in the activities of business organizations, irrespective of their size and industry.

The paper briefly presents the evolution of strategy in the business domain. The results of the paper show that there are various approaches related to the strategy concept. Based on a comprehensive literature review, the study illustrates some of the most important characteristics of this concept. Also, it demonstrates that strategy represents a key element for today's business organizations.

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SMART DEVELOPMENT OF BRAILA COUNTY BY SUPPORTING RESEARCH- DEVELOPMENT, INNOVATION AND DIGITALIZATION

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Abstract: *Through the article "Smart development of Braila County by supporting research - development, innovation and digitalization", I will try to capture all the absolute measures and directions of action necessary to achieve the strategic objective regarding intelligent development by supporting research, development, digitalization and increasing economic competitiveness and entrepreneurship in Brăila County. Brăila is the gateway to Europe, an important economic, medical and educational pole, supported by a modern and continuously modernizing infrastructure and a developed partnership environment, with a sustainable economy developed through innovation, tradition and resource utilization, attractive for investors, cultural center and touristic, modern and with a democratic multi-ethnic community. The European Commission encourages the development of national/regional research and innovation strategies for intelligent specialization as a means of directing the use of public funds towards strategic, integrated investments, in order to capitalize on the potential of intelligent growth and the knowledge economy in all Union territories. Taking into account the National Strategy for Research, Innovation and Intelligent Specialization 2022-2027, Brăila County has approved its own development strategy, putting in the foreground as a strategic objective: intelligent development by supporting research, development and innovation, digitization and increasing economic competitiveness and entrepreneurship. The article includes in detail two priorities: that of developing the research, development, innovation capacity of Brăila County and the adoption of appropriate technologies, with the two directions of action: that of increasing the digitization capacity of institutions and companies for the benefit of citizens with the eight directions of action. The evidence of the actions undertaken are highlighted in the article with the awards obtained due to the implementation of the strategic objective and the implementation of the e-governance concept at the local level based on the platforms: ghiseul.ro, town planning certificates, operating permits, GIS.*

Keywords: *strategy, research, innovation, investments, strategic objective, digitization, competitiveness.*

JEL Classification: *G21.*

1. Introduction

Brăila is the gateway to Europe, an important economic, medical and educational pole, supported by a modern and continuously modernizing infrastructure and a developed partnership environment, with a sustainable economy developed through innovation, tradition and resource utilization, attractive for investors, cultural center and touristic, modern and with a democratic multi-ethnic community.

Four pillars are necessary to put the county back on the map of Europe because it deserves it:

1. Involvement: The administration's relationship with the community must be redefined and resettled on new foundations with the citizen at the center, the administration thus becoming more open, more transparent and proactive, and the citizens with more civic spirit;

2. Vision: it is necessary for Brăila to redefine its vision of development and to get out of a stage of stagnation;

3. Development: the administration must identify fast and reasonable ways from a budgetary point of view to think and implement in feasible terms impact projects on the local community, from infrastructure, to heritage protection and to social aspects;

4. People: the local community of Brăila, with its specific social structure, is the one that will benefit from the smart development strategy of the County by supporting research-development, innovation and digitization.

2. Development vision

The mission of this vision is to ensure:

- the balance between the socio-economic systems and the natural potential with special emphasis on the exploitation of the tourist and ecotourism potential based on non-polluting and traditional resources;
- there is a highly qualified workforce, for which a sufficient number of jobs are ensured to ensure the increase of competitiveness, by capitalizing on the existing economic sectors;
- capitalizing on the natural and cultural-historical heritage
- permanent improvement of people's quality of life and ensuring equal access to utilities and public services;
- the active involvement of the institutions for the balanced economic and social development of the county with permanent consultation of the community, social partners and the business environment in the decision-making process.

3. Strategic objective: Smart Development of Braila County

The European Commission encourages the development of national/regional research and innovation strategies for intelligent specialization as a means of directing the use of public funds towards strategic, integrated investments, in order to capitalize on the potential of intelligent growth and the knowledge economy in all Union territories.

Taking into account the National Strategy for Research, Innovation and Intelligent Specialization 2022-2027, Brăila County approved its own development strategy, putting on the forefront as a strategic objective the development of intelligence by supporting research, development and innovation, digitization and increasing economic competitiveness and entrepreneurship.

The measures and directions of action to achieve this objective include several priorities, each with well-established measures and directions of action.

1. The priority regarding the development of the capacity for research, development, innovation and the adoption of appropriate technologies develops two measures:

The first: that of developing the capacity for research, development, innovation, with investments in the infrastructures of CDI/SME organizations as directions of action; creation, participation in structures, partnerships, collaboration programs of organizations and SMEs; preparation and implementation of projects within international CDI programs.

The second measure consists in supporting innovation activities in SMEs through SME investments in equipment and services for carrying out innovative research; applied research activities and technological development; investments in fields of intelligence specialization; implementing the certification process of products, services or different specific processes.

Two trophies obtained by Brăila could play an important role in attracting investors in the near future. Although it may seem hard to believe for some, our city received the title of Capital of Romanian Entrepreneurship at the Gala of the Association of Municipalities in Romania (AMR). The trophy came from the National Council of Small and Medium Private Enterprises in Romania. Also, also during the event, the Municipality of Braila received the award for excellence in supporting entrepreneurship, this time from AMR. A victory that

could weigh a lot in the relationship with future possible investors and not only that, precisely their activity contributed to winning the two trophies. For the award of excellence, Brăila competed in the last instant with the municipalities of Constanta and Suceava. The gala organized by AMR took place under the patronage of the President of Romania, the collaboration of the National Council of Rectors and the National Council of Small and Medium-sized Private Enterprises in Romania, the titles received will count in the future in the development of the economic sector, as they can become contractual partners with the construction of the Bridge over the Danube.

2. The second priority of Brăila County refers to increasing the digitization capacity of institutions and companies for the benefit of citizens through:

- the measure of digitization in education with the implementation of the online educational process as action directions; ensuring internet access in all pre-university schools and ensuring wireless infrastructure; equipping schools and educational institutions with digital equipment; digitization in the university and pre-university environment through the creation and development of digital platforms, databases and virtual libraries for pupils, students, live streaming, projection and video mapping equipment and infrastructure. In this sense, we can exemplify the rehabilitation of schools and kindergartens in Brăila Municipality with European funds, which led to their digitization.

- the measure of digitization in culture has as action directions the acquisition of modern facilities for cultural activity (equipment and infrastructure, databases, software, digital platform, integrated systems, ICT means, 3D digital models, IT infrastructures and cloud solutions, exploitation digitized; the creation of a complete and updated database regarding the state of the Brăila County through the use of ICT means (3D scanning, legal regime). The proof of the implementation of this measure is the creation of a virtual library and an online catalog within the County Library.

- the third measure refers to digitization in health with the following directions of action: investments in equipment and specific infrastructure - hardware, software, digital platforms, implementation of solutions for tele-consultations, continuous monitoring and management of patients, integrated development of health solutions (electronic archiving). An implementation of these measures, even if partially, has already been achieved at the Psychiatric Hospital, which completed a project with European funds.

- a fourth measure refers to ensuring cyber security by improving the security of networks and IT systems within local public authorities, ensuring an adequate level of cyber security for public and private entities by using solutions that use artificial intelligence, creating specific infrastructure for cyber protection .

- regarding the sixth measure regarding digitization in companies through the adoption of ICT technologies and digital tools that lead to the innovation of the business model for SMEs and their digital transformation, through the implementation of integrated IT systems, electronic applications business management, e-commerce solutions at the level of businesses in the county and the creation, development of digital innovation hubs, these are the responsibility of all economic agents that carry out their activity in Brăila County.

- measure of interoperability of the databases used by the public administration aims at the implementation of the functionalities for the migration and integration into the existing data structures of all the data necessary for the real-time provision of public services.

- the measure aimed at digitization in local public administration has many and complex directions of action, namely the provision of digital equipment, the development and

implementation of IT software solutions for the digitization of activities, investments in specific infrastructure equipment - hardware, software, digital platforms, for the implementation of the concept of e-government for citizens, digitization of local public services; creation, significant development of platforms for the management of official documents issued by authorities, tax collection, project management, electronic archiving; the development of integrated "smart streets" type intelligent video surveillance systems with lot sensors, smart urban furniture, smart lighting; developing the use of intelligent video technologies for the management of the selective waste collection stage; creation, development of integrated intelligent telemanagement systems for public lighting. At the beginning of February, 2017, it was announced in the local press that the installation of LED lighting fixtures had begun in the municipality, and in the next two years 12,800 will be installed." Brăila 02/07/2017 - The first day (or night) with lighting on LEDs !!! 12,659 LED lighting fixtures (street and pedestrian) will be installed in Brăila, 79 electrical panels, installation period - 2 years. Today, 40 lighting fixtures were installed on Calea Călărășilor from Strada Milcov (bus end, 4) to Barriere. We have the first 700 LED lighting fixtures of different light intensities" in the "Romania Association Gala", which took place at the Romanian Academy, in Bucharest rewarded with the Award for Excellence in Public Lighting. "Gala of the Association of Municipalities in Romania, 06.11.2017 - "Brăila - Award for Excellence in Public Lighting !!!" We are increasingly talking about environmental protection, modern projects with a low impact on the environment. At Brăila, words turn into deeds. Remote management, dimming, 8,300 LED lighting fixtures installed out of 12,800, installation in 2 years, payment in 10 years in equal installments without interest. More light, more ecological and cheaper". That these measures are being implemented is also proven by the video camera system administered by the Local Police, made with European funds, the GIS system at the level of the Brăila City Hall, the software implemented for filing documents necessary for the issuance of the Operating Authorizations of the economic agents operating within the Brăila Municipality, but also for the Town Planning Certificates. And the examples can go on. Digitalizarea la nivelul Municipiului Brăila a început timid cu platformă GHIȘEUL.RO și continuă încă până la implementarea unui soft integrat accesibil și ușor de folosit atât pentru salariați, cetățeni dar și de organele de control intern și extern.

- the last measure of priority number two is represented by the increase in broadband internet connection speed with increased capacity, with the following directions of action: modernization of current broadband networks, cabling of buildings for access to broadband networks, investments in the development of wireless networks .

Smart specializations represent priorities designed to constitute a competitive advantage by developing and correlating the strengths of research and innovation with the needs of the business environment in order to address emerging opportunities and market developments in a coherent way, having at the same time the duplication and fragmentation of efforts. These are identified through a process of entrepreneurial discovery, a process that, starting from evidence, involves the interactive dialogue of actors from the business environment, research, public institutions and civil society.

4. Resources

The resources needed for implementation involve: human, technical and financial resources. Although the last one as the financial resource is a priority, being about public but also private funds like this:

- local budget: own revenues of the county, donations and sponsorships, subsidies, financial operations, revenues for investments;
- national programs;
- European structural instruments: operational programs for 2021-2027 (POR, POEO, PODD, POCIDIF, POS, POT, POIDS, PAC, etc.);
- financing programs of the European Commission;
- other financing instruments;
- loans: credits from commercial banks or European institutions: EBRD, EIB;
- public-private partnerships.

5. Conclusions

At the end of the time period of the strategy, Brăila county will be characterized by:

- easy accessibility for citizens, tourists and businessmen, a county with fast, safe and sustainable internal transport links, connected to the main flows of people, goods and information in Central and Eastern Europe;
- non-discriminatory access of the population to quality public services, utilities and telecommunications, education, health, social assistance, public safety, culture and leisure, which will contribute to reducing the phenomenon of internal and external migration;
- important tourist destination that capitalizes on the authenticity of architecture, well-preserved local crafts and traditions, gastronomy, museums, contemporary cultural production, but also the uniqueness of landscapes, the diversity of natural resources or the historical heritage of the county.
- a green county, with a clean environment, green spaces, attractive opportunities for spending free time and practicing sports, capable of conserving nature, landscapes, the generous flora and fauna it enjoys, attractive for housing, tourism and ecological agriculture ;
- a dynamic business environment, characterized by attracting investments, local entrepreneurship and innovation, but also by permanent collaboration with local authorities and the university environment, capable of generating well-paid jobs and well-being for citizens;
- community of educated, innovative, confident, hospitable, tolerant, hardworking, honest people, open to new things but also with respect for traditions and history, involved in public life;
- proactive, efficient public administration and permanently interested in reducing bureaucracy, bringing its citizen services closer to the business environment, as well as its involvement in making strategic development decisions of the county.

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EVALUATION OF THE LEVEL OF SUSTAINABLE DEVELOPMENT THROUGH THE PRISM OF FINANCIAL INSTRUMENTS FOR ITS PROMOTION

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Abstract: *The present article examines the relationship between the financial instruments meant to stimulate sustainable growth and the level of meeting Sustainable Development Goals (SDGs). The urgency of the research is argued by the recognition of the sustainable development concept on a large scale on the global level. To consolidate the quality of the analysis and conclusions, there were selected several countries that are relatively small in terms of their territory, similar to the Republic of Moldova and Israel, and fall into different categories in terms of the amount of income per capita. Having applied a number of research methods, like scientific abstraction, induction, deduction, analysis and synthesis, it can be concluded that the EU member states demonstrate the highest level of achieving SDG, the Republic of Moldova, Armenia and Albania being much below the level of the EU member states, whereas Israel occupies an intermediary position between these two categories of countries. Insufficient and inefficient financing represents one of the major reasons explaining these developments. The article emphasizes the importance of reconsidering public finance, financial system, formal international financial assistance, direct investment, philanthropic donations in the Republic of Moldova through the prism of stimulating sustainable development.*

Keywords: *sustainable development, financing, public finance, financial instruments, sustainable development goals, financial system.*

JEL Classification: *G20, H2, O10.*

1. Introduction

The concept of sustainable development became a recognized objective on a large scale on the global level according to the *Brundtland Report* entitled "Our Common Future", which was presented in 1987 at the United Nations World Commission on Environment and Development [11].

In 1992, the United Nations Conference on Environment and Development in Rio de Janeiro, in the Rio Declaration on the Environment and Development, defines sustainable development as "the development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" and outlines fundamental dimensions of durable development: social, economic and environmental ones [10].

At the *Millennium Summit* in September 2000, which took place at the UN headquarters in New York, the Millennium Declaration was adopted, which includes eight Millennium Development Goals for the reduction of extreme poverty by 2015 [13].

The World Summit on Sustainable Development in Johannesburg in 2002 specifies the content of each of the components of sustainable development [12]. Thus, the economic component focuses on the constant economic growth, which is considered as a necessary condition for the continuous improvement of social welfare. The environmental component refers to respecting ecosystem limits for maintaining a stable productive base, ensuring protection and quality of natural resources, to prevent their excessive exploitation and diminishing their quality, as well as for biodiversity protection. The social component is

basically concentrated on ensuring equality of generations and within generations, on social integration and cohesion, civic participation, social mobility and respect for cultural diversities. These three components are interconnected in the following way: the economic dimension of development represents a means for serving its social dimension, which is the purpose of sustainable development, whereas the environmental dimension is the basis for sustainable development.

At the UN Conference on sustainable development („Rio + 20”) in 2012, the way to Agenda 2030 was opened.

Agenda 2030 was adopted on 25 September 2015 at a UN special summit, which defined a set of 17 Sustainable Development Goals (SDGs), 169 targets and over 230 indicators [14].

For the implementation of the sustainable development goals it is necessary to harmonize and interconnect all the promotion and implementation instruments, especially the financial ones.

In this respect, *the Action Agenda of the third international conference on financing for development in Addis Abeba* emphasizes the importance of cohesive sustainable development strategies, assumed on the national level and supported by the integrated national financing bodies [7]. Every country bears the main responsibility for its economy and society. At the same time, national development efforts should be supported by a favorable international economic environment, including the cohesive global commercial, monetary and financial systems, which are reciprocally supported, as well as by a consolidated and improved global economic governance [3; 6].

2. The specifics of sustainable development in small countries.

To consolidate the quality of the analysis and conclusions made in the present paper, the authors selected several countries which, being relatively small in terms of their surface area, like the Republic of Moldova and Israel, fall into different categories in terms of the amount of income per capita (table 1). Thus, as a basis for drawing comparisons, the following countries were chosen: Estonia, Denmark, Belgium, Israel and Slovenia (from the group of high income countries); Moldova, Armenia and Albania (from the group of upper middle income countries) and Rwanda (from the group of low income countries). Simultaneously, considering the prospects of the Republic of Moldova as a candidate country for joining the EU, there were selected the EU member states that are post-socialist countries as well (Estonia and Slovenia), and Albania, which, like the Republic of Moldova, has the status of a EU candidate country.

Table no 1. The general characteristic of the countries selected to be evaluated from the perspective of sustainable development, 2022

	Surface area (sq. km)	Population		GDP (current US\$)		Gross capital formation (current US\$)	
		thousands of people	in % of the total population by the category of countries it belongs to	millions	in % of the total GDP by the category of countries it belongs to	millions	in % of the gross capital formation by the category of countries it belongs to
Estonia	54,340	1,349	0.11	38,101	0.06	11,527	0.08
Denmark	42,920	5,903	0.47	400,167	0.65	95,562	0.66
Moldova	33,850	2,539	0.09	14,508	0.05	3,751	0.04
Belgium	30,530	11,686	0.94	583,436	0.95	158,332	1.09
Armenia	29,740	2,780	0.10	19,513	0.06	4,222	0.04
Albania	28,750	2,778	0.10	18,916	0.06	4,449	0.04
Rwanda	26,340	13,777	1.96	13,311	2.52	3,341	3.07
Israel	22,070	9,558	0.77	525,002	0.85	141,476	0.97
Slovenia	20,480	2,112	0.17	60,063	0.10	14,584	0.10

Source: made by the authors on the basis of the World Bank's information. Available at: <https://data.worldbank.org/indicator>.

The level of sustainable development of the countries included in the analysis has been evaluated on the basis of the Global indicator framework for SDGs and the targets of the 2030 Agenda for Sustainable Development¹.

Table no 2. Indicators serving as a basis for evaluating the Sustainable Development Goals

SDG	Indicators serving as a basis for evaluating the Sustainable Development Goal
Goal 1: No poverty	1. The percentage of employees and their families living on less than \$1.90 per person a day; 2. The proportion of the population living below the extreme poverty line.
Goal 2: Zero hunger	1. The proportion of the population suffering from hunger; 2. The proportion of adults experiencing moderate or severe food insecurity.
Goal 3: Good health and well-being	1. Maternal mortality rate; 2. The mortality rate of children under the age of 5 years old.
Goal 4. Quality education	1. The rate of participation in pre-school/primary education one year ahead of the official primary school entry age; 2. The proportion of primary schools with the internet access for pedagogical purposes.
Goal 5. Gender equality	1. The proportion of seats occupied by women in parliamentary bodies.
Goal 6. Clean water and sanitation	1. The percentage of the population using drinking water supply services provided in safe conditions; an improved indoor source, accessible on demand and free of contamination; 2. The percentage of household wastewater treated in safe conditions.
Goal 7. Affordable and clean energy	1. The proportion of the population with access to electricity; 2. The proportion of the population using non-polluting fuels and technologies; 3. The share of renewable energy in the total energy consumption.

¹ The Global indicator framework was approved by the UN General Assembly Resolution of July 2017 and was updated in 2022.

Goal 8. Decent work and economic growth	1. The annual growth rate of real GDP per employed person; 2. The share of informal employment; 3. The total unemployment rate; The share of the young who neither study nor work.
Goal 9. Industry, innovation, and infrastructure	1. Added value in the manufacturing industry as a share of GDP; 2. The share of small enterprises that benefit from a loan or a credit line; 3. Research and development expenses as a percentage of GDP; 4. The share of medium and high technology industry in the total value added.
Goal 10. Reduced inequalities	1. The proportion of the people living on the amount below 50% of the average income; 2. The proportion of the population that reported feeling discriminated; 3. The share of labor force in GDP, including salaries and social benefits.
Goal 11. Sustainable cities and communities	The proportion of the urban population living in slums.
Goal 12. Responsible consumption and production	1. The amount of hazardous waste generated per person; 2. The share of pre-tax fossil fuel subsidies (consumption and production) in GDP.
Goal 13. Climate action	1. Evaluating the adoption and application of national risk reduction strategies, including disaster risks.
Goal 14. Life below water	1. The average proportion of key marine zones; biodiversity covered by the protected areas.
Goal 15. Life on land	1. The share of plots of land covered with forests.
Goal 16. Peace, justice and strong institutions	1. The bribery prevalence rate; 2. The percentage of companies having faced at least one bribe request; 3. Primary public expenses as a percentage of the budget which was initially approved.
Goal 17. Partnerships for the goals	1. Total public revenues as a share of GDP; 2. The flow of direct foreign investment; 3. Remittances as a percentage of total GDP.

Source: made by the authors on the basis of *the Global indicator framework for the Sustainable Development; Goals and targets of the 2030 Agenda for Sustainable Development*. Available at: https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202022%20refinement_Eng.pdf

At the same time, from this indicator framework, there were selected only the indicators that have value coverage for all the countries included in the analysis. Consequently, there was made table 2, representing the list of indicators that served as a basis for evaluating each SDG for the countries included in the research.

The way of evaluating the extent of meeting the targets meant for SDG by the countries under analysis is presented on the basis of the Sustainable Development Goal 8, which is “promoting inclusive and sustainable economic growth, full and productive employment and decent work for all” (table 3).

Table no 3. The level of meeting Sustainable Development Goal 8: Decent work and economic growth on the level of the selected countries.

	Estonia	Denmark	Moldova	Belgium	Armenia	Albania	Rwanda	Israel	Slovenia
Annual growth rate of real GDP per employed person	↓ from 12.0% in 2000 to 2.2% in 2022	↓ from 3.3% in 2000 to 0.0% in 2022	↓ from 0.2% in 2000 to 9.2% in 2022	↑ from 0.2% in 2000 to 0.3% in 2022	↑ from 6.1% in 2000 to 6.8% in 2022	↓ from 5.4% in 2000 to 2.3% in 2022	↓ from 4.4% in 2000 to 4.1% in 2022	↓ from 5.3% in 2000 to 2.3% in 2022	2022: 3.6%
Share of informal employment	↑ from 6.7% in 2007 to 9.1% in 2021	↓ from 8.1% in 2007 to 7.6% in 2019	↓ from 100.0% in 2000 to 57.2% in 2021	↓ from 7.1% in 2007 to 3.2% in 2021	↓ from 51.2% in 2008 to 49.3% in 2020	↓ from 66.6% in 2012 to 56.7% in 2019	↑ from 84.3% in 2017 to 87.1% in 2021	-	↑ from 4.0% in 2007 to 7.7% in 2021
Total unemployment rate	↓ from 13.4% in 2000 to 6.2% in 2021	↑ from 4.5% in 2000 to 5.1% in 2021	↓ from 8.5% in 2000 to 0.8% in 2021	↓ from 6.6% in 2000 to 6.3% in 2021	↑ from 9.8% in 2007 to 12.2% in 2020	↑ from 4.6% in 2002 to 11.5% in 2019	↑ from 11.9% in 2017 to 15.8% in 2021	↓ from 11.1% in 2000 r. to 5.0% in 2021	↓ from 6.9% in 2000 to 4.7% in 2021
Share of the young who neither study nor work	↓ from 12.1% in 2003 to 10.9% in 2021	↑ from 5.4% in 2003 to 7.1% in 2021	↓ from 24.9% in 2000 to 13.6% in 2021	↓ from 8.6% in 2004 to 7.4% in 2021	↓ from 40.5% in 2009 to 26.1% in 2020	↓ from 41.8% in 2002 to 25.8% in 2019	↑ from 25.6% in 2017 to 29.1% in 2021	↑ from 15.4% in 2012 to 16.8% in 2021	↓ from 8.0% in 2003 to 6.6% in 2021

Source: made by the authors on the basis of the information from the UN's database regarding the indicators related to SDG. Available at: <https://unstats.un.org/sdgs/dataportal/countryprofiles>.

Note: Indicator values and their evolution were evaluated on the basis of the following variation ranges:

	positive evolution / high level		negative evolution / negative level
	neutral evolution / satisfactory level		extremely negative evolution / extremely negative level

The values of the indicators characterising these SDGs have been taken from the UN's database related to the sustainable development.

Depending on the evolution of the values of the selected indicators, the tendency of this evolution has been identified and presented (positive, neutral, negative, and extremely negative evolution) by assigning a certain color, as it is explained in the note under table 3.

As it can be seen from this analysis, the Republic of Moldova records extremely unfavorable developments on "Annual growth rate of real GDP per employed person" and "Share of informal employment". The reasons determining the direction of the first indicator are mostly connected to the Covid-19 pandemic crisis, energetic crisis, and the impact of the war in Ukraine. As to the second indicator, informal employment represents a complex problem for Armenia and Albania, which are both post-socialist countries, as well as for Rwanda.

Although the Republic of Moldova records a positive evolution on "Total unemployment rate", these favorable dynamics do not reflect the real situation on the national employment market, the occupation rate being very low.

As regards the indicator "Share of the young who neither study nor work" the identified tendency suggests the conclusion about a negative evolution in the Republic of Moldova, and extremely negative dynamics in Armenia, Albania, Israel, and Rwanda.

As a result, on the basis of the conclusions made, the level of achievement of Sustainable Development Goal 8 has been appreciated as extremely negative.

Table no 4. Summative evaluation of the level of achievement of Sustainable Development Goals on the level of the selected countries

Sustainable Development Goal	Estonia	Denmark	Moldova	Belgium	Armenia	Albania	Rwanda	Israel	Slovenia
Goal 1: No poverty	Green	Green	Green	Green	Green	Green	Red	Green	Green
Goal 2: Zero hunger	Yellow	Yellow	Red	Yellow	Pink	Red	Red	Pink	Pink
Goal 3: Good health and well-being	Yellow	Yellow	Pink	Yellow	Red	Red	Red	Yellow	Yellow
Goal 4. Quality education	-	Green	Pink	Yellow	Pink	Pink	Red	Green	Pink
Goal 5. Gender equality	Yellow	Green	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow
Goal 6. Clean water and sanitation	Yellow	Yellow	Red	Pink	Red	Red	Red	Yellow	Pink
Goal 7. Affordable and clean energy	Yellow	Yellow	Yellow	Yellow	Pink	Yellow	Red	Pink	Yellow
Goal 8. Decent work and economic growth	Pink	Yellow	Red	Yellow	Red	Red	Red	Pink	Yellow
Goal 9. Industry, innovation, and infrastructure	Green	Green	Pink	Green	Yellow	Pink	Pink	Yellow	Green
Goal 10. Reduced inequalities	Yellow	Yellow	Pink	Yellow	Yellow	Pink	Pink	Pink	Yellow
Goal 11. Sustainable cities and communities	Green	Green	Pink	Green	Yellow	Pink	Pink	Yellow	Green
Goal 12. Responsible consumption and production	Green	Yellow	Yellow	Yellow	Yellow	Pink	Pink	Pink	Green
Goal 13. Climate action	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Goal 14. Life below water	Green	Yellow	-	Green	-	Green	-	Yellow	Green
Goal 15. Life on land	Green	Yellow	Yellow	Yellow	Pink	Yellow	Pink	Pink	Green
Goal 16. Peace, justice and strong institutions	Green	Green	Yellow	Yellow	Yellow	Pink	Pink	-	Green
Goal 17. Partnerships for the goals	Green	Green	Yellow	Green	Green	Yellow	Yellow	Yellow	Yellow

Source: made by the authors on the basis of the information from the UN's database regarding the indicators related to SDGs. Available at: <https://unstats.un.org/sdgs/dataportal/countryprofiles>.

Note: Indicator values and their evolution were evaluated on the basis of the following variation ranges:

Green	positive evolution / high level	Pink	negative evolution / negative level
Yellow	neutral evolution / satisfactory level	Red	extremely negative evolution / extremely negative level

Similar evaluations were made on the level of other SDGs, the obtained results being synthesized in table 4. Consequently, the Republic of Moldova recorded positive results on achieving SDG 1 – No poverty. The greatest failures were reported in connection with SDG 2 – Zero hunger; SDG 6 – Clean water and sanitation; and SDG 8 – Decent work and economic growth.

For the most part, developments comparable to those in the Republic of Moldova were also recorded by Armenia și Albania. Israel and EU countries demonstrated much better performances as compared to the countries demonstrating their aspirations for European integration. Rwanda, a small country in east-central Africa tackles complicated problems and challenges, which explains negative developments of SDGs on the level of this country.

The ambitious content of SDGs and relatively limited progress recorded in the countries with low and medium income per capita included into the analysis suggests the conclusion about the need for extraordinary efforts that should be applied both on the level of these countries and on the level of the international community, including the increase of official assistance. The national authorities should follow a very ambitious program of reforms to ensure the long-term growth, mobilize internal revenues and improve asset management in the public sector [5]. In this regard, the problem associated with the SDG financing represents an area of primary importance [8].

3. Financial tools for promoting and accomplishing Sustainable Development Goals

Financial aspects associated with sustainable development can be evaluated through the prism of some indicators [4] that, depending on the Sustainable Development Goals, can be grouped into the following two categories:

- a) indicators reflecting the country's direct financial effort to implement sustainable development; and
- b) indicators expressing external financial aid and assistance received by some countries, as a rule, poor and developing ones, with the purpose of achieving the level provided by sustainable development.

As it can be noticed in table 5, which reflects financial aspects of sustainable development goals, the first category includes the following:

- indicators characterising the contribution of public finance to the country's sustainable development. This group includes the indicators that measure the financial position expressed by:
 - public expenditures (absolute and relative value, especially, the proportion of some expenditure articles in the total amount of public expenditures, the proportion of some expenditure articles in GDP, public expenditures related to some expenses per capita, etc.);
 - public revenues (absolute and relative value, sources etc.);
 - variables related to the fiscal policy (e.g. the redistributive impact of fiscal policy, debt service as a proportion of exports of goods and services);
- indicators characterizing the contribution of the financial system to the country's sustainable development. This group includes indicators measuring the financial position expressed by:
 - parameters of financial inclusion (for example, the number of bank branches per 100 thousand adults, etc.)

- indicators of financial soundness. With the help of these indicators, it is possible to monitor the financial factor solidity from a macroprudential point of view, the following aspects being targeted: capital adequacy, asset quality, cost effectiveness, liquidity and market risk on the level of financial institutions and on the level of the financial system;
- indicators characterizing the contribution of obtained financial resources, in the form of transfers, to the country's sustainable development. This group includes indicators measuring the financial position expressed by:
 - indicators regarding remittances (for example, the volume of remittances as proportion from GDP, the costs of remittance as a proportion from the amount sent, etc.)
 - indicators characterizing the mobilization of resources from all the sources to finance Sustainable Development Goals. This group includes:
 - generated income and mobilized finances from the relevant economic instruments for biodiversity.

The second category includes the indicators related to the official assistance for development and is connected to: decreasing poverty (SDG 1); the agricultural sector (SDG 2); scholarships (SDG 4); clean water and sanitation (SDG 6); research and development in the field of clean energy and renewable energy products (SDG 7); infrastructure (SDG 9); development, direct foreign investment and other flows (SDG 10); conservation and sustainable use of biodiversity (SDG 15).

Table no 5. Financial dimension of the Sustainable Development Goals

Goal 1: No poverty	The proportion of public spending destined for essential social services (education, health, social protection) in the total of public expenditures; Social public expenditures destined for the poor
Goal 2: Zero hunger	The agriculture orientation index for public expenditures; Subsidies for exporting agricultural products
Goal 4. Quality education	The volume of official assistance flows for the development of scholarships, by sectors and types of studies
Goal 6. Clean water and sanitation	The volume of official assistance for the development related to water and sewage which is part of government-coordinated expenditure plan
Goal 7. Affordable and clean energy	International financial flows to the developing countries meant to support research and development in the field of clean energy and renewable energy production, including in hybrid systems
Goal 8. Decent work and economic growth	The number of commercial bank branches per 100.000 of adults and the number of ATMs per 100.000 of adults; The proportion of adults (15 years old and more) having an account in a bank or another financial institution or at a mobile money service provider
Goal 9. Industry, innovation, and infrastructure	The proportion of small industries having a loan or a credit line; Research and development expenses as a proportion of GDP; Official assistance for development plus other official flows for the infrastructure
Goal 10. Reduced inequalities	The redistributive impact of fiscal policy; Indicators of financial soundness; Remittance costs as a proportion of the amount sent
Goal 11. Sustainable cities and communities	Total expenses per capita for preservation, protection and conservation of the entire cultural and natural heritage, depending on the source of financing (public, private), the heritage type (cultural, natural) and the government level (national, regional, and local/municipal)
Goal 12. Responsible consumption and production	The value of fossil fuel subsidies (production and consumption) per GDP unit
Goal 15. Life on land	The official development assistance regarding conservation and sustainable usage of biodiversity; The generated revenues and mobilized financing from the economic sources relevant to diversity
Goal 16. Peace, justice and strong institutions	The total value of illicit incoming and outgoing financial flows (in current US dollars); Primary public expenses as a proportion from the initial approved budget, by sectors (or by budgetary sectors or similar things)
Goal 17. Partnerships for the goals	Total public revenues as a GDP proportion, by sources; The proportion of the public national budget financed by internal taxes; Supplementary financial resources mobilized for the developing countries from multiple sources; Remittance volume (in US dollars) as a proportion of the total GDP; Debt service as a proportion of exports of goods and services

Source: made by the authors on the basis of *Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development*. Available at: https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202022%20refinement_Eng.pdf

Next, there is evaluated the contribution of the quality of financing to the achievement of the Sustainable Development Goal "Building a resilient infrastructure, promoting inclusive and sustainable industrialization, and encouraging innovation" (SDG 9) for the case of the Republic of Moldova as compared to other relatively small countries and some countries that are also candidates to joining the EU. Global goal 9 was chosen for the reason that the Republic of Moldova has recorded an unfavorable result in respecting the provisions related to it.

SDG 8 integrates eight specific targets. Out of them, the first five represent result targets: development of durable, resistant and accessible infrastructure; promoting sustainable industrialization from the social and economic point of view; extending the access to financial services and markets for all enterprises; modernization and durability of industrial sectors; the increase of innovation, research and development grade. The other three are just the means for achieving the targets.

As regards SDG 9, there is a number of financial instruments contributing to its achievement, the following being among them: access to bank loans, their financing from the national public budget, external official financial assistance for the infrastructure, etc.

The evolution of the Republic of Moldova in terms of this SDG is evaluated as being negative (table 4), the best results being recorded by the EU countries (Estonia, Denmark, Belgium, and Slovenia). One of the reasons explaining this unfavorable course is the access of small industries to bank loans. Thus, as shown in table 6, the Republic of Moldova has the poorest performance among the countries under analysis: only 7.3% of small industries benefited from bank loans in 2019. Moreover, there is a tendency of continuous decrease of these industries' access to bank financing.

Table no 6. Proportion of small industries having at least one loan or credit line (%)

	2009	2013	2019	2023
Moldova	48.56	34.87	7.3	-
Estonia	51.67	42.47	38.32	-
Georgia	32.4	35.76	37.96	42.7
Albania	37.37	21.41	20.89	-

Source: made by the authors on the basis of the World Bank Enterprise Surveys. Available at: <https://www.enterprisesurveys.org/>

The same negative trend characterises the evolution of financing expenses on research and development from public budgetary sources in the Republic of Moldova. As it can be seen in figure 1, the Republic of Moldova and Georgia record the lowest amount of public expenditures on research and development in relation to GDP (0.2%). For comparison, regarding this indicator, Israel reached the value of 5.6% of GDP in 2021, Denmark – 2.8%, Estonia – 1.8%. The high level of financing expenses on research and development correlates

positively with a higher level of innovation, modern technologies, competitive products, work places, facilitation of international commerce, efficient use of resources, etc.

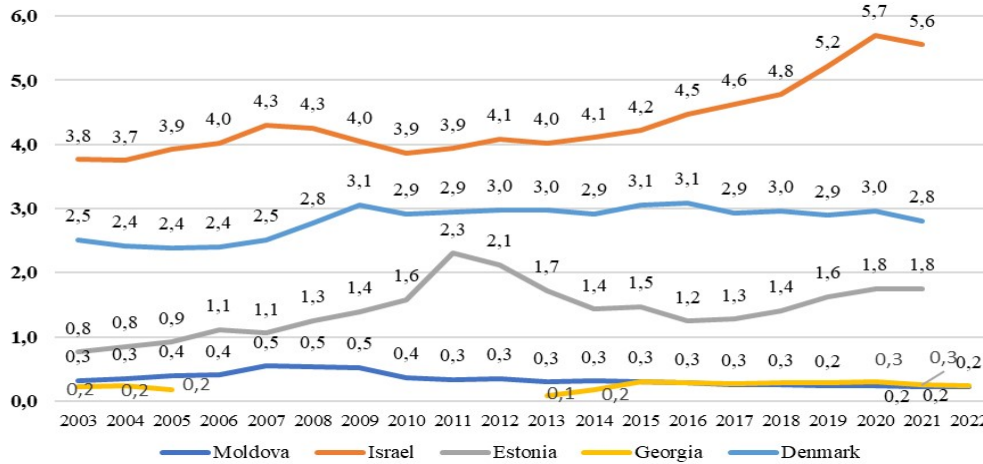


Figure no 1. Public spending on research and development as a proportion of GDP (%)
Source: made by the authors on the basis of the information from UNECE statistical database. Available at: <https://w3.unece.org/SDG/en/Indicator?id=123>

Negative evolutions are also characteristic of official development assistance (ODA) that the Republic of Moldova benefited from in the period 2002 – 2021 to develop its infrastructure. In this context, we would like to mention that ODA includes both debt-generating financial flows (for example, concessional loans for projects) and those that do not generate any debt (for example, grants).

As it is suggested in figure 2, among the countries under consideration, Montenegro and the Republic of Moldova recorded the lowest volume of financial flows obtained from external financial assistance.

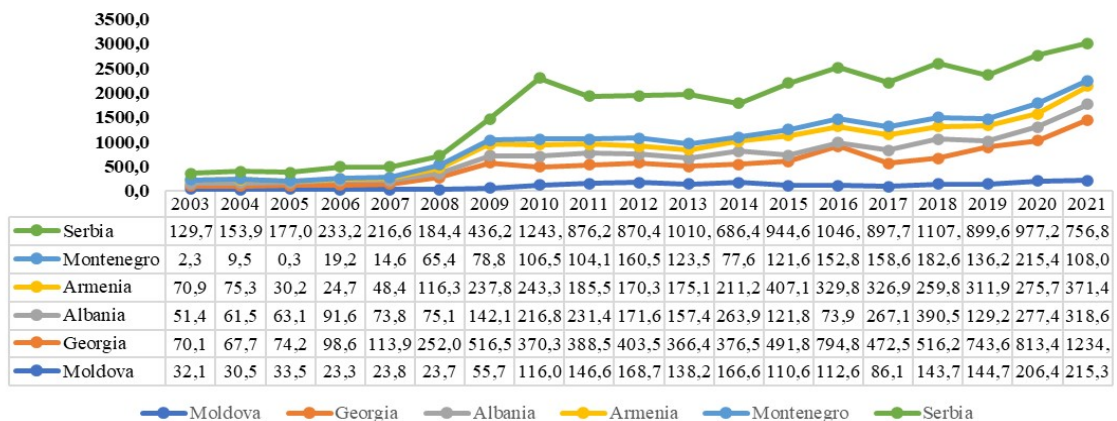


Figure no 2. Total of the foreign official financial flows for infrastructure, by beneficiary countries (in millions of American dollars at their constant 2021 value)

Source: made by the authors on the basis of the information from the UN's database on indicators related to SDGs. Available at: <https://unstats.un.org/sdgs/dataportal/countryprofiles>.

Besides the modest volume of foreign official assistance destined for infrastructure, the Republic of Moldova, as compared to other countries included in the analysis, demonstrates a very slow growth rhythm of this assistance.

In this context, taking into account the fact that: i) official development assistance (ODA) is considered one of the most important means of applying financing for development; ii) developing countries with small revenues and countries with medium revenues are eligible for ODA², the Republic of Moldova must intensify its efforts to increase the efficiency of this instrument of SDG financing [1; 2].

For this reason it is necessary to efficiently manage foreign official assistance, including providing ODA transparency; to update the electronic platform of external official assistance management; to improve communication with society as regards external assistance; consolidate institutional framework (respective subdivisions from the State Chancellery and Ministry of Finance), as well as conceptual and methodological framework (looking into political conditionality and its correlation with ODA quality) of external official assistance, adjusting ODA in the modern geopolitical context.

4. Conclusions

Additional internal financial resources supplemented by international assistance are essential for accomplishing sustainable development and achieving sustainable development goals.

At the same time, limited fiscal space determined by the results of a number of consecutive and concomitant crises has tested out public finance in the Republic of Moldova.

Considering the specifics of modern economic, social and political context the Republic of Moldova is in, with the purpose of providing sustainable growth, it is necessary to consolidate the administration of revenues through modernizing the national fiscal system, to improve fiscal policy, to make tax collection more efficient. At the same time, for the purpose of accountability of public finance and increase of public resources efficiency from the perspective of accomplishing SDGs, it is necessary to provide absolute transparency of public expenditures, public procurement and budgets on all the public administration levels. Public spending must be necessarily connected to the performance and regularly reevaluated.

From the perspective of accomplishing SDGs, it is necessary to improve the national fiscal system's equity, transparency, efficiency and efficacy, including through the expansion of the tax base and through continuing efforts of integration of the informal sector into the formal economy, according to national circumstances.

An important role in expanding the funding of the objectives of sustainable development should be played by a full and equal access of everybody to financial services. In this respect, it is important to develop the Strategy of financial inclusion on the national level, having consultations with the relevant interested stakeholders. Financial inclusion must be taken into consideration as a political objective in financial regulating.

Sustainable development needs encouraging the use of innovative instruments, including mobile bank services, payment platforms and digitalized payments.

It is necessary to expand the contribution of migrants to inclusive growth and sustainable development in the Republic of Moldova.

It is required to strengthen international cooperation to support the efforts to consolidate the capacities of central and local public administration authorities related to official development assistance management.

International practice emphasizes the importance of philanthropic donations and considerable financial and non-financial contribution of philanthropists to SDG accomplishment. In this respect, philanthropic donors' flexibility and their capacity to innovate and assume risks are appreciated, as well as their capacity to mobilize supplementary funds through partnerships with a greater number of the parties concerned.

To meet long-term financing needs some effort must be made for the development of the internal capital market, especially long-term bond and insurance market. We would like to emphasize the fact that regional markets represent an efficient way to achieve economies of scale, which cannot be achieved when individual markets are small.

There is a need for considerable increase of the contribution that direct investments, including foreign direct investments, can make to sustainable development.

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THE CONCEPTUAL AND INSTITUTIONAL FRAMEWORK OF ECONOMIC RESILIENCE

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Abstract. *Recent disruptions and shocks caused by financial crises, pandemics, and catastrophic events, emphasize the importance of economic resilience as the ability of an economy to adapt and recover quickly. The concept is crucial for maintaining stability and economic growth in the face of global or internal challenges and fluctuations. This study aims to analyze the European institutional framework related to economic resilience and to explore the concept at the international level. The importance of studying resilience derives from the risk of it becoming a substance-less cliché due to excessive use and associated ambiguity. Numerous academic works address this subject, creating uncertainty. Despite the efforts of some international organizations to define the term, the inconsistencies encountered in some guidelines and the incompatibilities between them create difficulties in the development and implementation of appropriate policies. The methods used in this study are: bibliographic documentation, observation, synthesis and interpretation of information. As a result of the rigorous research carried out, the conceptual limits of economic resilience were established, which allowed the identification of key elements and resilient economic strategies, to ensure risk management and the promotion of sustainable development.*

Keywords: *economic resilience, sustainable development, conceptual framework.*

JEL Classification: *D60, Q51, R11.*

1. Introduction

Economic resilience is an essential concept in the context of managing risks and ensuring the long-term prosperity of an economy. It refers to the ability of an economy to cope with and recover quickly from disruptions or shocks, including recessions, financial crises or catastrophic events. Moreover, economic resilience is a measure of that economy's ability to maintain its stability and growth in the face of challenges and fluctuations in the global or domestic economic environment.

There are several key elements that contribute to a country's economic resilience. Sectoral diversification, for example, is crucial because economies that are overly dependent on a single sector are more vulnerable to shocks that may affect that sector. Institutional robustness is also essential, as strong and transparent institutions can help stabilize an economy in times of crisis. Adequate fiscal and monetary policies, investment in infrastructure, education and innovation play an important role in increasing a country's economic resilience.

Also, the adaptability and flexibility of labor markets and the business system are essential aspects of economic resilience. Economies with flexible and adaptable labor markets can more easily adjust to changes in the economic environment as well as crises that may occur.

In the contemporary world, economies face a number of risks and threats, such as climate change, financial crises, pandemics and natural disasters. To manage these risks and minimize their negative impact on the economy it is essential to know and understand the concept of resilience.

A resilient economy is better able to maintain stability in the face of shocks and return to a growth trajectory after periods of turbulence. Therefore, the study of economic resilience

can contribute to the development and implementation of policies that enhance an economy's ability to cope with challenges and sustain long-term economic growth.

A resilient economy is one that can support sustainable development, taking into account both the needs of the present and those of future generations. By studying economic resilience, we can identify ways to build more robust and adaptable economies that can withstand and thrive in the face of economic and environmental challenges.

2. Development of the concept of economic resilience

2.1. The scientific evolution of the concept of resilience

The origin of the concept of resilience comes from the science of material resistance and expresses the behavior of materials to shock stresses. From the Latin *resilio*, means to jump back, to retreat, to recover. The term was originally used to describe the ability of a system to return to equilibrium after a disturbance. In the meantime, it has been enriched with new nuances and meanings, coming to include not only the return to a certain state, but also the adaptation to change and the transformation of the system (Mihai, et al., 2022).

In the opinion of the Romanian authors (Mihai, et al., 2022), but also of the author Adam Rose from the University of California (Rose, 2007), the first to introduce the scientific notion of resilience in the modern sense was C.S. Holling, a theoretical ecologist. Holling argued that "resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes in state, process, and parameter variables while managing to persist" (Holling, 1973).

Generous studies on resilience can be found in Linkov and Trump (2019). The central idea of the research presented by the authors concerns the need to understand resilience as a function dependent on *time and space*. The authors argue that resilience is both a philosophy and a methodological practice that emphasizes the role of *recovery* from a disruption as much as the *absorption* of a threat and its consequences.

The specialized literature contains several definitions of resilience depending on the field of application: ecological, psychological, physical, economic, social resilience, etc. There are also several dimensions, characteristics and principles that define this concept. In our study, we will focus on and describe the concept of economic resilience.

According to the Euro-Atlantic Institute for Building Resilience, economic resilience represents a country's ability to face and adapt to economic shocks and challenges, while maintaining sustainable growth and macroeconomic stability (IEACR, 2023).

2.2. The use of the concept of resilience at the level of European Union policies

The concept of resilience has been developed in various policy documents at European level. We will mention some of them below to outline the institutional and conceptual framework of resilience from the perspective of the European Commission.

One of the first approaches to the concept of resilience at EU level can be found in the 2012 Communication from the Commission to the European Parliament and the Council on resilience in the field of food security (COM, 2012). In this communication, resilience is defined as the ability of an individual, household, community, country or region to withstand, adapt and recover quickly from stress and shocks without compromises long-term development prospects. This involves two aspects: the ability to withstand and the ability to quickly recover from an impact.

According to this communication, increasing resilience can be achieved through two methods: increasing the entity's ability to deal with crisis situations or reducing the impact of these crises. It is also recommended to apply both strategies simultaneously. This requires a complex approach and a comprehensive perspective aimed at both reducing the multiple risks of crises and improving adaptive capacity at local, national and regional levels. Therefore, in building resilience, a long-term approach that focuses on mitigating the root causes of crises and improving capacities to manage future uncertainty and change is essential.

A series of acts and programs at the level of the European Union that address resilience followed. The European program for the protection of critical infrastructures (SWD, 2013) adopted the term "resilience" to develop a common approach in the EU for the protection and resilience of critical infrastructures, taking into account the interdependence between these infrastructures, industry and the state.

A number of approaches to resilience in the field of energy, security and foreign policy have also been reported (COM, 2014; COM, 2015; European Parliament, 2015; European Commission, 2016).

A significant contribution to the development of the concept of resilience was made by the Joint Communication to the European Parliament and the Council on resilience in EU external action (SWD, 2017) which examines different aspects of state and society resilience, helping to define a strategic approach to resilience in EU external action. This Strategy talks about resilience as "a broad concept encompassing all individuals and the whole of society" that features "democracy, trust in institutions and sustainable development, and the capacity to reform". The EU's strategic approach to resilience aims to achieve the following objectives:

- the adaptability of states, societies, communities and individuals to political, economic, environmental, demographic or societal pressures, to support progress towards national development objectives;
- the ability of a state, amidst substantial pressures, to establish, uphold, or reinstate its fundamental functions, along with essential social and political unity, in a manner that upholds democratic principles, the rule of law, human and fundamental rights, and promotes comprehensive long-term security and advancement;
- the capacity of societies, communities and individuals to manage opportunities and risks in a peaceful and stable way and to build, maintain or restore livelihoods in the face of major pressures.

The Strategic Foresight Report - Charting the course towards a more resilient Europe (European Commission, 2020) addresses the use of foresight in EU policy-making and introduces the extended concept of EU resilience. The report assesses EU resilience from four interconnected perspectives: social and economic, geopolitical, environmental and digital. For each perspective, the report identifies the capacities, vulnerabilities and opportunities exposed by the crisis that need to be addressed in the medium and long term.

Social and economic resilience refers to the ability to cope with economic shocks and implement equitable and inclusive structural changes. Ecological resilience involves achieving climate neutrality by 2050, with measures to mitigate and adapt to climate change and protect the environment. Digital resilience ensures that living, working and interacting in the digital age respects and reinforces human dignity, freedom, equality and other

fundamental European values. Geopolitical resilience refers to strengthening Europe's "open strategic autonomy" and its role as global leader in an interdependent world affected by the COVID-19 pandemic.

These documents and initiatives demonstrate the EU's commitment to building resilience in various areas and contexts as part of its efforts to promote stability, security and prosperity across the region.

2.3. Approaching the concept of economic resilience at the international level

The United Nations, through studies provided by the IPCC (Intergovernmental Panel on Climate Change), sees resilience as the ability of a system and its component parts to anticipate, absorb, adapt or recover in a timely and efficient manner from the effects of a hazardous event, including by ensuring conservation, restoration or improvement of its basic structures and functions (IPCC 2012).

The World Bank (World Bank, 2014) in the study conducted by Stephane Hallegatte, approaches economic resilience from two aspects: micro and macroeconomic:

- *Microeconomic resilience* is defined as the ability of an economy and society to minimize household welfare losses for a given level of aggregate consumption losses. This means that microeconomic resilience refers to the ability of an economy and society to manage and reduce the negative impact on individual household well-being in situations of crisis or economic disruption, without having a significant impact on the total consumption of the economy.
- *Macroeconomic resilience* is the ability to keep aggregate consumption losses as low as possible, for a given amount of capital losses, i.e. minimization of the amplification factor. This means that macroeconomic resilience refers to the ability of an economy to manage and reduce total losses to aggregate consumption in a crisis or economic disruption, while minimizing the impact of these losses on capital and other macroeconomic aspects. It is about the ability of the economic system to mitigate and limit the negative consequences of a crisis or economic shocks on the general level of consumption, thus reducing the factor that amplifies its negative effects.

Regarding the Republic of Moldova - the country towards which we are focusing our research interest, The World Bank's Board of Executive Directors approved in May 2023 the Second Emergency Response, Resilience, and Competitiveness Development Policy Operation (World Bank, 2023). This financial support, totaling 134.3 million dollars, will help the Government of the Republic of Moldova in mitigating the socio-economic impact on refugees and households caused by the war in Ukraine. In addition, the support package aims to strengthen resilience and increase competitiveness to reduce vulnerabilities to future shocks for the Republic of Moldova.

The Organization for Economic Cooperation and Development (OECD) has been concerned with the development of the concept of resilience since 2014 (OECD, 2014), publishing various studies on this topic in recent years. Synthesizing the definitions promoted by the OECD, we can deduce that economic resilience refers to the ability of an economy to adapt and withstand external and internal disturbances, as well as to return to sustainable growth and development (OECD, 2018).

The International Monetary Fund (IMF) is deeply oriented towards the financial support of the resilience of less developed states. Thus, in April 2022, the IMF launched a financial instrument called the IMF Resilience and Sustainability Trust (RST) through which it provides long-term financing with the aim of contributing to the stability of the balance of payments of low- and middle-income countries in the context of the climate change approach. RST offers loans with favorable terms, such as long repayment periods and extended grace periods, to support these countries in their efforts to adapt to the impacts of climate change and promote sustainable development.

The Republic of Moldova will receive a loan worth 129.375 million Special Drawing Rights (SDR), equivalent to more than 170 million dollars, from the International Monetary Fund (IMF), through the Resilience and Sustainability Trust (RST) financing mechanism. This loan aims to support the efforts of the Republic of Moldova in strengthening its capacity to face the impact of climate shocks, in implementing reforms in the energy sector and in ensuring the mobilization of sustainable financing. In order to benefit from this loan, the Republic of Moldova, including the Government, the ministries and the National Bank, must meet 12 reform conditions related to the country's economic resilience.

In the light of research conducted by international organizations, the concept of economic resilience is essential for anticipating, absorbing and recovering from hazardous events, both at the microeconomic and macroeconomic levels. The concern of these organizations on this topic is given by the programs and financial support instruments to strengthen economic resilience and to implement the necessary reforms to adapt to climate change and ensure sustainable development.

3. Conceptual framework on resilience

In the present study we analyzed the concept of resilience from a scientific point of view, we investigated what are the approaches to resilience, especially economic resilience at the level of the European Union and international organizations. From the research carried out we derive the following conceptual framework regarding economic resilience (Tab. 1).

Table no. 1. International conceptual framework on the concept of resilience

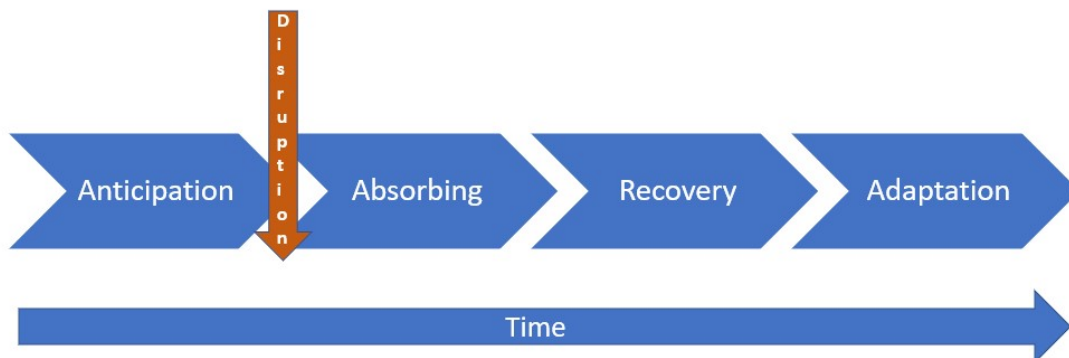
Author	Definition
C.S. Holling (1973)	Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes in state variables, process variables, and parameters, while managing to persist.
Linkov and Trump (2019)	Resilience is a function dependent on time and space, serving as both a philosophy and a methodological practice that emphasizes the role of recovery after disruption as much as the absorption of a threat and its consequences.
Euro-Atlantic Institute for Building Resilience	Economic resilience is a country's ability to cope with and adapt to economic shocks and challenges while maintaining sustainable growth and macroeconomic stability.
European Commission (2012)	Resilience is the ability of an individual, household, community, country or region to withstand, adapt and recover quickly from stress and shocks without compromising long-term development prospects.

The United Nations, IPCC (Intergovernmental Panel on Climate Change) 2021	Resilience is the ability of a system and its component parts to anticipate, absorb, adapt or recover in a timely and effective manner from the effects of a hazardous event, including by ensuring the preservation, restoration or improvement of its basic structures and functions.
The World Bank (World Bank, 2014), Stephane Hallegatte	Economic resilience is the ability of the economic system to mitigate and limit the negative consequences of a crisis or economic shocks on the general level of consumption, thus reducing the factor that amplifies its negative effects.
The Organization for Economic Cooperation and Development (OECD) - 2014	Economic resilience refers to the ability of an economy to adapt and withstand external and internal shocks, and to return to sustainable growth and development.

Source: developed by the author based on the analyzed scientific literature

The analyzed conceptual framework allows us to establish the key elements of economic resilience that we present in Figure no. 1.

Figure no. 1. Key elements of economic resilience

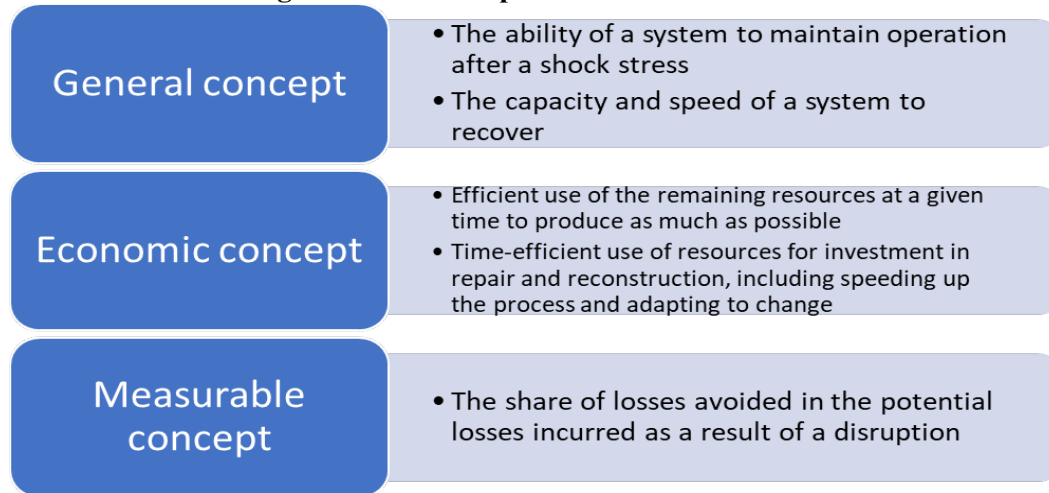


Source: developed by the author

Adam Rose (Rose, 2007) in his work focuses on the economic aspects of resilience, with emphasis on two distinct dimensions: time and context. In Rose's view, the concept of static economic resilience involves maximizing the efficiency of the use of available resources at a given point in time, in contrast to the dynamic processes involved in repair and reconstruction, which influence the evolution of the economy over time. This definition is consistent with a fundamental problem of economics, namely the efficient allocation of resources. In essence, it speaks to the fact that when we identify and delineate economic problems, we focus on ways to use resources efficiently, both now and for the future. Thus, it is important to understand how to use resources responsibly and productively to meet the current and future needs of society. Disasters amplify this problem, and *static resilience* has the potential to reduce associated losses in a simple and economical way. *Dynamic resilience*, however, focuses on speed of recovery and is more in the realm of engineering.

From the analysis carried out we can deduce some important aspects of the concept of resilience which we present in Figure no.2.

Figure no. 2. Conceptual delimitations of resilience



Source: developed by the author

4. Conclusions

The conducted study demonstrated that economic resilience represents an important concept in the current context of the countries' development, being a fundamental pillar in building and maintaining the prosperity of a long-term economy. Essentially, economic resilience measures the ability of an economy to maintain its stability and growth in the face of challenges and fluctuations in the global or domestic economic environment.

In the contemporary world, economies face a number of risks and threats, such as climate change, financial crises, pandemics and wars. To manage these risks and minimize their negative impact on the economy, it is essential to understand and promote economic resilience.

The concern of researchers, but also of international organizations experts towards the concept of resilience derives from the need to maintain the stability of economies and to find ways to return to an economic growth trajectory after periods of turbulence. The study and promotion of economic resilience can contribute to the development and implementation of policies that enhance an economy's ability to cope with challenges and sustain long-term economic growth.

In conclusion, economic resilience is an essential aspect in ensuring the long-term stability and prosperity of an economy, being a determining factor in managing risks and challenges in the global economic environment. By understanding and promoting this concept, we can help build more robust and adaptable economies that can withstand and thrive in the face of economic and environmental challenges.

Acknowledgments: *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.*

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COOPERATION BETWEEN COMPETING ENTERPRISES AND ITS ASSESSMENT IN THE REPUBLIC OF MOLDOVA

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Abstract: *Research on cooperation between enterprises and competitors – "co-opetition" – has demonstrated the positive impact of this process on the efficiency of participating enterprises. Collaborating with competitors creates conditions for a unique dynamic where companies can both compete and collaborate with each other simultaneously. This approach enables enterprises to share resources, knowledge, and expertise, enhancing their competitiveness and contributing to the development of the entrepreneurial ecosystem. In the Republic of Moldova, cooperation between competing enterprises is insufficiently developed. Surveys of entrepreneurs attest to this fact.*

Key words: *Cooperation, competitors, co-opetition, enterprises, survey.*

JEL Classification: *L26, M21.*

1. Introduction

The integration of competition and cooperation among enterprises plays a crucial role in developing an effective entrepreneurial ecosystem. Competition between companies stimulates innovation and product/service improvement. However, to enhance efficiency and increase benefits for all participants, it is also necessary to foster cooperation. Interaction among competing enterprises enables them to combine efforts and resources to achieve common goals. Additionally, cooperation contributes to cost reduction and optimization of production processes. By sharing resources and risks, companies can reduce financial burdens and enhance their competitiveness. Moreover, joint efforts of enterprises can facilitate access to new markets and customers. The convergence of competition and cooperation ensures a balance for sustainable business development. Such interaction creates a conducive environment for innovation and growth both for individual enterprises and the economy as a whole.

2. Cooperation with Competing Enterprises in Literature

The success of an enterprise in modern market conditions is determined by its ability to organize effective interaction with the external environment. In literature, such interaction is divided into "positive" (collaborative relationships that a company builds with suppliers, end consumers, and marketing intermediaries) and "negative" (competitive relationships that arise between the enterprise and its competitors). Specialists assess the importance of "positive" and "negative" relationships for the company differently. Marketing classic Philip Kotler believes that the primary importance for the company lies in building relationships with consumers (Kotler et al., 2016), while Al Ries and Jack Trout (Ries and Trout, 2006) argue that the most crucial aspect for a company is effective competition against its competitors.

According to Kotlyarov, I.D. (2010), the goal of competition is to ensure the effective development of the industry (in particular, to prevent the displacement from the market of its constituent companies by producers of new substitute products) and the optimal satisfaction of the needs of the target market. From this, it follows that competing companies have not only private but also common interests.

Private goals include: resisting competitors seeking to lure away customers; increasing market share; increasing sales volume.

Common goals include:

- Resisting competitors from other industries offering substitute products in the target market of the industry;
- Creating uniform customer service standards and monitoring their compliance;
- Lobbying industry interests;
- Joint customer service;
- Conducting competition by fair methods.

Thus, in the activities of each company, one can trace the tendency towards competition (achieving private goals) and cooperation (achieving industry-wide goals). Kotlyarov developed a “cooperation-competition” matrix, which reflects four types of combinations of readiness for competition and cooperation among enterprises within a specific industry (Table no. 1).

Table no. 1. Industry matrix “cooperation-competition”

		Cooperation	
		<i>absent</i>	<i>present</i>
Competition	<i>absent</i>	I. Monopoly	II. Cartel agreement
	<i>present</i>	III. Predatory competition	IV. Effective competition

Source: (Kotlyarov, I.D., 2010)

The quadrant IV "Effective competition" of the matrix reflects a situation where companies collaborate with each other to achieve common goals while engaging in rigorous competition (albeit with civilized methods) to achieve their own private objectives. This form of competition ensures both the most effective development of the industry and the best satisfaction of customer needs through constructive cooperation among companies. Competitors are perceived not as enemies but as rivals and partners under this approach.

This perspective advances the understanding of the combination of competition and cooperation, which was initiated by Adam M. Brandenburger and Barry J. Nalebuff in 1998. (Brandenburger and Nalebuff, 1998) introduced the term "co-opetition," defining it as a business strategy that goes beyond the old rules of competition and cooperation to combine the advantages of both.

Vik Pant and Eric Yu (2018) discuss co-opetition as a prominent industrial practice that allows enterprises to increase combined welfare through cooperation while maximizing individual gains through competition.

Devece et al. (2019) emphasize the importance of understanding how cooperation and competition coexist in inter-firm alliances.

Rubin (2014) notes that in competition, many signs of cooperation between parties are found, as well as prerequisites for its emergence and development on a mutually beneficial basis. An important aspect of competitive action management is the need to plan combinations of competitive actions, define goals, and conditions for their implementation.

Goals of cooperation may include: reducing costs through joint procurement of raw materials, equipment, or services; increasing innovation through joint research and development efforts; accessing new markets; exchanging experience and knowledge.

Rules and practices of cooperation with competitors may include:

- Establishing associations to develop industry-wide quality standards and ethical codes, and monitoring their compliance;
- Participating in joint events with competitors (roundtables, press conferences, charity events, etc.).
- Joint lobbying of industry interests in government bodies.
- Conducting joint scientific and technical developments aimed at improving industry products.
- Agreements on the joint use of technological equipment.
- Outsourcing agreements.
- Agreements on joint customer service.

An earlier study involving the author (Stratan et al., 2020) found that the innovative potential of enterprises can be enhanced through cooperation with other enterprises and researchers. The research results showed that in the Republic of Moldova, small and medium-sized enterprises are quite hesitant and passive in cooperating with other companies and research institutions to implement innovations.

3. Research Methodology

The activity of Moldovan entrepreneurs in expanding cooperation within the framework of business operations, including with competitor enterprises, can be assessed through a survey of entrepreneurs.

Thus, from June to October 2022, under the leadership of the article's author, a group of researchers from the National Institute for Economic Research of the Academy of Economic Studies of Moldova conducted a survey of 204 entrepreneurs from 25 districts of the Republic of Moldova. The survey was conducted as part of an applied scientific project "Multidimensional Assessment and Development of the Entrepreneurial Ecosystem at the National and Regional Levels to Boost the SME Sector in the Republic of Moldova".

The main goal of the survey was to assess the state of a large number of factors in the entrepreneurial ecosystem of the country. One of the evaluated factors was the level of cooperation with competitor enterprises.

Among the enterprises surveyed, the overwhelming majority belong to the small and medium-sized enterprise sector (97.5%), depending on the number of personnel (Fig. no. 1).

In terms of types of activities, nearly half of the sample enterprises (45.8%) are engaged in the service sector; 25.4% are in trade; 15.4% are in manufacturing activities; 10.9% are in agriculture (Fig. no. 1).

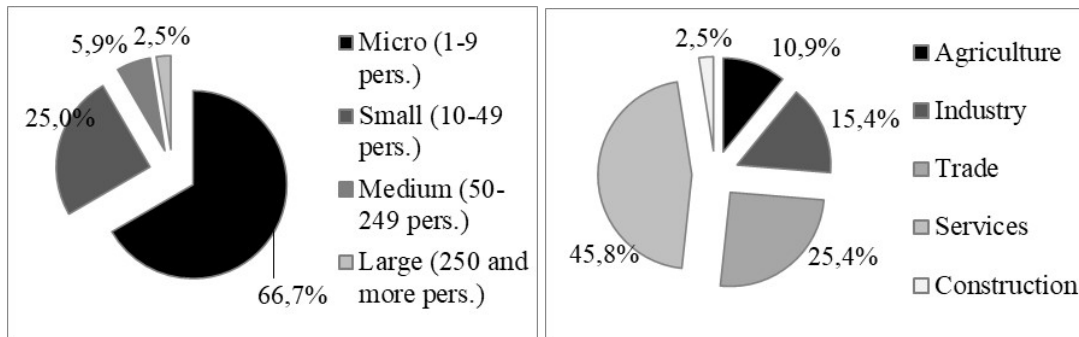


Figure no. 1. Characteristics of the sample enterprises by size and types of activities
Source: own elaboration

If we consider the sample enterprises by location, it can be noted that almost 3/4 of them (73.0%) are located in urban areas, and accordingly, 27.0% are in rural areas (Fig. no. 2).

In terms of the age of operation, the majority of the sample consists of mature enterprises aged over 6 years (69.1%). The age of 19.1% of the enterprises in the sample ranged from 3 to 5 years, while 10.3% were between 1 to 2 years old. Only 1.5% of the sample comprised newly established enterprises aged less than a year (Fig. no. 2).

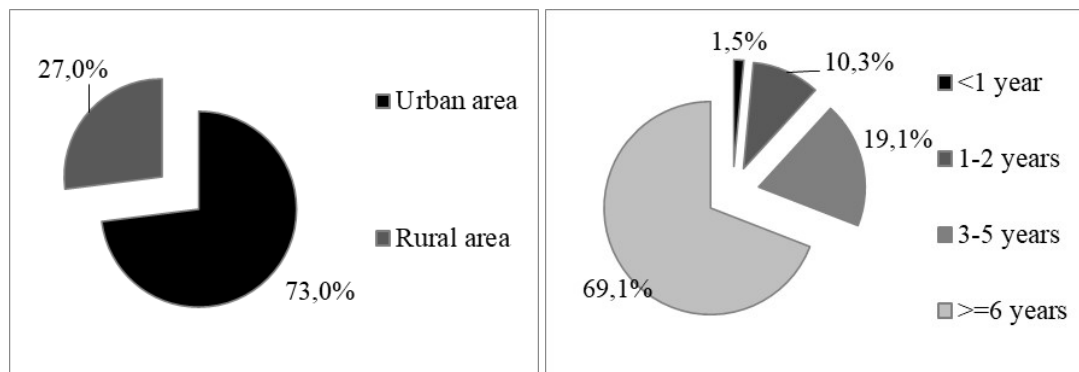


Figure 2. Characteristics of the sample enterprises by location area and age
Source: own elaboration

The respondents were owners or managers of enterprises, well-informed about the activities of the enterprise.

Within the survey, entrepreneurs were asked to evaluate the level of cooperation of their enterprise with competitors on a 5-point scale, from 1 (minimum level) to 5 (maximum level).

4. Results

The results of the survey of entrepreneurs showed that only 20% of enterprises in the Republic of Moldova cooperate with competitors at a high or maximum level. At the same time, 32.5% of respondents rated the level of cooperation as low, and 22.5% as minimum (Table no. 2).

Table no. 2. Distribution of ratings of the level of cooperation of enterprises with competitors - overall sample

	1=Minimum level	2=Low level	3=Neutral level	4=High level	5=Maximum level
Level of cooperation with competing enterprises	22,5%	32,5%	25,0%	17,0%	3,0%

Source: own elaboration

When considering the responses of enterprises based on their size, it can be observed that the smaller the enterprise, the more often the degree of cooperation with competitors was assessed at the minimum level (micro-enterprises - 24.8%; small enterprises - 19.6%; medium-sized enterprises - 18.2%; large enterprises - 0%). At the same time, large enterprises (20.0%), small enterprises (3.9%), and micro-enterprises (2.3%) were more likely to rate cooperation with competitors at the maximum level (Fig. no. 3).

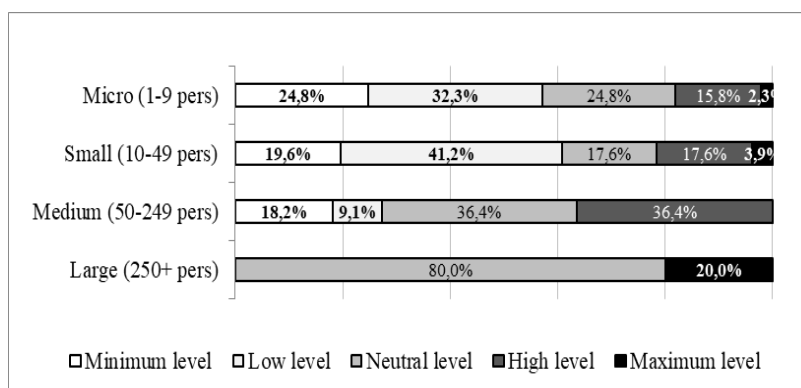


Figure no. 3. Distribution of ratings for the level of cooperation between enterprises and competitors – based on the size of the enterprise

Source: own elaboration

By types of activity, a relatively high level of cooperation with competitors was identified in enterprises in the IT, construction, and transportation sectors. A relatively lower level of cooperation with competitors was observed in agriculture, the service sector, and HoReCa (Fig. no. 4).

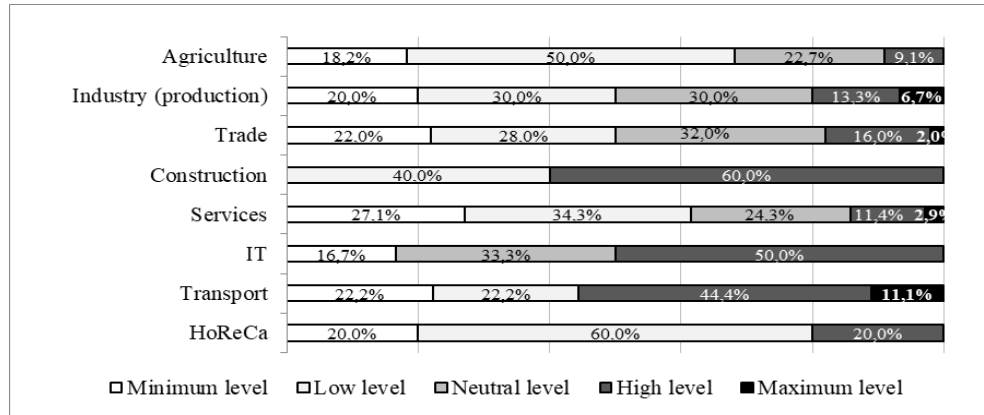


Figure no. 4. Distribution of ratings for the level of cooperation between enterprises and competitors – based on the type of activity

Source: own elaboration

In terms of location area, approximately the same proportion of rural and urban enterprises rated the level of cooperation with competitors as high or maximum (20.8% and 19.7% respectively). However, rural enterprises reported minimal levels of cooperation less frequently than urban enterprises (17.0% and 24.5% respectively) (Fig. no. 5). This may be due to the more limited access to resources in rural areas, leading enterprises to rely more on cooperation with competitors for assistance.

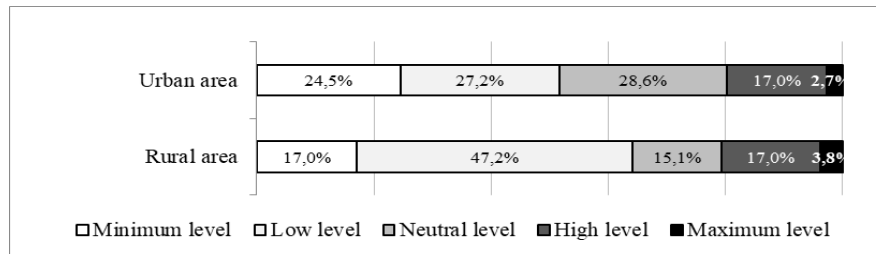


Figure no. 5. Distribution of ratings for the level of cooperation between enterprises and competitors – based on the location area

Source: own elaboration

Regarding the cooperation between competing enterprises based on their age, an interesting pattern emerges: the highest ratings for cooperation with competitors are given by new enterprises aged up to 1 year (11.1% marked the maximum level of cooperation and 33.3% - high level). Perhaps this can be explained by the greater openness of new enterprises, limited resources and experience, and therefore the need for assistance from more experienced colleagues. As enterprises mature, the level of cooperation with competitors decreases. However, mature enterprises older than 6 years relatively more often rate the level of cooperation with competing enterprises as maximum (3.1%), but their cooperation at this stage likely reaches a higher level (Fig. no. 6).

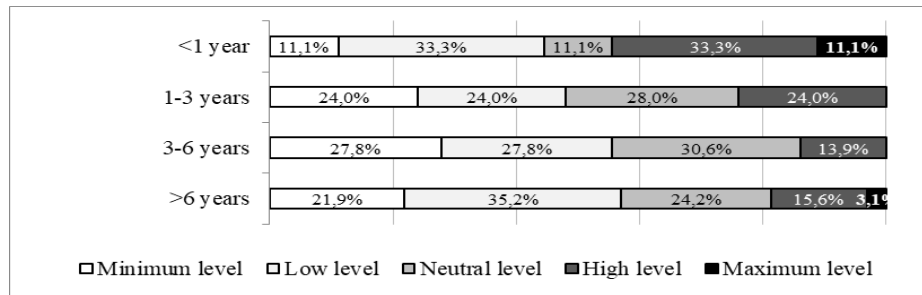


Figure no. 6. Distribution of ratings for the level of cooperation between enterprises and competitors – based on the age of the enterprise

Source: own elaboration

5. Conclusions and Recommendations

The survey of entrepreneurs has shown a relatively low level of cooperation among enterprises with their competitors in the Republic of Moldova. This may be attributed to a lack of trust among entrepreneurs, a weak entrepreneurial culture, and insufficient development of the professional business association sector in the country.

Increasing the level of cooperation between enterprises can bring mutual benefits and improve the entrepreneurial ecosystem. To achieve this, measures can be implemented by the government, business associations, and the enterprises themselves. In particular, the government can promote cooperation by developing and implementing programs and initiatives that encourage entrepreneurs to collaborate with each other. This could involve funding joint research and development projects and participation in educational programs.

Business associations can implement measures such as:

- organizing educational programs and courses for entrepreneurs to learn about the benefits of collaboration;
- creating platforms (seminars, workshops, conferences) for knowledge and experience sharing among member enterprises;
- engaging external consultants and experts to develop and support cooperation programs between competing enterprises, helping them effectively implement joint projects and achieve common goals;
- involving member enterprises in jointly developing industry standards, recommendations for improving the business environment, and lobbying for them.

Finally, enterprises themselves can overcome barriers to cooperation with competitors by taking the following measures:

- studying existing experiences of cooperation between competitors in Moldova and abroad;
- enhancing their own entrepreneurial skills and competencies;
- joining in associations, clusters, business alliances for knowledge, resource, and knowledge exchange;
- conducting competitor analysis to identify their strengths and weaknesses, as well as areas where collaboration is possible;
- conducting joint research for innovation implementation and development of new products and services, other measures.

It is important for enterprises to understand the goals they will achieve through cooperation with competitors and the rules to be followed in the process.

Acknowledgments: *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”.*

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DIAGNOSTICS OF THE TABLE GRAPE SECTOR AND THE PROSPECTS OF DEVELOPMENT

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Abstract: *The cultivation of table grapes vines is a special sector, referring to high value agriculture. Wine-growing process is a stable source of income for people in rural areas and is a reason for their retention in rural areas. In order to stimulate the development of viticulture, the national programme for the recovery and promotion of viticulture and winemaking sector has been elaborated for the period 2002-2020 in the Republic of Moldova. The main purpose of this document is to restore and create an efficient branch of production of high-quality wine products, competitive on the markets and with increased economic efficiency. The research is based on a diagnostic analysis of the table grapes from the economic perspective. In order to achieve the objective of the research, several researches, studies, documents and comprehensive analyses related to this important segment of the national economy, statistical data from the National Bureau of Statistics, reports of the Ministry of Agriculture and Food Industry were analyzed, using methods of analysis, synthesis, tabulation and graphics have been applied. The research results revealed the importance of the table grapes sector and its export potential. Thus, the authors of research conclude that, although the table grape sector in the Republic of Moldova is facing many problems, it is nevertheless registering positive trends - the export share of agricultural production of plant origin reached 7% in 2023.*

Keywords: *wine sector, economic development, export, vineyards.*

JEL Classification: *Q1, Q10, Q12, Q17.*

1. Introduction

One of the profitable branches of the agro-industrial complex is the viticulture of table grapes. Table grapes are a symbol of prosperity and reward for the hard work of winegrowers. Millennial traditions of a highly effective viticulture and a human, agro-industrial potential dispose our country. The grapes are prized for their rich and complex flavor. The assortment structure of the plantations is almost 80 varieties of table grapes, the most popular are the black grapes Moldova, Codreanca (or Black Magic) and Muscat de Hamburg, the red varieties Cardinal and Apiren Roz and the white varieties Italia, Victoria and Alb de Suruceni.

2. The analysis of the wine sector

The wine sector is a strategic one that can ensure the growing demands of the domestic and foreign market with high quality, competitive and economically effective production. The viticulture sector and especially the development of viticulture for table grapes has been given increased attention since 2006. Also, a GD project was developed on the restoration and development of viticulture for table grapes until 2020.

Viticulture is a strategic pillar for the national economy of the country. The contribution of this sector to the formation of the main indicators of the national economy, the added value of wine products, the traditions and regional and international recognition of wines and grapes, but also the related and collateral links with other sectors of the economy. The vineyards represent the most valuable asset of the wine heritage in the Republic of Moldova. The fertile soil and suitable climatic conditions in the country, the size of the vineyard areas, the traditions, the low input and operating costs are advantageous factors compared to many other wine-growing countries. Viticulture in the Republic of Moldova has a high level of utilization of agricultural land [3]. Vine plantations occupy 7% of the total

agricultural land in Moldova and 3.8% of the total surface of the country, demonstrating the highest density of vineyards in the world.

In recent years, table grape producers have moved from the exclusive use of the "Vertical Trellis" vine formation system to intensive vine systems, which allow for high quality grapes and higher yields. Thus, by adopting an intensive production system, grape producers have maximized both the quality and productivity of table grape plantations obtaining up to 30 tons of grapes per hectare, compared to 10-12 tons obtained in classic plantations [7].

The areas of wine plantations and the harvest of table grapes are not stable recently, being influenced by a series of factors, and climate changes have a significant impact on this sector.

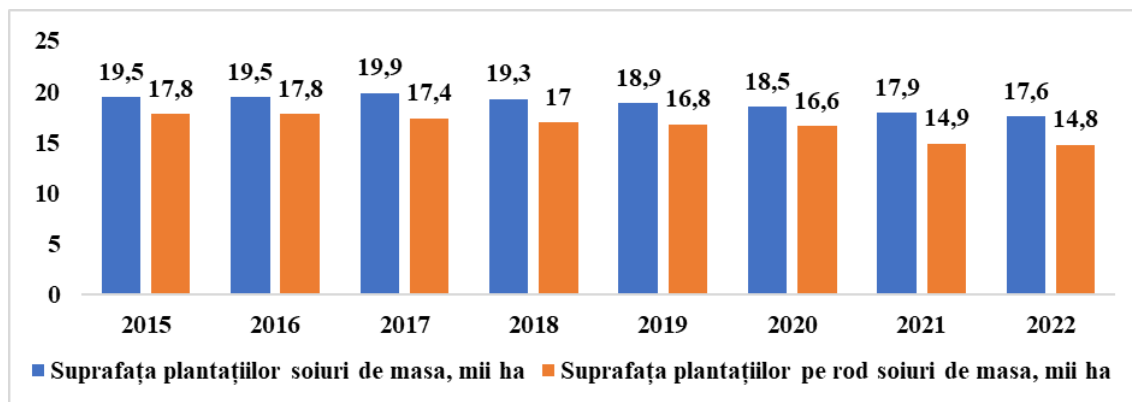


Figure 1. The dynamics of table grape vineyard areas in the Republic of Moldova, for the period 2010 -2022, thousand ha

Source: Elaborated by the author using the data from the National Bureau of Statistics

Wine plantations with table varieties have a share of about 15% in the structure of wine plantations in the Republic of Moldova. The area of wine plantations with table grape varieties in the period 2010-2022 was stable at around 20 thousand ha. The area per fruit of wine plantations with table grape varieties in the same period varied from 17.8 thousand ha (2015) to 14.8 thousand ha (2022). In 2022, this constitutes 14.9 thousand ha, figure 1.

Although, the wine sector faces many challenges and difficulties, climate change, poor agrotechnical and phytotechnical condition, financial difficulties, global crisis and many others, however, despite the challenges, the wine sector has been showing a positive trend lately. According to the data, in 2022 the global harvest of table grapes was about 99.3 thousand tons, being 10.9% less compared to the year 2000. The average harvest in 2022 was about 64.9 q/ha, being higher by 14.6% compared to 2000 [1; 4; 5].

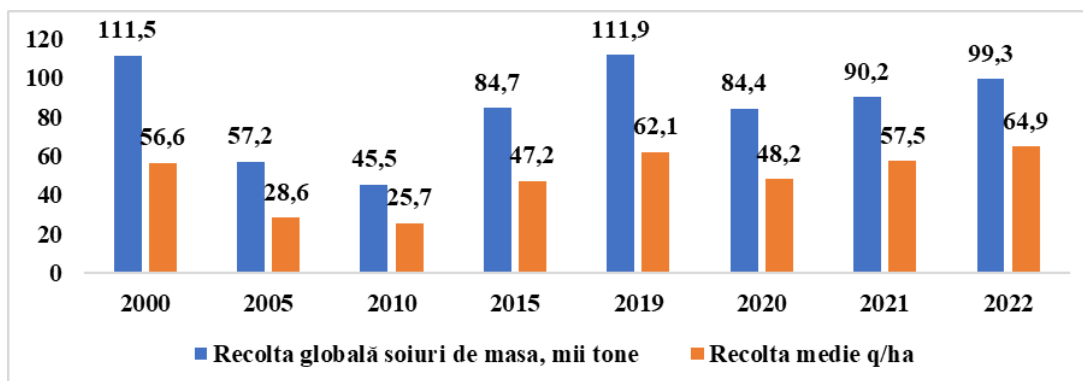


Figure 2. Table grape harvest trends, for the period 2000-2022

Source: Elaborated by the author using the data from the National Bureau of Statistics

The research concluded that not all vineyards have a highly developed post-harvest infrastructure (especially emergency cooling facilities), but some progress has been made in this area. The quality of grapes for trade, especially export-oriented grapes, has increased in recent years, which has a positive impact on the price.

Thus, in recent years, the table grape sector has seen growth and enormous export potential. And, following the research carried out, we observe that approximately 100 thousand tons of table grapes are obtained annually, of which more than 60% are exported. Thus, the share of table grapes in the export of agricultural production of the vegetable kingdom was 4.8% in 2020 and reached 6% in 2022. The share in the export of edible fruits: 11.9% was in 2020 and reached 24 % in 2022.

Table 1. Export of table grapes (code 0806) from the Republic of Moldova to some partner countries, in 2016-2021

	Sales volume, thousands of tons						Growth/decrease rate in 2021, %, compared to:	
	2016	2017	2018	2019	2020	2021	2019	2020
Total	51,44	80,2	48,2	62,7	41,3	57,8	92,2	140
from which								
Belarus	9,3	6,2	2,8	5,3	1,9	4,3	81,1	226
The Russian Federation	24,7	48,2	27,4	25,4	19,9	27,1	107	136
Romania	11,8	16,3	11,4	17,4	11,5	12,6	72,4	110
Ukraine	4,6	2,9	3,4	7,8	4,3	6,3	81	147
Iraq	0,65	2,5	0,5	2,1	0,3	1,9	90,4	633
Poland	-	-	-	1,5	1,8	2,6	173	144

Source: According to the data, <https://comtradeplus.un.org/>

The analysis of exports of table grapes (table 1) shows an upward trend, so in 2021 about 57.8 thousand tons of grapes were exported, which is 12.4% more than in 2016. Thus in 2021 the volume of sales of grapes for table constituted 57.8 thousand tons. Of which about 27.1 thousand tons were delivered to the Russian Federation, which had a share of more than 50% of the total export, to Romania, being also a main partner for the Republic of Moldova, the export of grapes to this country constituted 12 ,6 thousand tons. At the same time, during this period, the amount of income from the export of table grapes was also recorded. In 2021, income from the export of table grapes is increasing by 76.8% compared to 2016 (table 2).

Table 2. Sales revenue related to table grapes exported from the Republic of Moldova to some partner countries, for the period 2016-2021

	Sales revenue, thousands of US dollars						Growth/decrease rate in 2021,% compared to:	
	2016	2017	2018	2019	2020	2021	2019	2020
Total	20403,8	38625,8	25124,5	29664,7	26868,9	36077,9	122	134
Belarus	2504,7	3927,4	1727,9	3323,8	1198,8	3287,2	98,9	274
The Russian Federation	7157,4	16869,9	9548,6	9679,8	12192,1	16280,1	168	134
Romania	8615,1	12777,3	10324,8	10223,9	9040,1	8658,6	84,7	95,8
Ukraine	1253,5	945,9	1037,7	2385,3	1237,2	2259,5	94,7	183
Iraq	205,1	1209,4	192	770,5	124,6	380,5	49,4	305
Poland	-	-	997,2	1151,9	1678	2506,4	218	149

Source: According to the data, <https://comtradeplus.un.org/>

According to the analysis of the income from the export of table grapes, we notice that, although a smaller amount of grapes was exported to Romania, compared to the Russian Federation, but the export income was higher, which proves to us that the winegrowers can obtain income higher, complying with international requirements, which influence the price.

If we compare the average export price of table grapes, we can mention that between 2001/2005 the average price was 0.26 dollars per kilogram; 2006/2010 – 0.36; 2011/2015 – 0.44; 2016/2020 – 0.51; 2021 – 0.62; 2022 – \$0.69 per kilogram. In the last period, there was also a diversification of the market, so that in 2010 table grapes from the Republic of Moldova were exported to only 7 countries; in 2015 already in 18 countries; 2019 – 28 countries, 2020 (pandemic year) – 22 countries; 2021 – 23 countries; 2022 – 26 countries. The main partner countries of the Republic of Moldova in recent years Romania is in first place with 30%; Russia – 24.2%; Poland – 9.8%; Belarus – 8.5%; Kazakhstan – 6.3%; Ukraine – 5.9%; Latvia – 2.8%; Netherlands – 2.1%; Mongolia – 1.9%; Kyrgyzstan – 1.3%; Other 30 countries – 7.4%.

Exporters of table grapes mention that the Moldovan grape variety has several advantages in the export markets, such as the unique taste, the dark color of the berries, the ability to keep for a long time. At the same time, the Republic of Moldova must concentrate its exports on the EU market in the months of September-December, when the grapes

produced in countries with traditions such as Chile, Peru, Brazil, etc. are still not delivered. they must also undertake several priority actions such as increasing the quality of grapes, managing the level of pesticide residues, harvesting, sorting and storing correctly, implementing the international standards Global G.A.P., GRASP and/or SMETA, diversifying the types of packaging. And in the long term, producers need to diversify the assortment of table grape varieties by testing and adopting seedless (seedless) varieties [7].

The Association of Producers and Exporters of Grapes from the Republic of Moldova mentions that the increase in the price of grapes for export was due to the significant increase in the mass viticulture structure of the weight of products harvested from plantations where high technologies are used. According to forecasts, this year the total area of "Pergola" and "Gable" type vineyards, capable of producing high-quality products of 30-50 tons per hectare, will increase to 600-700 hectares [2].

Another factor that influenced the price of table grapes for export was primarily due to the specific conditions of the European market. Namely, the small harvest of table grapes in some important wine-growing countries in the EU due to weather conditions (extreme drought and, in some regions, floods. In order to have stable exports of table grapes from Moldova to the EU, it is necessary to further improve and the EU market is a market that opens up perspectives for grape producers, but winegrowers in the Republic of Moldova must take measures regarding the renewal of the grape assortment and identify highly productive varieties with qualities requested by consumers. Today, on the territory of the Republic of Moldova, the Moldova variety predominates, occupying about 90% of the structure of wine plantations [8].

3. Conclusions

In the last two years, most of Moldova's table grape harvest was sold between September and December, while "off-season" exports, winter-spring, decreased. That's why, we can conclude that the sales period for table grapes in the Republic of Moldova has changed, the marketing year now almost coincides with the calendar year.

Not all vineyards have a highly developed post-harvest infrastructure, especially emergency cooling facilities, but some progress has been made in this area. The quality of grapes for trade, especially export-oriented grapes, has increased in recent years, which has a positive impact on the price.

The solution regarding the restructuring and modernization of the wine sector can be through investments, subsidies being a tool applied by the authorities to stimulate this process. But they are to be used with care and caution. Both subsidies and aid should be applied only to help winegrowers channel themselves into successful modes of operation, not to perpetuate outdated, uneconomic or inappropriate practices.

Grape exporters can access the EU market without tariff or quantitative restrictions, but this comes with responsibility, and it is essential that producers engage in effective planning and coordination to ensure that their grapes meet the strict quality and safety requirements of the market European.

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THE IMPACT OF IMPLEMENTING PROJECTS WITH EUROPEAN FUNDING ON PERFORMANCE IN SCHOOL ORGANIZATIONS

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***Abstract:** The implementation of projects financed by European funds increases performance in school organizations. By accessing these projects, educational units benefit from expertise in the field of education and additional financial resources, facilitating the modernization of the educational infrastructure, the development of the professional skills of the teaching staff, as well as their multilingual skills, the promotion of lifelong learning and learning mobility for students and teachers, innovation, cooperation and reform. With the help of non-reimbursable financing, learning conditions are improved, the learning performance of students increases, the rate of school participation increases and, thus, contributing to the visible improvement of the quality of educational services provided by school organizations. This article aims to highlight the impact of the implementation of projects with European funding on the increase in performance in the beneficiary school organizations. By analyzing and evaluating this impact, it is possible to identify and implement the most effective strategic interventions that can lead to the improvement of the quality of educational services.*

***Keywords:** European funding, performance in school organization, quality of educational services.*

***JEL Classification:** M15, O15.*

1. Introduction

The implementation of projects with European funding in pre-university education units determines both the increase in the quality of educational services and the development of society as a whole.

Achieving the objectives of the Europe 2020 Strategy supports smart, sustainable economic growth and social inclusion through the main directions in the field of education and employment, and the opportunities offered by European projects respond to new trends, such as the internationalization of education and flexible learning, in accordance with the needs and the development objectives of the students.

2. The impact of European funding on performance in school organizations

Projects with European funding play a significant role in improving the quality of the educational system in the member states of the European Union and beyond. These projects promote innovation, exchange of best practices and collaboration between countries to bring about substantial improvements in the field of education.

Through the implementation of these projects, significant changes have occurred in terms of modernizing the school infrastructure, developing the professional skills of human resources, professionalizing the management of educational units, ensuring fair access to education for disadvantaged groups, improving learning outcomes, increasing the school participation rate.

European partnerships remain the promoters of the continuous improvement of the didactic approach, of cooperation and innovation, pillar elements of institutional development, which contribute decisively to the achievement of the European dimension of education.

Given that modern approaches focus on the training of the eight key skills necessary for employment, personal fulfillment and good health, active and responsible citizenship and social inclusion and are centered on the student, by identifying his skills and mentoring their development until reaching their maximum potential, the European projects remain the perfect educational framework, through the educational expertise offered by all partners, who collaborate in identifying and sharing the most effective educational strategies.

From the analysis of the good practices disseminated, of the intermediate and final reports of the projects carried out in the educational units of Dâmbovița, several types of interventions/changes can be identified: at the level of the school infrastructure, at the level of the management of the school unit, at the level of the school curriculum, at the level of the teaching staff, at the level of students and their parents.

a) Results at the level of the educational infrastructure

The non-reimbursable funding attracted through European projects helped administrative-territorial units and educational units to expand/rehabilitate/modernize school infrastructure, to carry out civil works and to renovate, expand, fit out the interiors of school buildings and facilitate access to modern educational resources, such as STEAM labs, digital libraries, gyms, school spaces for preschool education. At the same time, educational platforms intended for distance learning or online activities were purchased, schools were equipped with modern teaching aids (smartboards, video projectors, computers, equipment for physics/chemistry/biology laboratories), educational software, didactic games etc.

b) Results at the management level of school units

Some of the European projects aimed at improving the educational policy development process, institutional development in accordance with the needs identified in the school and local community, professionalizing managers, improving intra- and inter-institutional communication, strengthening the school-parent-community partnership, improving the leadership style, of the organizational climate and culture (of its dominant values: quality and professionalism, communication, team spirit, creativity, responsibility, involvement, tolerance, civic spirit, cooperation, mutual respect, attachment to students, respect for the profession, freedom, of expression, receptivity to new, enthusiasm, desire for affirmation). increasing the capacity to operate at local/national/European level,

Positive changes are also noticeable in the aspect of innovative approaches to interaction with certain target groups, disadvantaged groups, the manifestation of greater openness/synergy with organizations active at the European level. In order to improve school performance and reduce the dropout rate, the management of the school organization that implemented European programs benefited from:

- strengthening the organizational capacity to identify students at risk of leaving school prematurely and the associated causes.
- strengthening the organizational capacity to carry out school dropout prevention activities.
- strengthening the organizational capacity to implement interventions aimed at improving school performance.
- establishing partnerships at the county level with various school organizations and relevant institutions, in order to promote school participation and improve academic results.
- the development of monitoring and intervention tools to identify and address cases of educational risk.
- promoting an inclusive and motivating school environment.

-consolidation of the prestige and trust of the community in the school and its organization.

c) Results at the school curriculum level

As a result of the implementation of projects with European funding, the beneficial pre-university education units have succeeded in diversifying the curriculum at the school's decision, the offer of school and extracurricular educational activities (such as visits/documentation trips), the organization of training courses, participation in competitions and the formation of interschool networks.

d) Results at the level of the professional development of teaching staff

Through projects financed from European funds, teachers and educational trainers have access to professional training programs for the development of professional skills, at a general level, the development of didactic and methodological skills, which lead to the implementation of effective, attractive and motivating for students, the development and use of new services and learning/teaching materials, improving the ability to express oneself in a foreign language and digital skills, acquiring knowledge and skills including learning foreign languages or deepening ICT skills for professionals involved at preschool level, primary or secondary. At the same time, didactic staff benefited from training to implement the new curriculum, to improve the teaching style and to ensure that learning is centered on them, they shared and benefited from the exchange of experience and the transfer of good practices that constituted points starting point for new educational endeavors.

e) Results at the level of students

The involvement of students in the activities of projects with European funding determined their new acquisitions in different study subjects, at the level of knowledge, attitudes, values; increasing motivation for learning and involvement in various activities, changes in attitude, acquisition/improvement of social skills and improvement of school participation and learning performance,

Other significant results aim at improving student attendance, manifested by reducing the number of absences per student, increasing the percentage of students who make progress in their educational journey, improving the results obtained in national exams, strengthening student involvement in extracurricular and extracurricular activities, developing self-esteem, of socio-emotional skills and life skills, improving socialization, relationship and teamwork skills, stimulating learning motivation and promoting active participation in the learning process.

f) European projects have generated significant changes outside the school environment as well, influencing communities in various ways, among which the following stand out: motivating local public authorities to support school activities, increasing the degree of community involvement in school life by offering contributions and support in order to carry out various activities, intensifying the participation of representatives of the local business environment, of non-governmental organizations and of the local administration in defining the development directions of educational institutions, as well as in the implementation of these directions, according to needs.

Extremely valuable are the results of projects whose objective is to reduce the risk of early school leaving by: increasing the quality of the education offer, educational support measures for students to achieve better school results. Intervention measures aim to implement policies at school level or measures at individual level, by providing support to students at risk of early school leaving, as a result of early warning signals received. The

compensation measures aim to support the reintegration into the education system and the training of people who left school prematurely and the acquisition of the necessary qualifications to access the labor market.

The inventory of the categories of activities carried out in the European projects highlights the focus of the projects both on mobilities for teachers and students, but also the creation of products with a didactic/educational role. Teachers participate in organized mobilities in other countries with the aim of familiarizing themselves with different education systems and acquiring skills in preventing and combating early school leaving or early school leaving. Students participate in organized mobilities in other countries to familiarize themselves with various education systems and to increase their motivation to participate in school activities. Resources have been created, either in the form of guides or kits, etc., available in print or online, for teachers, can have a significant impact in reducing the early school leaving rate, as well as learning kits, available in print or online format, addressed to students, can play a crucial role in stimulating learning motivation and facilitating the learning process. Coherent programs of remedial activities, counseling, guidance and vocational guidance, as well as mediation were carried out in communities at risk of social exclusion, essential interventions for their development.

3. Conclusions

In conclusion, the European projects had a significant impact in improving the quality of the educational system by promoting innovation, the exchange of best practices, developing the professional skills of teachers, increasing the school participation rate, improving learning performance, promoting inclusion and diversity, as well as modernizing educational infrastructure. These initiatives continue to play a crucial role in ensuring quality education and preparing students for future challenges.

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RATIONAL CHOICE AND CYBERSECURITY

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***Abstract:** Along the technological development of recent years, cyber threats have become increasingly common. Cyber threats can target both the devices of individuals, but especially critical objectives related to digitized objectives within the national industry, namely power plants, public services, government agencies, health system or vital private services, such as the banking system. Thereby, cyberspace has become an operational space, under the statal authority, in terms of ensuring security. With the expansion of digitalization in more and more application areas, cybersecurity has become a vital aspect of national security, aimed to protect individuals and infrastructures or services of national importance. Due to the increased importance of cybersecurity, the paper starts from the assumption that the state, as a rational actor, is the ultimate agent in terms of ensuring security, and examines the ways in which the state can address cyber threats. In this respect the rational choice theory, represents a topical approach. Namely, the state, as an individual actor, can adopt a rational conduct regarding prevention, response, and recovery after a cyberattack. Rational choice theory can be a good guide for outlining a choice in terms of the existence of two or more alternatives in an environment determined by information volatility.*

***Keywords:** rational actor, cybersecurity, rational choice theory.*

***JEL Classification:** O33.*

1. Introduction

In the context of technological development in recent years and specific means in the cyber field, this area has acquired an increasing importance. With the expansion of the fields of applicability of cyberspace, from the small space applicable first to military infrastructures to civilian ones, to almost all important spheres of public or private life, the need for cyber security has become more and more pressing.

Currently, in the military space, the cyber domain shows its usefulness, but also its lethal component, in the confrontations within the war in Ukraine, which generates an accelerated progress in all technological areas specific to the war. Also, in recent decades, more and more critical areas have been digitized, which, in addition to the multiple advantages brought by digitization, has also come with the related cybersecurity risks. This can include hospitals, government structures, certain objectives of strategic interest, such as energy sources and so on, which are potential targets for hackers. As proof of the importance of this critical area of cybersecurity, NATO itself introduced cyberspace in 2016 among the other three operational spaces (air, sea, land), subject to Article 5 of the Alliance treaty, turning it into a battlefield (NATO, 2023).

Thus, the battlefield is no longer reserved only for classical means, seen, represented by armies, but also for less detectable ones, such as cyber. Given the increasing importance in

recent years of the field subsumed by cyber security, as a critical field, this paper starts from the assumption that the state, as holder of the legitimate monopoly on coercion, is the court under whose authority falls the responsibility to manage and respond to cyber threats. On the other hand, this raises the legitimate question of how the state can address cyber threats. One answer to this is given by rational choice theory. Namely, the state, as an individual actor, can adopt a rational conduct regarding prevention, response and recovery after a cyber attack.

This theoretical approach is one with a long tradition and represents one of the most well-known and used approaches in political science, proving to be useful in decision-making processes at the state level. On the other hand, the adornment represented by the theory of rational choice is also a good guide from a theoretical point of view to state action in the field reserved for security, today extended to cyberspace. Next, the work is divided as follows. A first part aims to present the rational choice paradigm, a second part refers to the integration of rational choice in cybersecurity, and the last part is reserved for conclusions.

2. The paradigm of rational choice theory

This section has the role of making a foray into the paradigm represented by the theory of rational choice (TAR), in order to extract a useful meaning for the present research, applicable to the field represented by cybersecurity. From the outset, we must exclude the common, scientifically unsubstantiated meaning, which refers to a person's ability to use his cognitive functions to act, that is, reason in the sense of a simple act of thinking. As the name of this theory derives, reason, or cold calculation, without subjective emotions and passions, is the element that constitutes the lifeblood of this approach. It has both an explanatory component - "why do individual entities act in a certain way?" - and a normative, prescriptive component - "how should an individual entity (the state, in this case) act to best pursue its interests?".

If goals or interests are the result of a subjective process of cognition and definition, means or even ends can be subjected to a process of rational coagulation, according to well-established criteria. Given the individualistic side of this paradigm, applied in the field of state decision, this paper will use the assumption that the state is an individual actor, to whom the attribute of rationality is attributed. In short, the state is a rational actor. In the following lines, this section will be reserved for presenting the most important concepts belonging to the paradigm of rational choice, which are based on a sum of specific principles.

As a theoretical paradigm, rational choice theory refers to phenomena that shape social choice, which is reserved for individuals, supposedly rational, thus trying to give meaning to behaviors starting from real situations (Miroiu, 2006, p. 20). Hence the assumption that the sum of individual actions is the basis for the totality of social phenomena or decisions, doubled by a second premise, which assumes the rationality of individuals (Miroiu, 2006, p. 24).

Rational choice theory has deep roots in economics, where reason and egoism are defining characteristics. The first characteristic calls for the elimination of emotions from the actional sphere through the use of objective and logical thinking, while the second requires a focal point focused on gain, in any circumstance, disregarding others. Neoclassical economics is based on these two components in explaining behavior at unit level, in conditions of insufficiency (Ungureanu, 2018, pp. 19-20).

Within the TAR perspective, the term "rational" is circumscribed an instrumental meaning, hence the term "instrumental rationality", which designates the way in which

individuals pursue certain goals derived from their own desires and preferences. The goals are thus achieved through specific instruments, meant to outline the individual action - rational-instrumental - in order to better achieve the goals (Miroiu, 2006, pp. 35, 38-39; Simon, 1983, pp. 7-8; Grünberg, 1989, p. 162).

According to Max Weber, instrumental rationality relates to how objectives can be achieved, starting from the assumption that the action of individuals is by itself rational (Miroiu, 2006, p. 38; Weber, 1978, p. 25). Or, in the words of a classic author, John Stuart Mill, "[t]he [e]xist [...] a large class of social phenomena whose immediate causes are principally those acting by the desire for wealth, and for which the psychological law implied is the familiar one according to which the greater gain is preferred to the less" (Mill, 1843, p. 878).

Three principles underlie instrumental rationality, namely: Principle of effective means, Principle of comprehensiveness and The principle of higher probability (Miroiu, 2006, p. 39; Rawls, 1971, pp. 411-413). The principle of effective means is par excellence the model of the classical homo economicus, that is, the individual who has preferences and the context of choice, acting with all means for the optimal realization of self-interest (Buchanan and Tullock, 1962, p. 33; Miroiu, 2006, pp. 40-41).

Instrumental rationality is distinguished in two ways of definition. The first is rationality as internally consistent choices, which refers to an individual's decision in the context of group membership, then to the relevance of this decision for the group in question, as well as how to influence the decision of the group outcome, but also how the group influences the individual decision in reverse. This makes the decision not dependent on a single individual in the group. The second way refers to rationality as maximization of self-interest, where each individual in the group is reserved a sum of alternatives, assessable according to benefits, while also taking into account that the other members of the group are in the same situation. In this case, individual action also relates to the mode of action of the other individuals of the group (Miroiu, 2006, pp. 43-44; Sen, 1987, p. 12).

According to Adrian Miroiu, the rational individual possesses three attributes. First, it possesses perfect rationality, which determines the ability to choose between alternatives, compare and rank to choose the best alternative. Second, the rational actor acts by pursuing a self-interest And he doesn't aim for what he does to help others, but also not to harm them. Third, the rational individual owns perfect information, that is, the totality of information needed to choose favorably (alternatives, rules, existence of individuals with similar possibilities) (Miroiu, 2006, pp. 41-42).

The *MaxiMin* principle of action represents another important decision-making component that characterizes a rational actor. According to John Rawls, in an initial situation, in the process of designating social rules, people will not want to take risks (Rawls, 1971). The maximin principle thus involves choosing the least possible evil, not necessarily the best outcome, being specific to the homo economicus pattern. Rawls stated that maximin requires probabilistic calculations under uncertainty, the desirable alternative being the one with the highest possibility of realization, with minimal risks (Miroiu, 2006, pp. 48-49; Rawls, 1971, pp. 154-155). According to this principle, the individual compares all available alternatives and chooses the safest and plausible one (Nurmi, 1983, p. 186).

Coming from the sphere of International Relations, John J. Mearsheimer appreciated states as rational actors. In fact, the rationality of actors, of states in this case, represents a fundamental assumption of realism as a paradigm, from which Mearsheimer comes.

According to him, states know the outside world, on which they have a strategic approach, analyzing their preferences and behaviors in relation to those of other states, to predict how their actions can be influenced. States have both a short- and long-term approach to their own behavior. In conditions of systemic anarchy (there is no hierarchical authority above states in the international system), states, especially great powers, possess capabilities through which they can cause damage to others, never having certainty about the intentions of others, whether they can be aggressive or not. Thus, in the international system, states operate under conditions of uncertainty, of imperfect information (Mearsheimer, 2003, p. 27).

For Mearsheimer, rationality involves striving to understand the world around us in order to achieve foreign policy goals, by the best means, within the framework of a credible theory (Mearsheimer and Rosato, 2023, p. 2). Moreover, both decision-makers and states taken as a unit operate in an international environment where information is scarce, non-existent or uncertain, at the level of their own state, friends or enemies (Mearsheimer and Rosato, 2023, pp. 4-5).

Other relevant contributions to the field of rational choice theory were made by Christopher A. Sims and Thomas Sargent, winners of the Nobel Prize in economics in 2011. According to Sims, Goldfeld and Sachs, in economics, the assumption of rational expectations, used in policy analysis, states that, according to its own objectives and available information, the public adopts optimal behavior, understanding exactly the path chosen for implemented policies, whether present or future actions (Sims et. al, pp. 111-112). Also, according to Sargent and Wallace, public expectations will vary depending on the policy regime. Concurrently, public expectations will change with policies if perceptions are accurate (Sargent and Wallace, 1974, pp. 7-8). In his turn, Nicholas Georgescu-Roegen advanced a theory - the law of entropy - according to which the natural resources of the Earth are finite, to be exhausted in the end, as a result of human consumption (Georgescu-Roegen, 1974).

In conclusion, the rational actor, in this case the state, is represented by an entity that makes decisions in a strategic manner, according to self-defined goals, making use of the means at its disposal and seeking to maximize its interests. The rational actor outlines a hierarchy of interests, proceeding to maximize them, to make the best choice.

3. Integrating rational choice into cybersecurity

Cyberspace is a constantly expanding field, with the digitization of more and more fields, from financial-banking, government, hospitals or other critical infrastructure, but especially the military field. Thus, they become targets for hackers, whether they belong to a state or a non-state organization, being attackable, with damage that can be comparable to that caused by kinetic attacks, such as bombings. The destruction is not similar to that generated by bombing, but it can temporarily stop the activity of certain critical targets. Moreover, if in the case of a bombing, for example, most of the time the source of the attack is known, in the case of a cyberattack often the origin of the source is diffuse, and some states may even deny involvement. From the start, the level of information may be lower, because there is a possibility of not detecting the source of the attack, which means that the level of uncertainty in which it is operated is higher.

One cannot overlook a foray, at least minimal, into the meanings that the concept of "cyber security" requires. What is cybersecurity about? What does it protect? It aims to secure data and refers to the defense of computer systems and users, through a sum of guarantees and

measures, against attacks, damage or access from unauthorized sources. It also involves prevention or detection, response and recovery in case of cyber incidents.

Cybersecurity operates on two distinct levels. The first refers strictly to security and protected values, while a second layer refers to the more modern field designated by information technology (IT) and cybernetics, an autonomous domain and subject to continuous changes. Some theorists consider different angles of reporting on cybersecurity. For example, von Solms and van Niekerk give a narrow meaning to cybersecurity, pointing out the existence of a distinction of cyber security - information security, the second type being embedded in the first, by involving individuals, processes and technology (von Solms and van Niekerk, 2013). However, Kianpour, Kowalski and Øverby (2021) argue that "cybersecurity deals with the various procedures that create a secure environment by protecting assets".

As mentioned earlier, this paper assumes that the ultimate depository of the decision regarding the management of cybersecurity is the state, in a Weberian sense, as the holder of the monopoly on legitimate coercion. Another argument is related to the fact that national defense policy falls under the responsibility of the state, which must develop the main decision-making and procedural tools, as well as optimal capabilities to ensure prevention, response and recovery in case of cyber attack. In this respect, the state, through the agency or agencies managing cyber security issues, acts according to a unitary, individual actor.

An important aspect regarding state action in the field of cyber security is related to the space defined by volatility and information uncertainty. According to the precepts of rational choice theory, the individual decision-maker must have all the information necessary to make the best decision. This is more difficult in cyberspace, where the threat and its source are less visible than, for example, airspace, land or sea, where sources and means of attack are more visible and easier to detect, thus also making it easier to respond or provide protection than in cyberspace.

As well as air, land or sea threats, the effect is amplified by anarchy within the international system, which implies the lack of a central authority over states. Thus, states must ensure their own protection against cyber threats. In case of attack from an external source - another state or a non-state entity - the individual state cannot address a higher authority, as is the case in the hierarchical environment of domestic politics.

Starting from the principle of instrumental rationality, I assume that the state is an individual actor. The state assumes the objective of ensuring national security, targeting all spaces, namely land, air, sea and, more recently, cyber. Adopting the homo economicus principle, the state, as an individual unit with preferences and the context of choice, must act using all means for the optimal realization of its own interest, which is to ensure the cyber security of the vital objectives concerned. The means that can be at the disposal of the state to ensure cyber security can be policies, strategies, decision-making procedures, regulations, hardware or software equipment, human or financial resources, resources that must be allocated in the most efficient manner.

Nor should we lose sight of the fact that, within an international system of an anarchic character, the state must also take into account other international actors, state or non-state, such as hacker groups or transnational terrorist organisations, which have an offensive potential. Not only does the state in question have its own capabilities, which it may not know or estimate exactly, but also the other states have certain capabilities, which they can use to pursue their own interests, more or less offensive. Thus, in shaping the decision, the state

must take into account that it does not operate in a vacuum, that there are other actors around it, with their own capabilities, about which it may not have complete or accurate information. Therefore, information is not perfect, but interests in a multi-entity world must be pursued, having a certain amount of information at their disposal, given the possession of a quantity of finite means, which must be allocated efficiently.

If reference is made to internally consistent choices, which assume that an individual's decision is made taking into account group membership, being relevant to the group in question, the state entity responsible for ensuring cybersecurity at the level of society must adopt decisions in the context of the reference group or groups - the decision group (advisors, subordinates), state agencies, and perhaps even society more broadly. Thus, decisions to ensure cybersecurity within a company are the result of group deliberation, relevant at the level of the reference group. This way of making decisions may be rather specific within democratic societies, where political decision-making envisages a process of deliberation, group coercion, as well as a process that takes into account the influence of public opinion, which means that decision-makers must bear in mind that some measures (restrictions, prohibitions, etc.) may be unpopular.

Regarding rationality as maximization of its own interest, the state, as a component of the group designated by the international system, populated with other entities with different, even opposite, interests, has at its disposal a sum of alternatives, which it can subject to an evaluation process taking into account the benefits it can bring, in relation to other international actors. A rational approach is for the state to maximize its own interest, given the existence of other actors in the international system, with their own interests, which they can pursue in a similar manner. The other actors may have practices or policies similar to the State concerned, similar interests, smaller or broader in scope. The other actors may also have similar means, reduced or more extensive compared to the State concerned.

As outlined above, Adrian Miroiu argues that the rational individual is endowed with three attributes, namely perfect rationality, action to satisfy one's own interest, and possession of perfect information. According to perfect rationality, the state, in order to ensure cyber security, has the ability to choose between alternatives (various policies, attack or defense, retaliation, extended or limited response, etc.), to make comparisons between the options at hand according to the means it has and to operate with a hierarchy of interests, All in the idea of choosing the best alternative.

Aiming at action in its own interest, the state, in the actions it takes to ensure cyber security, pursues its own objective, namely security, but does not seek from the start to help other states, nor to cause them damage without any well-founded reason.

Finally, the state should be an individual entity that has perfect information, but this is an ideal desideratum, because we have shown above that it is difficult for it to have all the necessary information. Thus, the state will make the decision in the field of ensuring cyber security having at hand all the information available at any given time.

Finally, the state, as a rational entity, can also act according to the Rawlsian principle of maximin. According to the maximin principle, the state will not aim to take risks in ensuring cybersecurity. In a given situation, especially of risk or threat, the state will tend to choose the least possible evil, not necessarily the best outcome, this strategy being suitable for a decision-making situation in conditions of uncertainty.

4. Conclusions

This paper considered the issue of state action to ensure security in cyberspace, from the perspective of rational choice theory. Rational choice theory, as an approach, can be a good analytical perspective in the field of state action in cybersecurity management. The paper started from the assumption that the state, seen as a unitary, individual entity, represents a rational actor, with its own interests, which it hierarchizes, and with objectives that it defines according to the means at its disposal.

Even if, traditionally, the state, as the depository of the legitimate monopoly on coercion in the Weberian sense, reserves as its manager the domains of security in land, air and sea space, it is also reserved for the management of cyberspace by means of specific means.

Apart from the military domain, the scope of cybersecurity can extend to objectives such as critical infrastructures (energy, transport, healthcare), private banking or any other entities, large or small, private or state-owned. Military objectives should not be ignored, whether is military bases, offensive or defensive equipment, or sensitive databases.

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LABOUR FORCE REGIONAL INDEX AS A HOLISTIC MEASURE FOR LABOUR MARKET EVALUATION

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Abstract: *There are a lot of indicators that depict the situation of the labour market that consider its various aspects in individual manner, like following: the rate of employment, the monthly salary and other indicators, but there can't be easily found an example of indicator that would show the picture in its entirety, combining it's aspects. That would be useful, for example, when doing comparisons between regions of the same country. In order to elaborate such an indicator was used Republic of Moldova as an example. As source of primary data on labour force characteristics was used the National Bureau of Statistics of Moldova. In this paper we propose a composite index called Labour Force Regional Index (LAFORI Index), created through normalization and combination of the indicators that refer to aspects of labour force like the share of NEET group, the rate of employment, average monthly salary, average amount of the expenditures on work accidents per victim of work accidents. The article was developed within the framework of 23.70105.0807.10T Project for Young Researchers "Development of new working models in the context of post-pandemic consequences and strengthening of job-specific skills for occupations and areas of smart specialization in the Republic of Moldova".*

Keywords: *labour, index, indicator, employment.*

JEL Classification: *E24, J29.*

1. Introduction

The labour market is typically analyzed through various independent indicators, each focusing on specific aspects such as employment rate and average monthly earnings and some others. However, a singular, comprehensive indicator that synthesizes these diverse aspects to provide an overarching view of labour market conditions is difficult to be found. Such an indicator would be especially beneficial for making regional comparisons within a country. In order to create such an indicator in this paper we introduce a composite index coined LAFORI Index (from Labour Force Regional Index) which is designed to offer a more holistic measure of the labour market by integrating several key aspects.

The article is elaborated within the framework of 23.70105.0807.10T Project for Young Researchers "Development of new working models in the context of post-pandemic consequences and strengthening of job-specific skills for occupations and areas of smart specialization in the Republic of Moldova".

2. Literature review

In the scientific literature usually the composite indicators that reflect multiple aspects of labour market include indicators which aren't usually found in standard list of primary indicators in the National Statistics authorities. For example, Yu (2020) proposes an employment quality index which contains sub-indicators on earnings, tenure, leave, firm size. Renold et al. (2014) analyzes the Youth Labour Market Index which contains such indicators

as unemployment rate, working conditions, education, transition smoothness. Spyropoulos et al. (2021) proposes Health and Wellbeing Index as a weighted composite index that includes number of sickness days, number of various disease cases, number of employees. It should be mentioned that the weights are more or less similar, yet the number of cardiovascular condition cases has the biggest weight. Aleksynska and Cazes (2016) mention the World Bank Employing Workers Index that is based on three indicators with similar weights covering hiring practices, working hours, and redundancy to align with the standards set by the International Labour Organization. Castellano and Rocca (2020) developed Gender Gap in the Labour Market Index – a composite index based on indicators from 5 pillars: Labour market participation and conditions, Labour market integration, Employment return and discrimination, Family responsibilities, Welfare measures related to female work. While these 5 indices are very specific and comprehensive they can have a series of limitations like: age-specific limitation, complexity in measuring indicators, potentially disproportionate weights in some cases, potential bias towards business interests, gender-specific focus, complexity and data availability. The broad scope covering five pillars requires extensive data, which may not be equally available or reliable in all regions, leading to potential gaps in the indices' applicability or accuracy. In this regard we will elaborate an index that can diminish those limitations.

3. Data sources and methodology

We used the Republic of Moldova as a case study, drawing on data from the National Bureau of Statistics of Moldova to develop this index. Depending on the availability of data, its comparability and the pool of labour market indicators for the design of LAFORI index we established a set of principles:

- LAFORI Index is a composite index based on labour market indicators offered by National Bureau of Statistics with yearly periodicity;
- Labour indicators will include positive and negative indicators;
- Positive indicators will be treated as those the increasing value of which is appreciated as positive and negative indicators – the increasing value of which – appreciated as negative;
- As positive indicators are considered the following: employment rate, monthly salary;
- As negative indicators - NEET share, average expenses for work accidents per victim of work accident;
- The calculation of LAFORI Index as well as its component parts will be done through min-max normalization method;
- For positive indicators maximum value is 1 and minimum value is 0;
- To make negative indicators compatible with positive indicators and to avoid conflict in interpretation of the composite indicator their scale will be reversed by extracting from 1 the values of negative indicators (this transformation allows the indicator to align positively with positive indicators where higher values are better, facilitating a unified analysis or composite index creation);
- LAFORI Index is a composite index based on the sum of normalized negative and positive indicators, each with same weight;
- For comparability purposes data years will be taken from 2019 onwards where available and used the standard statistical region classification of Moldova (North, South, Center, ATU Gagauzia, Chisinau Municipality).

4. LAFORI index design

The LAFORI Index combines factors like the share of the NEET group (in percents), employment rate (in percents), average gross monthly salary in real terms (in MDL), average expenditures on work accidents per victim of work accidents (in MDL). In the **Table 1** are shown the indicators that will be used in the design of LAFORI Index. The period used is only the years 2019-2023, due to comparability issues with years before. The regions included are the statistical regions of the Republic of Moldova (Chisinau Municipality, North, Center, South). Two indicators can be considered positive (rate of employment and average gross monthly salary in real terms) and two – negative (share of NEET Group (15-29 years old) and the average work accident costs per accident victim). The total data per country were included to create also a composite indicator for whole country (LAFOCI Index – Labour Force Country Index). In order to reduce the increasing effects of inflation on nominal average gross monthly salary we calculated the average gross monthly salary in real terms, taking as the base year first year of the period – 2019.

Table 1. The indicators components of LAFORI/LAFOCI Index, by regions, 2019-2023

		Total per country (only for LAFOCI Index)	Chisinau Municipality	North	Center	South
Rate of employment, %	2019	40.1	52.6	42.5	33.6	31.3
	2020	38.8	48.8	41.3	33.8	30.3
	2021	39.8	49.2	43.3	35.0	30.5
	2022	40.5	50.6	45.0	35.1	30.1
	2023	43.1	49.1	47.0	38.2	35.8
Share of NEET Group (15-29 years old), %	2019	27.4	21.5	29.3	29.9	29.5
	2020	26.0	21.4	26.1	26.2	32.8
	2021	26.4	22.8	25.6	28.8	29.6
	2022	26.2	24.8	24.5	28.9	26.5
	2023	23.1	21.9	22.9	23.9	24.6
Average gross monthly salary in real terms (2019=100), MDL	2019	7356.1	8645.3	5904.5	5887.9	5538.4
	2020	7811.9	9181.0	6270.4	6252.7	5881.6
	2021	8350.9	9814.5	6703.0	6684.2	6287.4
	2022	7490.8	8803.6	6012.6	5995.7	5639.8
	2023	7745.5	9102.9	6217.0	6199.6	5831.6
Average work accident costs per accident victim, thousand MDL per person	2019	7.1	11.3	51.5	79.6	112.9
	2020	8.4	13.4	97.3	85.4	159.1
	2021	6.3	9.8	53.0	57.4	109.4
	2022	6.8	10.7	50.7	56.5	112.9
	2023	6.1	8.9	66.1	48.0	109.4

Source: calculated and compiled by authors based on the National Bureau of Statistics of Moldova

The analysis of the primary indicators (from **Table 1**) has shown an increase of rate of employment after a reduction in the first year of COVID-19 pandemic period (2020) in all regions of country. The share of NEET group has slightly increased during COVID-19

pandemic period (2020-2022) in Chisinau Municipality and reduced in the analyzed period (2019-2023) in other regions. Average gross monthly salary in real terms has decreased significantly in 2022 (due to high inflation rates especially caused by high increases of gas prices), the following year (in 2023) it began to grow again. Average work accident costs per accident victim has shown in general a decrease in last three years of analyzed period (2021-2023), regardless of region.

In order to create the composite index the data from **Table 1** are normalized taking in consideration these conditions:

- minimum employment rate is 0% (no one is employed) and assigned value is zero, maximum employed rate is 100% (all active population is employed) and assigned value is 1;
- minimum share of NEET group is 0% (all young people study, are in training or work) with assigned value 1 since the scale is reversed due to it being a negative indicator, maximum share of NEET group is 100% (there is no young people that study, nor are in training or in work) with assigned value 0;
- minimum average gross monthly salary in real terms is 0 MDL (no salary) with assigned value 0, maximum average gross monthly salary in real terms is theoretically unlimited or is of unknown limit, but for practical reasons we will consider the actual maximum value of this indicator in the analyzed years and regions as the maximum value of the indicator with the assigned value 1;
- minimum average work accident costs per accident victim is 0 MDL (no costs due to no accidents) with assigned value 0, maximum average work accident costs per accident victim theoretically has no limit or is of unknown limit, but for practical purposes will be considered the actual maximum value of this indicator in the analyzed period and regions as the maximum value of the indicator with the assigned value 1;
- the normalization of positive indicators is calculated as the following ratio: $\text{normalized value} = (\text{current value} - \text{minimum value}) / (\text{maximum value} - \text{minimum value})$ and the normalization of negative indicators is calculated in the following way by reversing the scale: $\text{normalized value} = 1 - (\text{current value} - \text{minimum value}) / (\text{maximum value} - \text{minimum value})$.

In **Table 2** are shown the normalized indicators components of LAFORI/LAFOCI Index.

Table 2. The normalized indicators components of LAFORI/LAFOCI Index, by regions, 2019-2023

		Total per country (only for LAFOCI Index)	Chisinau Municipality	North	Center	South
Rate of employment, conventional units	2019	0.401	0.526	0.425	0.336	0.313
	2020	0.388	0.488	0.413	0.338	0.303
	2021	0.398	0.492	0.433	0.35	0.305
	2022	0.405	0.506	0.45	0.351	0.301
	2023	0.431	0.491	0.47	0.382	0.358
Share of NEET Group (15-29 years old), conventional units	2019	0.726	0.785	0.707	0.701	0.705
	2020	0.740	0.786	0.739	0.738	0.672
	2021	0.736	0.772	0.744	0.712	0.704
	2022	0.738	0.752	0.755	0.711	0.735
	2023	0.769	0.781	0.771	0.761	0.754
Average gross monthly salary in real terms (2019=100), conventional units	2019	0.750	0.881	0.602	0.600	0.564
	2020	0.796	0.935	0.639	0.637	0.599
	2021	0.851	1.000	0.683	0.681	0.641
	2022	0.763	0.897	0.613	0.611	0.575
	2023	0.789	0.927	0.633	0.632	0.594
Average work accident costs per accident victim, conventional units	2019	0.955	0.929	0.676	0.500	0.290
	2020	0.947	0.916	0.388	0.463	0.000
	2021	0.960	0.938	0.667	0.639	0.312
	2022	0.957	0.933	0.681	0.645	0.290
	2023	0.962	0.944	0.585	0.698	0.312

Source: calculated by authors based on the National Bureau of Statistics of Moldova

To get the composite LAFORI/LAFOCI Index to each indicator will be attached same weight and all component indicators' values will be summed (shown in the *Table 3*). Since maximum value of each component is 1 and components are 4, the maximum value of the LAFORI/LAFOCI Index will be 4, thus its value will range from 0 – minimum value to 4 – maximum value. The points of the obtained scale can be interpreted in the following way:

- 0 (Very Poor) - reflects very low rates of employment, high rates of NEET group, low average salaries, and/or high accident costs. Indicates a struggling labour force with severe challenges in economic activity, safety, and youth engagement.
- 1 (Poor) - still below average on most components, but slightly better than the very poor conditions. Some signs of emerging employment opportunities or minor improvements in NEET rates and accident costs.
- 2 (Average) - represents an average performance across the metrics. Employment rates and salaries are at satisfactory levels, NEET rates are moderate, and accident costs are manageable.
- 3 (Good) - above average performance where employment rates are high, NEET rates are low, salaries are robust, and work accidents are infrequent and less severe. Indicates a healthy labour market and economic condition.
- 4 (Excellent) - the highest performance with very high employment rates, very low or negligible NEET rates, high average salaries, and minimal work accident costs. Represents an optimal labour market and economic environment.

Table 3. The LAFOCI/LAFORI Index, by regions, 2019-2023

	Total per country (LAFOCI Index)	Chisinau Municipality (LAFORI Index)	North (LAFORI Index)	Center (LAFORI Index)	South (LAFORI Index)	
LAFORI/ LAFOCI Index, conventional units	2019	2.832	3.121	2.410	2.137	1.873
	2020	2.871	3.125	2.179	2.176	1.574
	2021	2.945	3.202	2.527	2.382	1.962
	2022	2.863	3.088	2.499	2.318	1.901
	2023	2.951	3.144	2.459	2.473	2.019

Source: calculated by authors based on the National Bureau of Statistics of Moldova

5. Results and discussions

The index values for Chisinau Municipality range from 3.088 to 3.202, indicating consistently "Good" performance, characterized by high employment rates, low NEET rates, robust salaries, and few work accidents. The North shows index values from 2.410 to 2.527, which generally can be classified as "Average". This suggests satisfactory employment levels, moderate NEET rates, manageable accident costs, and average salary conditions. The values for the Center range from 2.137 to 2.473, oscillating between "Very Poor" to "Average". This variability implies some fluctuation in economic activity, with improvements in employment and accident costs towards the latter years. The South's index values range from 1.574 to 2.019, primarily falling under "Poor" to nearly "Average" categories. These scores indicate below-average economic conditions, struggling with low employment, higher NEET rates, and higher accident costs, although showing some signs of improvement.

Overall, Chisinau Municipality demonstrates the healthiest economic conditions among the regions, while the South struggles comparatively more, with incremental improvements over the years. The North and Center show moderate performance with some annual variations indicating changes in their labour market dynamics, especially due to COVID-19 pandemic conditions in those years.

6. Conclusions

The LAFORI Index or LAFOCI Index (for the whole country), constructed from diverse labour market indicators, offers an insightful, composite measure of regional labour force conditions in the Republic of Moldova and can be useful for application in other countries as well. Through the integration of both "positive" indicators — namely employment rates, average monthly salaries in real terms, and "negative" indicators, as NEET group shares, and work accident costs—this index provides a nuanced perspective on the multidimensional nature of regional labour markets. Applied to regions of Republic of Moldova it has shown that Chisinau Municipality consistently showcased robust economic health, as indicated by its consistently "Good" performance in the LAFORI Index. It benefitted from high employment rates, low NEET rates, and substantial salaries, coupled with minimal accident costs. Northern and Central regions displayed more variability, with their index scores wavering between "Very Poor" to "Average". This reflected fluctuating economic conditions, which have seen gradual improvement, particularly in reducing NEET rates and stabilizing employment figures. The Southern region, despite its struggles, has shown signs of gradual economic recovery. The region's performance has incrementally improved from "Poor" to nearing "Average", underscoring a slow yet steady amelioration in labour market conditions. The

variability in regional performances could also be attributed to external economic pressures, such as the inflation spikes and economic disruptions caused by the COVID-19 pandemic, increasing gas prices, logistical chain disruptions as a consequence from the war in Ukraine. These factors have distinctly impacted employment rates and salary levels, particularly in 2022. The LAFORI/LAFOCI Index can be an essential tool for policymakers and researchers aiming to assess and compare the health of labour markets across different regions. By providing a holistic view, it facilitates targeted economic interventions and the crafting of region-specific strategies to enhance labour market conditions. Continued refinement and adaptation of the LAFORI/LAFOCI Index are necessary to maintain its relevance and accuracy, especially in light of evolving economic landscapes and labour market dynamics. Future research should focus on incorporating additional indicators that may capture emerging trends and challenges in the labour market. This composite index not only sheds light on the current state of the labour market in Moldova but also serves as a crucial benchmark for gauging regional economic vitality and guiding strategic economic planning. Its comprehensive nature makes it a useful tool in the ongoing efforts to strengthen Moldova's overall economic structure and to mitigate regional disparities in the labour market.

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EXPLORING THE INTERSECTION OF COMPUTER SCIENCE AND ACCOUNTING: AN OVERVIEW

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Abstract: *The evolution of accounting through technology, particularly Accounting Information Systems (AIS), has revolutionized the field. AIS integrates information systems and technology to streamline processes, enhancing efficiency, accuracy, and decision-making. It collects, stores, and processes financial data, providing real-time insights for management and stakeholders. While AIS offers numerous benefits, such as automation and improved reporting, it also presents challenges like the need for continuous technological adaptation and cybersecurity risks. Despite challenges, AIS has various applications including financial reporting, budgeting, auditing, and inventory management. Emerging trends like automation, cloud computing, and blockchain integration promise further advancements, empowering accountants to focus on strategic analysis. The future of AIS holds potential for enhanced efficiency, agility, and decision support, necessitating accountants to stay abreast of technological innovations for optimal utilization.*

Keywords: *financial, accounting, AIS, information.*

JEL Classification: *M41, O33.*

1. Revolutionizing accounting: the impact of information systems and technology

The world of accounting has undergone significant changes in the past few decades, with the rise of technology and the increasing need for efficiency and accuracy. One of the most significant changes has been the integration of information systems and technology in accounting.

An accounting information system (AIS) is a system of collecting, storing, and processing financial and accounting data that are used by decision-makers. This integration of information systems and technology has not only revolutionized the way accounting processes are conducted, but it has also opened up new avenues for accountants to analyze financial data and make informed decisions. With the help of AIS, accountants can now handle large volumes of financial data in a matter of seconds, and they can also generate comprehensive and accurate financial reports at a much faster pace. Moreover, the integration of technology in accounting has also reduced the risk of errors and fraud, as many manual processes have been automated.

However, the integration of technology in accounting has also brought about some challenges. One of the significant challenges is the need for accountants to be technologically adept and up-to-date. The vast array of software and systems available means that accountants must constantly update their skills and knowledge to ensure they can make the most of the technology at their disposal.

Additionally, there is also a risk of cyber-attacks and data breaches, which could compromise the confidentiality, integrity, and availability of financial data. Therefore, accountants must also be aware of the potential risks and take appropriate measures to mitigate them. The integration of AIS in accounting has revolutionized the way businesses manage their financial data. It has made the process of recording transactions, generating financial statements, and analyzing financial data much more efficient and accurate.

With the use of AIS, accountants and financial analysts can easily access data in real-time, which helps in making informed decisions. The use of AIS has also minimized the occurrence of errors and frauds. In this essay, we will explore the intersection of computer science and accounting, focusing on the overview of information systems and technology in accounting, their applications, and the future of these systems in accounting.

2. Enhancing decision-making: the role and benefits of AIS

An accounting information system (AIS) is a system that involves the collection, storage, and processing of financial and accounting data used by internal and external stakeholders, including managers, investors, creditors, and tax authorities (Tuovila, 2020). The AIS plays a critical role in ensuring the accuracy and reliability of financial information used for decision-making by management and other stakeholders. The system is designed to capture financial data from various sources, including transactions, invoices, receipts, and other financial records.

Once the data is collected, it is processed and stored in a database that can be accessed by authorized individuals. One of the key benefits of an AIS is that it can provide near real-time financial information that can help management make informed decisions about the business. This information can include financial statements, cash flow statements, balance sheets, and income statements. In addition to this, an AIS can also provide a variety of reports and analytics, which can help management gain insight into the business's performance. This can include information on sales, expenses, profits, and losses. The purpose of an AIS is to collect, store, and process financial and accounting data and produce informational reports that support decision-making processes (Guragai, et al. 2017).

The data collected by an AIS includes financial transactions, such as sales, purchases, expenses, and payments, as well as non-financial data, such as customer information and inventory levels. Moreover, an AIS is not only used by businesses but also by governments and non-profit organizations to manage their financial information. The use of an AIS can help these entities to comply with legal and regulatory requirements, such as tax filing obligations, financial reporting, and auditing.

An AIS can also help businesses and organizations to identify areas of risk and opportunities for growth. The system can provide managers with information on profitability, cost control, and financial performance, which can be used to make strategic decisions. Furthermore, an AIS is an efficient tool that can save time and reduce errors in financial reporting. With the use of technology, the system can automate many accounting processes, such as journal entries and account reconciliations. This reduces the manual effort required in maintaining accounting records and minimizes the risk of errors or omissions in financial reporting. The AIS is designed to ensure the accuracy, completeness, and timeliness of the data collected, as well as the security and privacy of the information stored (Belfo and Trigo, 2013).

3. Transforming accounting: the versatility of AIS applications

An AIS has numerous applications in accounting, including financial reporting, budgeting, forecasting, and auditing. Companies use AIS to monitor their finances and make decisions for the future (GW Capital Group, 2023). Information systems have a significant impact on how accounting is done and what reports are generated. AIS is a vital component of modern accounting practices. It provides an integrated platform for managing and processing financial data, which is essential for any business operation. The financial reporting capabilities of AIS enable companies to access accurate, timely, and relevant financial information. This information is critical for decision-making, as it enables companies to analyze their current financial position and make informed decisions about investments, expansion, and other strategic initiatives.

Budget preparation and forecasting are also critical areas where AIS plays a significant role. With the help of AIS, companies can forecast future sales, expenses, and cash flow, which is essential for preparing budgets. AIS also helps companies to monitor their actual performance against the budget and to identify areas where they need to improve. Furthermore, AIS is widely used in auditing. Most accounting tasks these days are processed in a computer, which has made accounting more efficient and effective (Indeed Editorial Team, 2024).

Auditing is also an essential application of AIS. AIS has revolutionized the accounting industry by automating several tasks that were previously done manually, such as data entry, record-keeping, and financial reporting. This has not only made accounting more efficient but has also minimized errors that were common when these tasks were performed manually. The integration of AIS with other business systems has also enabled real-time financial reporting, which is essential for decision-making. Managers can now access financial data instantly and make informed decisions based on accurate and up-to-date information. In addition to budget preparation and auditing, AIS also plays a crucial role in inventory management. By utilizing AIS, companies can accurately track their inventory levels and forecast future demand. This allows them to optimize their inventory levels and minimize waste, which ultimately results in cost savings.

Furthermore, AIS also helps companies to manage their supply chain more efficiently by providing real-time information about inventory levels, orders, and shipments. This information can be used to make informed decisions about production schedules, purchasing, and shipping, which can ultimately lead to cost savings and increased profitability. AIS has also enabled the development of new business models, such as e-commerce and online banking. These models would not have been possible without the automation and integration provided by AIS. An audit aims to establish whether information systems are safeguarding corporate assets, maintaining the integrity of stored and communicated data, supporting business objectives, and maintaining data privacy (Shanker, 2024).

4. Shaping the future: technological innovations in accounting information systems

The future of information systems in accounting is promising, with new technologies being developed every day. These trends include the rise of automation in accounting, such as the increased use of machine learning and robotic process automation (Zwass, 2024). These advancements in technology have enabled accountants to allocate their time and efforts on tasks that require human expertise, such as analyzing financial statements and providing strategic insights to management.

Automation also reduces the risk of human error, which is a significant challenge in accounting. Moreover, cloud computing has transformed the way accounting information systems are managed. Cloud-based accounting software has become increasingly popular due to its convenience and accessibility.

These software systems allow accounting professionals to access data in real-time from anywhere in the world, making remote work and collaboration easier than ever before. One of the significant advantages of cloud-based accounting software is that it provides real-time financial information. This real-time data enables businesses to make informed decisions in real-time, which is critical in today's fast-paced business environment.

Moreover, cloud-based accounting software is cost-effective since it eliminates the need for a physical infrastructure and hardware, reducing the operational costs significantly. Another trend that is gaining momentum in the accounting industry is the integration of blockchain technology. Blockchain technology is a decentralized ledger that allows secure and transparent record-keeping. With its immutable and tamper-proof nature, blockchain technology makes accounting more reliable and efficient, reducing the chances of fraud and errors.

The integration of blockchain technology in accounting is still in its early Accounting information systems will become more sophisticated, agile, and flexible, with improved capabilities for data analysis, visualization, and decision-making. The rapid evolution of technology and the increasingly integrated nature of accounting information systems (AIS) in business provide opportunities to enhance the efficiency, accuracy, and effectiveness of accounting processes (Qamar, 2020).

5. Conclusions

In conclusion, information systems and technology have revolutionized the accounting field, making it more efficient, effective, and accurate. Gone are the days when accountants had to manually record every transaction on paper journals and ledgers. With the advent of advanced information systems and technology, accountants can now automate the process of recording, processing, and reporting financial information.

These advanced systems and technologies have also enabled accountants to reduce errors in their work, providing more reliable financial data for decision-making purposes. Additionally, these systems facilitate collaboration and communication among accountants, clients, and other stakeholders, making it easier to share financial information and work together on projects remotely. This has not only reduced the possibility of human errors, but it has also increased the speed and accuracy of financial reporting.

One of the most significant improvements in the accounting field is the introduction of accounting software, which has made it easier for accountants to manage financial data. Accounting software is specialized software designed to handle financial transactions and manage financial data for individuals and organizations. It is used to record, store, and analyze financial transactions, ensuring that all financial information is accurate and up-to-date. This has made it easier for companies to keep track of their financial records and prepare financial statements, such as balance sheets and income statements, with ease.

Moreover, the integration of information systems and technology in accounting has also made it easier for accountants to collaborate with clients and colleagues. The use of cloud technology has made it possible for accountants to work remotely and access financial data from anywhere in the world. This has also facilitated the growth of virtual accounting, where

accountants work with clients online, providing financial services. The introduction of AIS has provided numerous applications, including financial reporting, budgeting, forecasting, and auditing.

The future of AIS seems promising, with the rise of automation in accounting and the development of new technologies. As technology continues to evolve, it is essential for accountants to keep up-to-date with the latest trends to ensure they are using the best tools available to handle financial data and make informed decisions.

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ANALYSIS OF THE WEALTH OF POPULATION AT NATIONAL AND GLOBAL LEVEL IN THE PERIOD 2015-2022

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Abstract: *The purpose of the paper is to present the wealth of the population/households at national and international level, respectively the real estate assets and the net financial assets of households in Romania, at the European and global level, in the period 2015-2022, as well as the proposal of measures to reduce the inequality between rich and poor, globally. In this sense, we use a descriptive and empirical methodology, by referring to bibliographic references from the international specialized literature, as well as statistical data of various fiscal bodies/entities (Eurostat, reports of the National Bank of Romania, Credit Suisse reports, reports of the World Bank).*

Keywords: *financial assets, real estate assets, households, individual wealth, inequality.*

Jel Classification: *H31, I38.*

1. Introduction

Since 2020, the five richest men in the world have doubled their wealth; in the same period, almost five billion people globally became poorer, difficulties with daily living, hunger being a hard reality for many persons around the world.

Wealth and its taxation are highly debated topics at the global level, the basis of these discussions being, mainly, the increase in aggregated private wealth in relation to national income, respectively the increase in the concentration of wealth. This phenomenon has increased during the pandemic crisis, while national income has fallen, the value of private wealth has increased, growth that has been extreme among billionaires.

The present paper is structured as follows: the analysis of the wealth of Romanian households in the period 2015-2022, the wealth of the population at the European and global level, as well as the proposal of measures to reduce the inequality between the rich and the poor, at the global level. The statistical data used are provided by the global reports developed by Credit Suisse in the period 2016-2023, as well as from the National Accounts and Financial Stability Reports of the National Bank of Romania (BNR), 2016-2023 editions.

2. Analysis of household assets in Romania in the period 2015-2022

In this paper, wealth refers to immovable property (real estate) and financial assets. According to the Financial Stability Report (BNR), real estate assets include only real estate, which is divided into residential real estate (residential and non-residential buildings), respectively commercial real estate (buildings, retail buildings, industrial buildings/spaces). Therefore, the wealth we refer to is represented by real estate (which, from a tax perspective, is subject to property taxation), and financial assets (cash, deposits, including income from work, wages, subject to income taxation).

Next, we present the situation of real estate and net financial assets of households in Romania (the difference between financial assets and financial liabilities) in the period 2015-2022.

Table 1. Financial net assets and real estate assets of the population in the period 2015-2022

Bn lei	2015	2016	2017	2018	2019	2020	2021	2022
Net financial assets	363	387	420	384	539	622	712	758
Real estate assets	1.219	1.295	1.425	1.581	1.736	1.847	2.080	2.190
liabilities / Asets	7,9	7,6	7,5	7,7	7,2	6,3	6,1	6,1

source: BNR, Financial Stability Report, June 2023 (statistical data)

We notice that real estate has an upward trend, being significant in 2017 (+ 130 billion lei compared to 2016), 2018 (+ 156 billion lei compared to 2017), year 2022, when there was an increase of 110 billion lei, compared to the year 2021. Afterwards, real estate continues its upward trend, but at a "lighter" pace.

Net financial assets have an increasing trend, except for 2018 (compared to 2017 they recorded a reduction of 36 billion lei), which indicates the faster growth rate of financial assets (liquidity) compared to liabilities. In 2021, the population's net wealth (calculated as the difference between the population's stock of financial assets and liabilities) continued its upward trajectory, with real estate assets representing more than 70% of total wealth.

Table 2. Financial assets of households in Romania in 2015-2022

Financial assets (mil lei)	2015	2016	2017	2018	2019	2020	2021	2022
Currency and deposits	179.347	202.345	222.539	239.024	272.745	309.352	339.845	363.716
Debt securities	6.281	6.135	5.626	8.403	10.506	13.986	13.131	15.886
Credits	199	170	115	2.250	6.179	6.368	9.603	16.780
Shares and units of investment funds	125.038	137.282	152.639	171.873	197.296	248.188	302.413	369.582
Investment fund shares/units	21.905	22.497	24.095	20.640	24.203	21.487	25.325	19.864
Insurance systems, pensions and standardized guarantee schemes	34.513	42.611	53.202	61.885	78.312	92.706	108.620	117.713
Financial derivatives and employee stock options	116	118	166	38	38	38	45	0
Other accounts receivable/payable	161.233	163.298	142.810	71.063	171.375	170.989	171.078	182.936
Total	506.726	551.958	577.098	554.537	736.451	841.627	944.736	1.066.613

source: BNR, National Financial Accounts 2017-2022, data series

If we consider the financial assets in Romania, we observe their upward trend, except for 2018, when they decreased by 22.561 million lei. Compared to 2015, they increased 2,10 times, respectively by 559.887 million lei.

In the structure, currency and deposits predominate (reached 363.716 million lei in 2022, compared to 179.347 million lei in 2015), participations and units of investment funds, insurance systems, pensions and standardized guarantee schemes (in 2022 they reached 117.713 lei, compared to 34.513 million lei in 2015). We observe the sudden increase in loans, approximately 84 times, from 199 million lei in 2015, to 16780 million lei in 2022.

We bring into discussion the study developed by Georgescu F, (2023), Romania's national wealth, according to which the savings of 59.500 Romanians are 100 times larger than the deposits of another 14,1 million citizens. The financial assets of the population register a pronounced increase, assets that are, however, highly polarized, this characteristic emerging from the distribution of deposits; 0,4% of depositors (59.500 persons) accumulated, at the end of 2022, a proportion of 26% (64,6 billion lei) of the total citizens' deposits, holding on average 1,08 million lei per person (equivalent to 220 thousand euros). At the opposite pole are 99,6% of depositors (14,1 million people) who own 74% of deposits, the average amount saved by these people being 11.000 lei (the equivalent of 2.200 euros).

Currency held by the population grew faster than population savings in banks; one of the causes that led to the significant increase in cash is represented by the tendency of a growing number of citizens who carry out unaccounted economic operations, the income thus obtained cannot be justified in relation to the banks for the purpose of establishing hoarding deposits in various forms, and to fuel the economy informal.

If we use the data provided by Credit Suisse (2023), the national wealth situation is as follows:

Table 3. Wealth in Romania in 2015- 2022

year	Adults (miii)	Total wealth (mld dollar)	wealth/ adult (dollars)	Financial wealth/ adult (dollars)	Non-financial weath/adult (dollars)	liabilities/ adult (dollars)
2015	15729	399	25347	7729	19775	2157
2016	15644	446	28479	8193	22654	2368
2017	15533	544	35032	9768	28080	2816
2018	15414	569	36940	9735	29828	2623
2019	15307	609	39806	11301	31483	2979
2020	15208	595	39113	13930	28697	3515
2021	15123	609	40262	14290	29345	3373
2022	15057	667	44320	14378	33238	3296

source: Credit Suisse, Global Wealth Databook 2023

We observe an upward trend in wealth in Romania, except for 2020, the year of the pandemic crisis, when it decreased by 14 billion dollars, compared to 2019. In 2022, it reached a maximum of 667 billion dollars, with 58 billion dollars more compared to 2021, and 268 billion dollars more than 2015. By components, both financial and non-financial wealth (real estate) have an upward trajectory, with non-financial wealth growing at a much faster pace. The maximum is in 2022, over 33.238 dollars/ adult.

3. Comparative analysis of the financial assets and liabilities of households in Romania and the European Union

We consider the comparative situation of the financial assets and liabilities of households, as a whole, as well as by type of financial instruments. We mention that the households also include non-profit institutions in the service of households.

In the period 2015-2022, at the EU 27 level, the financial assets of households and non-profit institutions serving households in the EU-27 generally had an upward trend (except for 2018 and 2022), while the share of financial liabilities in GDP decreased (with the exception of 2020). It draws attention the year 2022, when the total financial assets of EU households decreased significantly; their total value increased from 25.991 billion euros in 2015 to 35.345 billion euros in 2021 (a total increase of 56,9%), and the following year, in 2022, they reached 33.546 billion euros. Also, financial liabilities increased until 2022. Total financial liabilities increased from 7.690 billion euros in 2015 to 9.350 billion euros in 2022, a global increase of 21,6%.

For the year 2022, *the total financial assets* of EU households were assessed at 33.546 billion euros, a level 3,6 times higher than the *financial liabilities* of the EU 27, which reached a level of 9.350 million euros, resulting in a net difference of 24.196 billion euros (or 72,1% of the value of assets). At the EU 27 level, total financial assets have a share of 201,9% of GDP, and liabilities, of 58,8% of GDP.

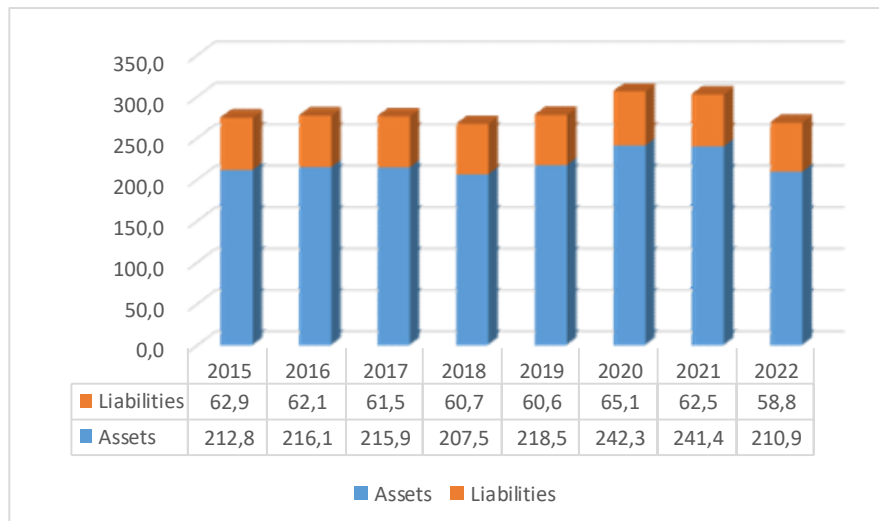


Figure 1. Assets and liabilities in UE 27 in 2015-2022 (% GDP)

source: Eurostat, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Households_-_statistics_on_financial_assets_and_liabilities#Assets_and_liabilities

In 2022, assets were valued in the EU at 210,9% of GDP, while liabilities were valued at 58,8% of GDP, resulting in net assets equivalent to 152,1% of GDP.

In Slovakia and Finland, household financial assets were 1,9, respectively 2,0 times higher than their liabilities, the two lowest such ratios among EU Member States. Otherwise, financial assets were at least 3 times higher in 22 Member States and at least 4 times higher in eight Member States. The three highest rates were in Bulgaria (5,6 times higher), Italy (5,7 times higher) and Hungary (6,0 times higher).

The value of households' financial assets as a percentage of GDP was over 100,0% in 2022 for all EU Member States except Ireland, Latvia, Slovakia, Poland and Romania; the highest level was recorded in Denmark (341,9%) and Sweden (315,9%). As for liabilities, their value as a percentage of GDP was below 100,0% for all Member States, the highest level being reached in the Netherlands (96,4%).

Similar to previous years, Romania ranks last, with the lowest values in the EU 27 (77,8% GDP for assets, respectively 19,5% GDP for liabilities).

Regarding the structure of assets and liabilities, we note that the data refer only to households, excluding non-profit institutions that serve households. Financial assets and liabilities in the EU member States are represented by currency and deposits; loans; participations and shares of investment funds; insurance, pensions and standardized guarantees; other accounts receivable/payable. Three other types of assets and liabilities represented small shares of the total financial assets of EU households in 2022 and are grouped as other instruments (with a collective share of 1,8% of the total): monetary gold and special drawing rights (SDR); debt securities; and derivatives and employee stock options. In particular, the category of monetary gold and SDRs was zero-rated for all EU Member States for the household sector.

As mentioned above, in 2022, the total financial assets of EU households were valued at 33.546 billion euros, being mainly composed of currency and deposits (34,1%), shares of investment funds (32,8%) and insurance, pensions and standardized guarantees (27,8 %). Liabilities, which totaled 9.350 billion euros, were mainly represented by loans (93,2%).

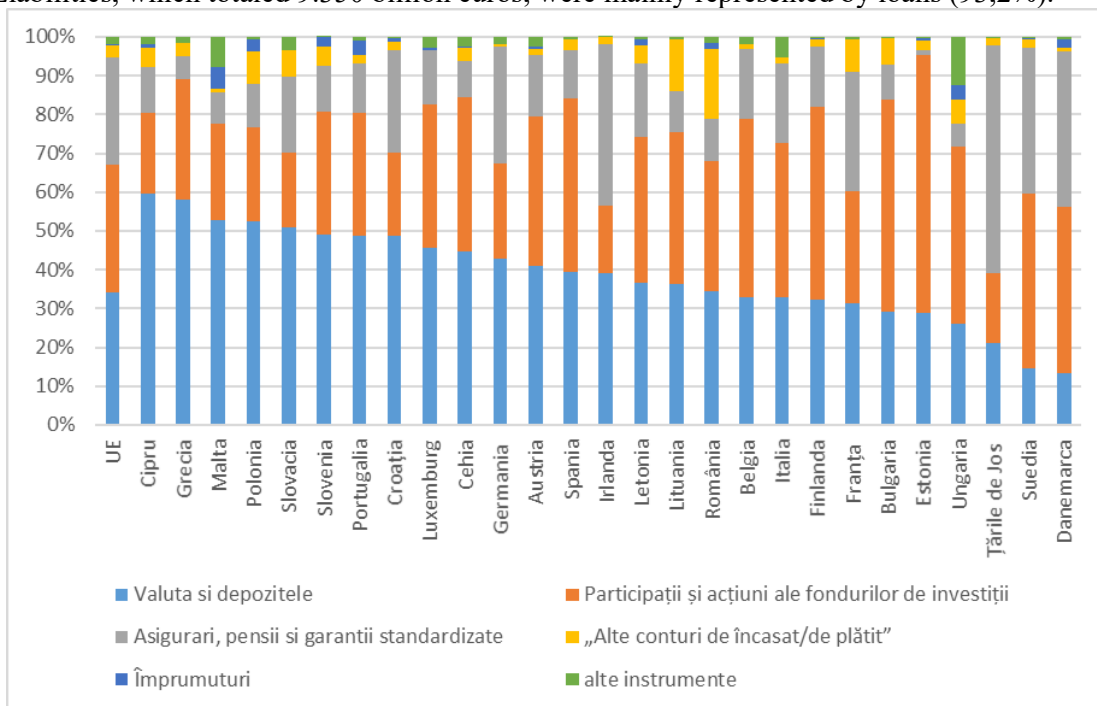


Figure 2. Share of the type of assets of Households, 2022 (% of total financial assets of Households)

Source: EUROSTAT, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Households_-_statistics_on_financial_assets_and_liabilities#Assets_and_liabilities_relative_to_GDP

Of the total financial assets of EU households in 2022, currency and deposits represented the largest share (34,1 %). This was closely followed by shares of capital and investment funds (32,8 %) and insurance, pensions and standardized guarantees (27,8 %). Lower shares were recorded for other accounts receivable/payable (3,1%), other instruments (1,8%) and loans (0,3%).

The *currency and deposits* category was the largest instrument in 14 Member States and represented more than half of the total in five of them: Cyprus (59,7%), Greece (58,0%), Malta (52,9%), Poland (52,3 %) and Slovakia (51,0 %). The category of *shares of investment funds* was the largest instrument in 11 Member States, where their share varied between 37,7% and 66,4%. The *insurance, pensions and standardized guarantees* category was the largest instrument in three Member States: the Netherlands (64,9%), Ireland (46,0%) and France (34,6%).

Regarding the structure of liabilities, loans represented 93,2% of the total financial liabilities of EU households in 2022. The rest (6,8% of the total) represented other accounts receivable/payable. The main type of liabilities for households in each of the EU member states in 2022 were loans, representing at least 82,1% of the total, with the exception of Romania, where the share was 71,3%. The lowest contributions from other accounts receivable/payable were 0,0% in Luxembourg and 1,1% in Germany; the highest shares were 16,1% in Cyprus, 16,2% in Bulgaria, 16,3% in Portugal and 19,4% in Romania.

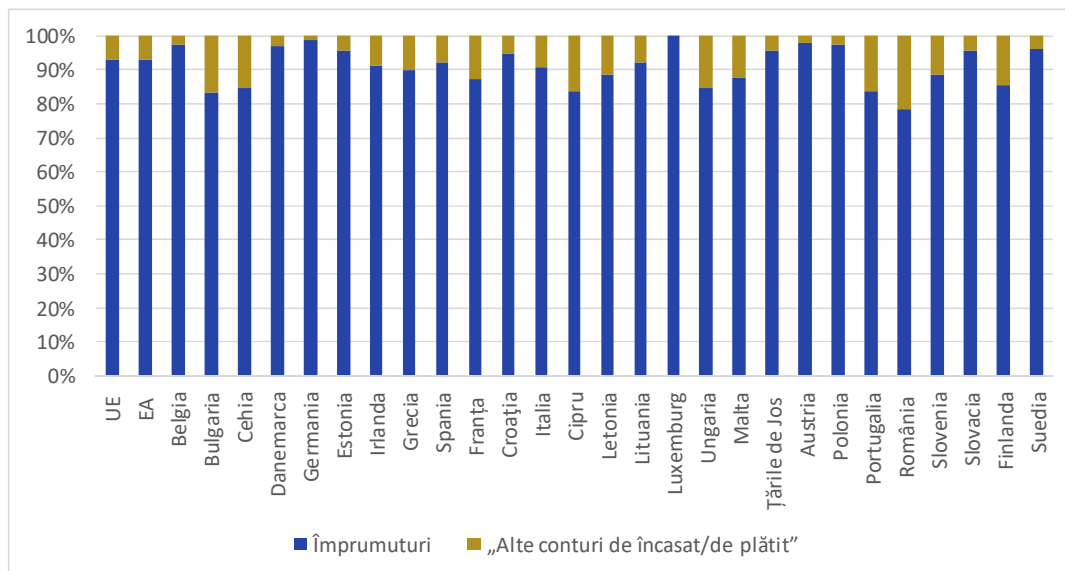


Figure 3. Financial liabilities of households by type of financial instruments in the EU, 2022 (billion euros)

Source: EUROSTAT, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Households_-_statistics_on_financial_assets_and_liabilities#Assets_and_liabilities_relative_to_GDP

The total financial assets of EU households increased almost continuously between 2015 and 2021, but in 2022 their value decreased by 5,1%; total financial liabilities followed the same trend, but at a slower pace than assets.

The value of financial assets of households as a percentage of GDP was 30,5 pp lower in 2022 than in 2021 in the EU; the level decreased in all EU Member States, especially Denmark and the Netherlands (in percentage points). The value of household financial liabilities as a percentage of GDP decreased by 3,7 pp in the EU in 2022 compared to 2021; this ratio (liabilities/GDP) decreased in 25 EU member states, especially in Denmark; increases were recorded in Luxembourg and Slovakia.

Wealth at global level

Another aspect we want to discuss is the one related to *global wealth*, namely the changes that occurred in households during 2021-2022, according to the Credit Suisse Global Wealth Report (2023).

Globally, household net wealth fell 2,4% in 2022, to 454,4 trillion dollars, while wealth per adult fell 3,6%, to 84.718 dollars, being the first decline after the 2008 financial crisis; a significant part of this decline comes from the appreciation of the US dollar compared to various currencies, followed by inflation and rising interest rates; financial assets contributed most to the decline in wealth in 2022, while non-financial assets, particularly real estate, proved themselves to be resilient despite rapidly rising interest rates. If exchange rates had remained the same as in 2021, total wealth would have increased by 3,4% and wealth per adult by 2,2%.

In the following table we present the situation of wealth in 2022 globally, by region, compared to 2021, respectively the changes in household wealth.

Table 4. Changes in households' wealth in 2021- 2022, by regions

region	Total wealth 2022 (bn dollars)	Total wealth change		wealth / adult 2022 (dollars)	Modificare Ave / adult (%)	Change in financial wealth (%)	Change in non-financial wealth (%)	Liabilities change (%)
		2022-2021 bn dollars	2022-2021 %					
Africa	5,909	85	1,5	8,345	-1,3	2,1	1,0	1,9
Asia Pacific	77,974	-2,070	-2,6	61,154	-4,0	-6,5	1,0	-3,6
China	84,485	-1,462	-1,7	75,731	-2,2	-0,3	-3,1	-2,8
Europa	104,410	-3,703	-3,4	177,179	-3,4	-10,4	2,3	-3,2
India	15,365	675	4,6	16,500	2,8	1,0	5,4	3,0
Latin America	15,071	2,359	18,6	32,760	16,9	12,9	22,7	15,1
North America	151,170	-7,166	-4,5	531,826	-5,3	-9,0	9,5	4,9
Globally	454,385	-11,281	-2,4	84,718	-3,6	-6,8	3,2	0,1

Source: Credit Suisse, Global Wealth Report 2023

The "loss" of global wealth was heavily concentrated in North America and Europe, which together lost 10,9 trillion dollars. China and the Asia-Pacific region also saw losses of 3,5 trillion dollars, but these were offset by small gains in India and Africa. However, Latin America stands out, where the total wealth increased by 2,4 trillion dollars (+ 18.6%), growth due to the appreciation of the national currency, by 6%, compared to the US dollar.

In terms of wealth per adult, Europe and Asia Pacific experienced declines similar to the global average of -3,6%, while the percentage loss in North America was larger. Africa's population growth has turned the modest 1,5% increase in total wealth into a 1,3% decline in wealth per adult.

Financial assets have contributed the most to total wealth growth since the financial crisis. However, stock prices fell in almost all regions in 2022, causing total financial wealth to fall by 19 trillion dollars, or - 6,8%. Non-financial assets increased by 7,9 trillion dollars, likely

reflecting the fact that housing markets remained relatively buoyant in the low interest rate environment of the first half of 2022. The reduction in financial assets was particularly marked in Europe, North American countries and from Asia-Pacific. Non-financial assets performed relatively better in most regions, the main exception being China, where both financial and non-financial assets fell in dollar terms, not in yuan (renminbi).

Total household debt was almost unchanged against the dollar, but fell by 6,0% if currency "movements" are taken into account. There were debt/liabilities reductions in China, Europe and Asia-Pacific, but also increases in North America and Latin America.

It should be noted that an important part of the annual change in household wealth in individual countries depends on *asset prices and exchange rates*.

Record wealth growth in 2021, fueled in part by stock markets, led to large increases in wealth across many markets. The stock market losses in 2022, however, determined that precisely these winning markets in 2021 to lose substantial wealth in 2022, in this sense at the top of the ranking being the United States of America, which lost 5,9 trillion dollars. Losses of over 1 trillion dollars were also recorded in Japan (minus 2,5 trillion dollars), China (- 1,5 trillion dollars), Canada (- 1,2 trillion dollars), Australia (- 1 trillion dollars). At the opposite pole, there were increases in Russia (+ 600 billion dollars), Mexico (+ 655 billion dollars), India (+ 675 billion dollars) and Brazil (+ 1,1 trillion dollars).

In terms of individual wealth, nations with high wealth per adult (over 100.000 dollars) are concentrated in North America and Western Europe and in the wealthier regions of East Asia, the Pacific and the Middle East. China and Russia belong to the group of "middle wealth" countries, with an average wealth between 25.000 dollars and 100.000 dollars, a group that now also includes countries in the European Union and major emerging market economies in Latin America, the Middle East, and East Asia.

The next group, the "frontier wealth", respectively 5.000-25.000 dollars per adult, includes the highly populated countries: India, Indonesia and the Philippines, large part of South America and many of the coastal states of Africa, as well as the rapidly developing Asian countries, Cambodia, Laos, and Vietnam. Countries with an average wealth of less than 5.000 dollars form the last group, which is dominated by Central African countries.

As for the *distribution of global wealth*, in 2022 the share of wealth in the global top 1% fell to 44,5%, slightly above the 2019 level, and the number of US dollar millionaires worldwide fell by 3,5 million, to 59,4 million at the end of the year. This number includes 4,4 million "inflation millionaires", who would no longer qualify if the millionaire threshold were adjusted for inflation during 2022. The ultra high net worth (UHNW) group, with wealth over 50 million dollars, had 22.490 fewer members, with North America accounting for 81% of this decline.

At the base of the pyramid are the low-wealth holders, namely 2,8 billion people – 53% of all adults in the world, who had wealth below 10.000 dollars in 2022. The next segment, represented by people with wealth in the 10.000-100.000 dollars interval, has experienced the largest growth in this century, tripling the size of its wealth from 503 million in 2000 to 1,8 billion in mid-2022. This reflects the growing prosperity of emerging economies, especially China, and the expansion of the middle class in the developing world. The average wealth of this group is 33.573 dollars, or about 40% of the global average wealth level, and total assets are worth 61,9 trillion dollars.

The upper-middle segment, with wealth ranging from 100.000 to 1 million dollars, has tripled in size this century, from 208 million to 642 million people. Members of this group currently

own net assets totaling 178,9 trillion, or 39,4% of global wealth, which is more than three times their percentage share of the adult population; the wealthy middle class in developed nations usually belongs to this group.

The next segment is the top tier of high net worth (HNW) individuals, which remains relatively small in size, at 59,4 million, or 1,1% of all adults. The number of millionaires worldwide has grown rapidly in recent years and surpassed 1% of adults for the first time in 2020, although in 2022 the number fell by 3,5 million. In terms of wealth ownership, the HNW group is increasingly dominant. The total wealth of HNWs increased fivefold, from 41,4 trillion dollars in 2000 to 208,3 trillion dollars in 2022, and their share of global wealth increased from 35% to 46% over the same period.

The decline in the number of millionaires occurred predominantly in the United States (by 1,8 million), Japan (–466.000), the United Kingdom (–439.000), Australia (–363.000), Canada (–299.000) and Germany (–253.000). Countries that reported fewer millionaires in 2022 typically reported higher numbers in 2021, and gains in 2021 typically exceeded losses in 2022 (exceptions include Japan, Germany, Italy, where the number of millionaires declined in both 2021 and 2022). Relatively small increases in the number of millionaires were recorded for a few countries in 2022, namely Norway (+104.000), Iran (+104.000) and Brazil (+120.000).

We mention that the vast majority of the 59,4 million millionaires in 2022 are between 1 million and 5 million dollars, or 51,5 million or 87% of the HNW group. Another 5,1 million adults (8,6%) have wealth between 5 million and 10 million dollars, and 2,8 million (4,6%) have wealth over 10 million. Of the latter, 2,5 million have assets in the 10-50 million dollars range, and 243.060 ultra-high net worth (UHNW) individuals have a net worth of more than 50 million dollars at the end of 2022 (down by 22.500 compared to 2021 when there were 265.560 UHNW adults due to falling stock prices). Currently, there are four times as many adults with wealth over 50 million dollars as there were in 2008, and although their number has decreased in 2022, however, from 2020 to 2022, the number of UHNWs has increased by more than 60.000 adults.

In terms of the distribution of UHNWs, there are 79.490 adults with wealth over 100 million dollars at the end of 2022, of which 7.020 have wealth over 500 million dollars. By region, we have North America with 128.470 members (53%), Europe with 40.090 (17%), 32.910 (14%) in mainland China and 27.700 (11%) in Asia-Pacific, excluding China and India. Among individual countries, the United States leads the way with 123.870 members, equivalent to 51% of the world total. Mainland China is second with 32.910 UHNWs, followed by Germany (9.100), India (5.480) and Canada (4.560), Russia (4.490), United Kingdom (3.980), Japan (3.930), France (3.890) and Australia (3.780).

According to the Credit Suisse report, global wealth is expected to grow by 38% in the next five years, reaching 629 trillion dollars by 2027, with low and middle income countries responsible for 56% of the growth, although they account for only 31% of current wealth. The growth of middle-income countries will be the main driver of global trends. Wealth per adult will increase by 30%, to 110.270 dollars in 2027, and the number of millionaires will increase significantly over the next five years to 86 million, while the number of UHNWs will increase to 372.000.

4. Measures to reduce inequalities and encourage taxpayers' compliance

In recent years, the gap between rich and poor has widened significantly, with wealth at the top increasing massively while the total wealth held by those at the bottom is shrinking. Since 2015, the richest 1% have more wealth than the rest of the world combined. Such extreme economic inequality is fueled by tax evasion and avoidance, which have reached considerable levels. While millions of people around the world live in poverty, wealthy individuals and companies, exploiting the secrecy provided by tax havens, continue to avoid their taxes, depriving the poorest countries of being able to provide vital services.

Tax revenue is essential to fund vital public services as education, health and infrastructure, cash transfers (child benefits, state pensions). It was proven that universal and free public services address inequality and poverty; reducing tax havens will ensure that the funds needed for these services can be raised in a more redistributive way, in particular through direct taxation of income, profits, wealth and capital gains, rather than through consumption taxes (VAT).

In order to *reduce inequality*, but also poverty, we believe that *wealth taxation* can be essential to redistribute resources and reduce inequality more fundamentally. According to Oxfam, a *progressive net wealth tax* of 2% on personal wealth over 5 million dollars, rising to 3% on wealth over 50 million dollars and 5% on wealth over 1 billion dollars, could generate 2,52 trillion dollars worldwide, raise enough to help 2,3 billion people living in poverty, provide universal healthcare and social protection to all living in low- and lower-middle-income countries (3, 6 billion people).

Also, to uncover hidden wealth, a *global asset registry* (Icrit, 2019) can be used to reveal the true owners of assets, like properties, shares, companies, trusts and other assets.

Recent years have been marked by a renewal of debates about *progressive wealth taxation*. While progressive wealth taxes have been declining in rich countries, they still exist in various forms in several countries- the Netherlands, Norway, Spain or Switzerland. More recently, some countries have discussed or voted in favor of introducing new wealth taxes (Argentina). In several other countries, there have been discussions of wealth taxes based on detailed proposals (in the USA, Germany, the UK or Chile).

It should be noted that most countries in the world already tax individual wealth through property and inheritance taxes. We recall that total tax revenues represent 30-50% of national income in rich countries, 15-30% in emerging countries and less than 10% in low-income countries. Wealth taxes on individuals – including estate and inheritance taxes – typically generate 2-3% of national income in rich countries, 1% in middle-income countries and 0,5% in low-income countries and emerging states; they represent non-negligible fractions of total tax revenues.

Property taxes, and their equivalent in different countries, for example foncière tax in France, are by far the largest component of total wealth tax revenue: they typically represent 80-100% of total tax revenue on individual wealth. Property taxes are usually in the form of taxes on real estate and land, which have been levied in many countries for centuries.

The best way to *modernize the property tax* would be to expand the base to all forms of wealth, rather than just real estate, and to *shift from flat rates to progressive tax programs*. In effect, this means turning flat property taxes into modern, progressive wealth taxes.

Relatively low wealth tax rates can generate substantial tax revenues, contribute to a better spread of wealth, thereby increasing the wealth-generating potential of billions of citizens who are completely deprived of capital.

Progressive wealth taxes also help limit the growth of extreme wealth inequality and thereby help mitigate the potentially negative impact of extreme wealth concentration, as the growth of monopolies or the risks of political capture by financial interests.

To reduce wealth/income inequalities, authorities need to increase the progressivity of personal income taxation, as well as firmer inheritance/gift taxation and property taxation, and emerging and developing market economies should focus on strengthening fiscal capacity to finance more social spending.

Also, other measures refer to the progressivity of personal income tax and the reduction of tax exemptions for private education, health and pensions; by increasing the "productivity" of income taxes; by raising capital gains tax rates to match income taxes.

Therefore, some tax solutions could refer to:

- more effective income taxation in reducing inequality, by charging higher rates for high-income taxpayers or limiting itemized deductions.
- establishing/extending taxes on inherited wealth, such as property taxes.
- broadening the sales tax base to include more services purchased by wealthy individuals.
- increasing the incomes of low- and moderate-wage working families by adopting state earned income tax credits.
- maintaining a general tax system that generates sufficient revenue to pay for the basics of shared prosperity, such as education and access to healthcare.
- strengthening financial literacy by helping individuals and households navigate the challenges and opportunities of financial markets and by promoting good budgeting, planning and saving practices.

5. Conclusions

In the paper we presented the wealth situation, respectively the assets and liabilities of households in Romania, at European Union and global level. It should be noted that globally, the net wealth of households decreased by 2,4% in 2022, reaching 454,4 trillion dollars, while the wealth per adult decreased by 3,6%, to 84.718 dollars, this being the first decline since the financial crisis of 2008; a significant part of this decline comes from the appreciation of the US dollar compared to various currencies, followed by inflation and rising interest rates; financial assets contributed most to the decline in wealth in 2022, while non-financial assets, particularly real estate, were resilient despite rapidly rising interest rates. If exchange rates had remained the same as in 2021, total wealth would have increased by 3,4% and wealth per adult by 2,2%.

In terms of household assets at EU 27 level, in 2022, both total financial assets and financial liabilities of EU households decreased significantly; if we refer to Romania, it records the lowest values in the EU, both for assets (77,8% GDP) and for liabilities (19,5% GDP). In terms of assets, we are surpassed by Poland (93,1% GDP), Slovakia (94,1% GDP), Latvia (97,3% GDP), Ireland (98,8% GDP). For Passives, countries that outrank us are Latvia (19,9% GDP), Hungary (22,0% GDP), Lithuania (23,7% GDP), Poland ((27,4%), Slovenia (29,2%); in terms of Romania's financial liabilities (% GDP), in 2022 they totaled 19,5% of GDP, with countries in the immediate vicinity in the ranking being Hungary, Latvia, and Lithuania very high debts in the Netherlands (over 96,4% GDP), Denmark or Cyprus (over 85% GDP).

To reduce wealth/income inequalities, authorities need to increase the progressivity of personal income taxation, as well as firmer inheritance/gift taxation and property taxation, and

emerging and developing market economies should focus on strengthening fiscal capacity to finance more social spending.

Also, other measures refer to the progressivity of personal income tax and the reduction of tax exemptions for private education, health and pensions; by increasing the "productivity" of income taxes; by raising capital gains tax rates to match income taxes.

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DIFFERENCES REGARDING COST CALCULATION IN ABSORPTION COSTING METHOD AND VARIABLE COSTING METHOD

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***Abstract:** The cost of the product is the basis for calculating the cost of goods sold, and the net operating income. Given the difference between the accounting treatment of fixed overhead, the variable and absorption-costing methods may lead to different operating income figures. Absorption costing method allocates all manufacturing costs to the product cost that is direct materials, direct labour, and variable and fixed manufacturing overhead. Under this method, fixed overhead is assigned to the product cost and is expensed in the reporting period that the product is sold. Variable costing method takes into account the difference between fixed and variable manufacturing costs. This method assigns only variable manufacturing costs to the cost of the product and fixed overhead is treated as a period expense being excluded from the product cost.*

***Keywords:** product costs, period expenses, net operating income, cost of goods sold, ending inventory.*

***JEL Classification:** M41.*

1. Introduction

Costs are divided into product costs and period expenses.

Product costs consist in all costs incurred in manufacturing a product. These costs include direct materials, direct labour, and manufacturing overhead (fixed and variable).

Period expenses are all costs incurred during a reporting period that have not been capitalized into inventory and include any expenses that are not directly related to the production of the goods sold.

Product costs are only incurred if products are produced, and period expenses are associated with the accounting period in which they occurred. A business that has no production activities during a reporting period incurs no product costs, but only period expenses.

Product costs are initially recorded as an inventory asset. Once the related goods are sold, these capitalized costs are charged to the cost of goods sold and they appear as expenses on the income statement. Thus, the revenue from a product sale matches with the associated cost of goods sold, so that the entire effect of a sale transaction appears within one reporting period's income statement.

2. Differences between absorption costing method and variable costing method

Manufacturing companies may use one of the following methods for determining the cost of inventories for financial accounting purposes: absorption costing or variable costing.

Absorption costing is a method that allocates the following costs to the cost of the product: all direct costs, variable manufacturing overhead and fixed manufacturing overhead. The value of inventory under absorption costing includes direct material, direct labour, and all overhead.

Variable costing is a method that allocates all variable costs to the cost of the product: direct materials, direct labour, and variable overhead. The fixed overhead is expensed in the period incurred.

The difference between the absorption and variable costing methods consists on the treatment of fixed manufacturing overhead costs. Absorption costing includes fixed manufacturing overhead as product costs (Figure no 1).

Figure no 1. Differences between absorption costing and variable costing

Absorption costing		Variable costing	
Product costs	Direct materials (variable)		Product costs
	Direct labour (variable)		
	Variable manufacturing overhead		
	Fixed manufacturing overhead		
Period expenses	Variable selling and administrative expenses		Period expenses
	Fixed selling and administrative expenses		

Absorption costing is in accordance with IFRS, because the product cost includes fixed overhead. According to IAS 2 Inventories, cost of inventories should include all:

- costs of purchase (including taxes, transport, and handling) net of trade discounts received
- costs of conversion (including fixed and variable manufacturing overheads) and
- other costs incurred in bringing the inventories to their present location and condition.

Under the variable costing method, fixed overhead are considered period expenses, regardless the production volume and generally concerning the ability of the company to produce. Thus, they are estimated and tracked globally or in relation to a small number of responsibility centres and they are not included in the cost of the product but are charged against revenue for each period.

The company's management should apply absorption costing method in order to be compliant with IFRS, but would prefer one method over the other for internal decision-making purposes.

The following example emphasises the differences between net operating income under absorption and variable costing, considering the basic format of the income statement: sales revenue less the cost of goods sold equal gross profit, and the gross profit less the selling and administrative expenses equals the net operating income. In order to simplify the calculation, the selling and administrative expenses are neglected in this example.

Assume that Company ABC manufactures 1,000 units of product A. The following costs are incurred:

- direct materials cost is CU 40 per unit,
- direct labour is 80 per unit,
- variable manufacturing overhead is 60 per unit and

- fixed manufacturing overhead is 200,000.

The cost of finished goods inventory is not the same under absorption and variable cost methods because of the different accounting treatment concerning the fixed manufacturing overheads (Table no 1).

Under the absorption costing method, fixed overhead is capitalized as part of the cost of inventories. Under variable cost method, fixed overheads are expensed related to the period they occurred.

Table no. 1. Cost of finished goods inventory using absorption costing method and variable costing method

	Absorption Costing	Variable Costing
Direct Materials (1,000 units x CU 40 per unit)	40,000	40,000
Direct Labour (1,000 units x CU 80 per unit)	80,000	80,000
Variable Manufacturing Overhead (1,000 units x CU 60 per unit)	60,000	60,000
Fixed Manufacturing Overhead	20,000	0
Product Cost	200,000	180,000
Product Cost per unit	200	180

Assuming that all the products are sold for CU 350 per unit, the net operating income for both the absorption and variable costing methods is the same (Table no 2).

Table no. 2. Net operating income using absorption and variable costing methods in case of selling the entire inventory

	Absorption Costing	Variable Costing
Sales Revenue (1,000 units x CU 350 per unit)	350,000	350,000
(-) Cost of Goods Sold	200,000	180,000
(=) Gross Profit	150,000	170,000
(-) Fixed Manufacturing Overhead	0	20,000
(=) Net Operating Income	150,000	150,000

We conclude that when the entire inventory is sold, the total fixed cost is expensed as the cost of goods sold under the absorption method or it is expensed as a period cost under the variable method; net operating income is the same under both methods.

Assuming that only 700 units are sold, the inventory at year-end is 300 units of product A.

Under the absorption costing, the cost of goods sold should be the amount of cost to produce the 700 sold units (Table no 3). The ending inventory would be the cost for the 300 unsold units (Table no 4). The amount of the fixed manufacturing overhead is not totally expensed, because the number of units in ending inventory has increased. The fixed overhead will be expensed when the inventory is sold in the future period.

The fixed manufacturing overhead is divided as follows:

- the fixed overhead allocated to the 700 sold units is expensed on the income statement as cost of goods sold: $700 \text{ units} \times \text{CU } 20 \text{ per unit} = \text{CU } 14,000$

- the fixed overhead allocated to the 300 unsold units is allocated to finished goods inventory: $300 \text{ units} \times \text{CU } 20 \text{ per unit} = \text{CU } 6,000$.

Under variable costing, the cost of goods sold and the ending inventory do not include fixed overhead because the whole amount of fixed cost is expensed as a period cost and it is not included in the cost of the product A.

Table no. 3. Cost of goods sold using absorption and variable costing methods

	Absorption Costing	Variable Costing
Direct materials (700 units x CU 40 per unit)	28,000	28,000
Direct labour (700 units x CU 80 per unit)	56,000	56,000
Variable Manufacturing overhead (700 units x CU 60 per unit)	42,000	42,000
Fixed Manufacturing Overhead	14,000	0
Cost of Goods Sold	140,000	126,000

Table no. 4. Ending inventory using absorption and variable costing methods

	Absorption Costing	Variable Costing
Direct materials (300 units x CU 40 per unit)	12,000	12,000
Direct labour (300 units x CU 80 per unit)	24,000	24,000
Variable Manufacturing overhead (300 units x CU 60 per unit)	18,000	18,000
Fixed Manufacturing Overhead	6,000	0
Ending Inventory	60,000	54,000

Under the absorption method, when the inventory is not entirely sold, the amount of fixed cost is partially expensed as the cost of goods sold, respectively CU 14,000, which is only the part of fixed cost that is allocated to the goods sold during the reporting period.

Under the variable costing method the whole amount of fixed cost is expensed as a period cost, respectively CU 20,000.

Net operating income is not the same under absorption and variable costing, the difference is the amount of fixed cost included in ending inventory, respectively CU 6,000 (Table no 5). This cost will be expensed when the inventory is sold.

Table no. 5. Net operating income using absorption and variable costing methods in case of partial selling the inventory

	Absorption Costing	Variable Costing
Sales Revenue (700 units x CU 350 per unit)	245,000	245,000
(-) Cost of Goods Sold	140,000	126,000
(=) Gross Profit	105,000	119,000
(-) Fixed Manufacturing Overhead	0	20,000
(=) Net Operating Income	105,000	99,000

Income statements from both methods can be reconciled by starting with the net operating income using variable costing and adding the amount of fixed costs included in ending inventory.

As it can be seen in the tables above, the net operating income and the ending inventory under absorption costing method are higher than the net operating income and the ending inventory under variable costing method (Figure no 2).

Figure no 2. Differences between net operating income and ending inventory when production exceeds sales

Production volume compared to sales volume	Net operating income	Ending inventory
Production = Sales	Same amount	Same amount
Production > Sales	Higher under absorption costing	Higher under absorption costing

3. Conclusions

Using absorption costing has some advantages. A major one refers to the necessity of including fixed overhead in inventory cost for compliance with financial accounting regulations. The cost accounting method using absorption costing produces ending inventories which include fixed manufacturing overhead. Based on this argument, income statement prepared using absorption costing presents a true and faithful representation of the actual operating results of the company. Also, we note that analysis of under/over-absorbed overhead is useful to identify inefficient utilisation of production resources.

Using absorption costing method may not be appropriate for short-term decision making. When production exceeds sales, absorption costing reports a higher net income than variable costing. The reason is that some fixed manufacturing costs are not expensed in the current period but are deferred to future periods as part as inventory cost. In order to increase net operating income in short term, management may decide to overproduce in a certain period. Although net income will increase, this decision to overproduce may not be in the company's best interest. Increasing inventories on long term may lead to additional costs to the company. Variable costing avoids this situation because net income under variable costing is unaffected by changes in production levels.

On the other hand, preparing the income statement using variable costing is considered more informative to management. For example, it provides necessary information for Cost-Volume-Profit analysis. Also, the net operating income is usually close to the flow of cash, being useful for companies with problems of cash flows.

The methods based on absorption costing may lose their relevance due to various causes: the rapid evolution of the production environment and techniques, the high cost and the longer duration of collecting and processing accounting information.

Taking into account the criterion of cost variability allows performing more operational and more predictable analysis.

Variable costing method is not opposed to absorption costing method. It responds to different but not contradictory concerns and should be considered as a complementary tool of analysis. The economic calculation that appeals to the notion of partial cost allows implementing a differentiated pricing policy, allowing the integration of those companies that think the problems in terms of marketing.

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EVOLUTIONS AND EXPLANATIONS ABOUT POST-PANDEMIC INFLATION

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Abstract: *The paper aims to (1) review the latest points of view regarding the causes of post-pandemic inflation, (2) analyze the evolution of inflation in some countries and (3) follow the main monetary policy measures taken by the authorities in the field in some states. Concretely, in the last two decades, the money supply link has been secondary or even totally neglected. However, in the last year, a series of theories and models have returned that link the evolutions in terms of inflation to the excess of monetary emission from the pandemic years. The increase in inflation was not quickly accompanied by anti-inflationary measures, the monetary authorities acting late, for fear of continuing the recession or that it would return in countries where economic growth had resumed. The mentioned situations are exemplified with the presentation of developments and analyzes from the Euro Zone, from the United States of America and from some Eastern European states, including Romania.*

Keywords: *inflation, causes, money, aggregate supply.*

JEL Classification: *E31.*

1. Introduction

The economic downturn and subsequent recession following the onset of the Covid-19 pandemic has led to few inflation concerns. The easing of restrictions by mid-2020 and the resumption of some activities in 2021 amid public vaccination campaigns did not change the inflation expectations of governments and particularly monetary authorities, either. It was thought that the sharp fall in labor force participation in the economic process and rising unemployment would cushion the fall in supply, upward pressures on wages and, in principle, price increases.

However, starting in late 2020, but much more visibly in the first part of 2021, inflation was returning, becoming a global phenomenon.

This is because global demand has rapidly rebounded and changed its demand structure, in the sense that as people spend more time at home to avoid the pandemic, they have reduced their demand for services but increased their demand for goods. This increase in demand further exacerbated the pressure on global trade, and as it came against the backdrop of disruptions in pre-pandemic supply chains, it caused bottlenecks as companies were unable to respond quickly to changing demand patterns.

But what were the causes of post-war inflation? In a previous paper (Gust, 2024) I presented at length the views of the monetary authorities, those whose main task/mission by law is to maintain price stability, i.e. low inflation (e.g. in the European Union, a price increase of 2% maximum). In the official views of the monetary authorities, among the causes of inflation are considered to be the effects of the energy crisis, disruptions in supply chains, the effects of the Russian-Ukrainian war, etc. The amount of money put into circulation by central banks is not mentioned in any of the official views. It should be noted that this cause is not mentioned even in the studies analyzing the implementation of inflation targeting policies. So, we should ask ourselves why, if official money, created by the central bank, plays no role in inflation, national legislations have given the monetary authorities the task of maintaining price stability. If post-pandemic inflation is due to commodity prices, caused by bottlenecks in supply chains, strong demand, high wage growth in some sectors, energy crisis, the impact

of the war in Ukraine, then monetary authorities/central banks have no role in price stability, and price increases are a matter of the governance of countries or geopolitical situations.

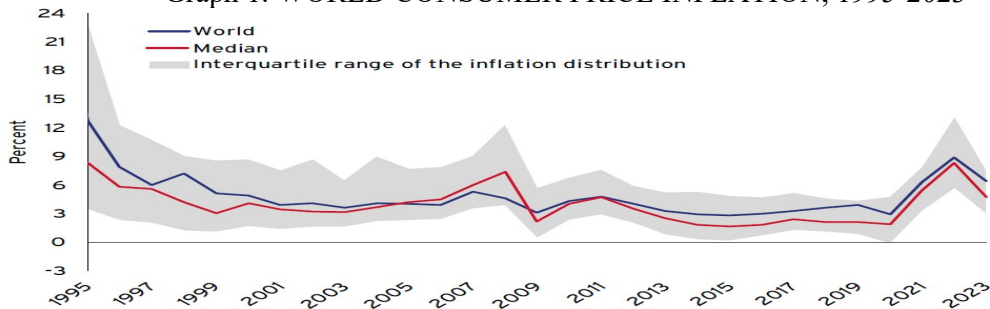
I have analyzed several papers from the period 2022, 2023, 2024 (so, recent) that deal with post-pandemic inflation and I can say that there are two broad categories of opinions. One that goes along with monetary authorities and does not see any link between post-pandemic inflation and money, and another which proposes to take into account the evolution of monetary aggregates in the estimates of inflation developments, even if money is not seen as the source of inflation (although some consider that a causal link between money and inflation is functional). In particular, with regard to the inflation forecast for 2020-2021, the monetary authorities have proved incorrect, sending the wrong signals to the markets.

2. Recent views on post-pandemic inflation

A. Traditional views

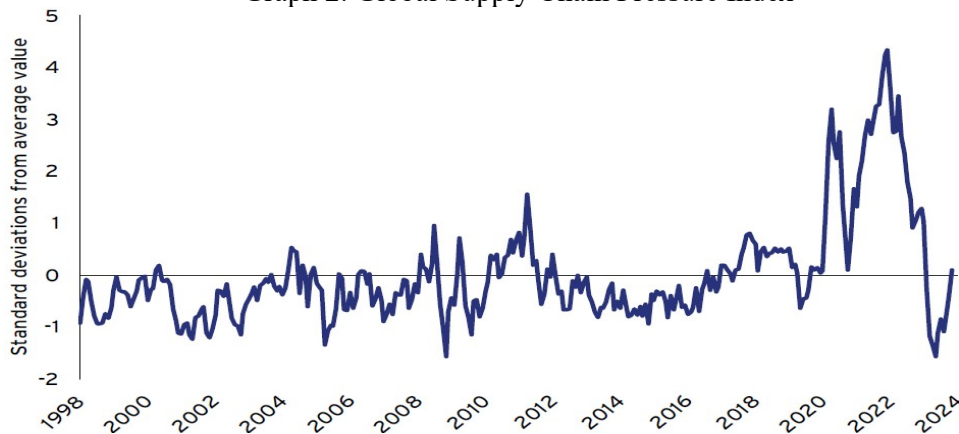
Towards the end of 2021, commodity prices started to rise rapidly as European natural gas prices were driven up as Russian supplies were reduced. And in early 2022, the Russian invasion of Ukraine and the start of the war pushed commodity prices to near historical unprecedented heights, caused in turn by sharp increases in the prices of oil, natural gas, electricity and most food (English, Forbes and Ubide, 2024)

Graph 1. WORLD CONSUMER PRICE INFLATION, 1995-2023

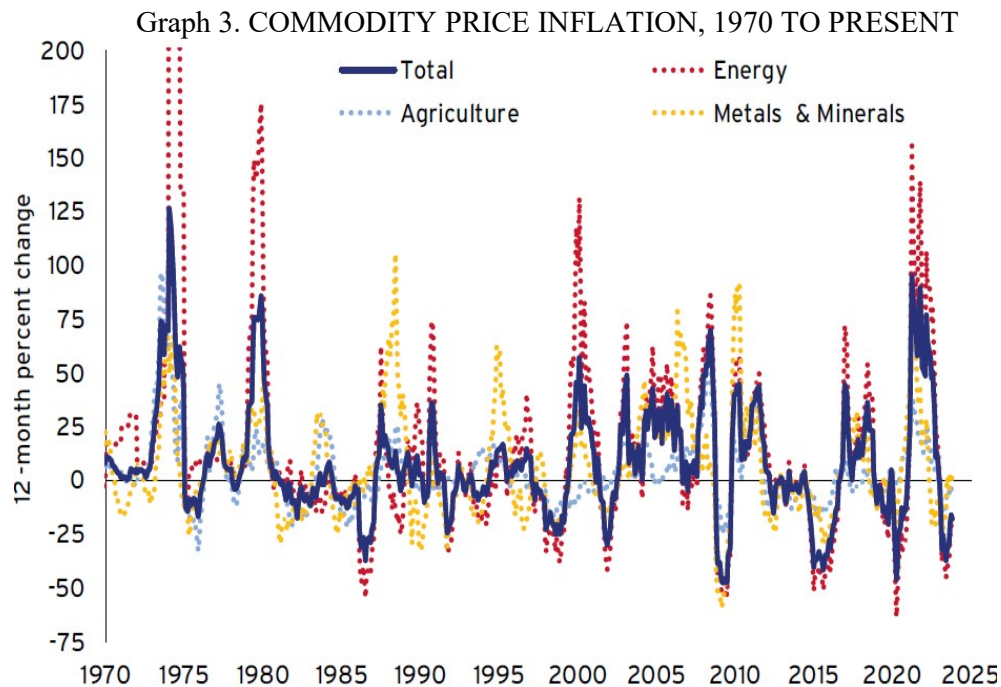


Source: IMF, World Economic Outlook, October 2023 apud English, Forbes and Ubide, 2024.

Graph 2. Global Supply Chain Pressure Index



Source: Federal Reserve Bank of New York, Global Supply Chain Pressure Index, <https://www.newyorkfed.org/research/policy/gscpi>. apud English, Forbes and Ubide, 2024



Source: Data from World Bank apud English, Forbes and Ubide, 2024

English, Forbes and Ubide (2024) also mention that the post-pandemic inflationary shock has also led to significant popular discontent and criticism of central banks in Western economies. But these authors note that the dissatisfaction and criticism would be due not to the causes (which were "beyond the control of these institutions") but to their inaccurate inflation forecasts, misleading the public with their predictions that inflation rates would remain low for a long period of time and delaying anti-inflation policies. The same source cites that public dissatisfaction has prompted either reports critical of central banks or revisions to some of the procedures central banks apply in forecasting monetary policy during periods of uncertainty or even lawsuits.

Another study (Ha, et al., 2023), finds that headline inflation from 2001-22 was caused by oil price and aggregate demand shocks, which accounted for 65% of the variance of inflation, aggregate supply shocks, only 13%, and interest rate shocks in boosting headline inflation ranged from 19% to 22%.

On the same note, another analysis (Visco, 2023), I find that the inflation factors were:

- first, fiscal policies that were expansionary in all states during the acute phase of the pandemic;

- second, household disposable income dynamics (in the US, demand in the services sector was restrained by pandemic-related factors, while in the goods sector there were signs of overheating, as personal consumption expenditure in the durable goods sector was already more than 30 percent above pre-crisis levels, and the rapid recovery in demand led to increased bottlenecks in global value chains, but also to higher prices for intermediate goods. In the euro area, demand for both goods and services remained below pre-crisis trends until the end of 2021);

- thirdly, the labor market (in the US, the annual nominal wage change has exceeded 4% since the third quarter of 2021 and is close to 6% in 2022, in the euro area, around 3%, above the 2% inflation target);

- fourth, the energy shock, which played a very different role on both sides of the Atlantic (oil prices in the second half of 2020 gradually rose in both the United States and the euro area, natural gas prices in the United States rose much more sharply, rising from around 10 USD per megawatt-hour before the pandemic to a peak of over 30 USD in 2022, while in Europe the increase went from just over 10 EUR per megawatt-hour in early 2020 to 180 EUR before the Russian aggression in Ukraine, peaking at 350 EUR in the summer of 2022, and then stabilizing at around 60 EUR in 2023).

Meanwhile, Ignazio Visco, governor of the Bank of Italy for 12 years until 2023, says Milton Friedman's famous statement should be seen as "a causal relationship between money supply and the price level that can be maintained, albeit with variable lags, over horizons that are not necessarily long." "Some say that [...] the persistence of the inflationary consequences of the energy shock could have been found [...] in the abundant liquidity created before and after the pandemic."

The same author also says "monetary tightening in the euro area needs to continue to ensure that a temporary increase in inflation caused by a supply shock does not become a more persistent demand-led phenomenon".

Afrouzi, et al., (2024) analyze how exogenous economic and policy factors generate central bank pressures that can affect long-run inflation and the transitions between them to steady states and argue that enhanced central bank independence or a more credible public debt policy is dependent on, and should offset the global economic pressures that push up average inflation in the long run now if inflation is to remain low and stable in the future. More specifically, they argue that an optimal central bank policy centered on achieving the commitment/target will push inflation towards zero in the long run, independent of economic parameters.

Economic pressures/shocks may result in higher average inflation, but these are more likely to be in the form of occasional bursts of inflation, such as after pandemics, than inflation that continuously overshoots the target. High inflation is also caused by aggregate distortions (monopolies) as well as price distortions in the economy.

As causes of the post-pandemic inflationary shock the study indicates:

- The reversal of globalization (declining international trade as a share of global GDP which stopped growing after peaking at 61% in 2008 and has since fallen to 57% in 2021, foreign direct investment as a share of global GDP, which peaked at 5.3% in 2007, has since fallen to 2.2% in 2021, international flows that have become more fragmented - exemplified by Brexit in 2016, the start of the US-China trade war in 2018, the rise in the number of international trade restrictions, the expansion of security-related screening mechanisms for foreign direct investment, and generally the application of protectionist trade policies around the world after the 2007 global financial crisis and accelerated after the 2020 pandemic (what I call the transition from "hyperglobalization" before the global financial crisis to "slowbalization", which occurred largely due to the political backlash against free trade) and the rise of international geopolitical tensions (exemplified by trade and capital flows that have segmented along geopolitical lines, following the invasion of Ukraine by Russia in 2022 and which became particularly costly for Europe, the Israel-Gaza war in 2023, and the widening conflict in the region, which led to attacks on merchant ships in the Red Sea. All this has led

to new disruptions in global trade, less global competition and a monopoly of powerful firms and pressure on the central bank to create inflation;

- increasing fiscal pressures (higher government debt in the 2020s than in the 2010s for all groups of countries, excess debts made in the pandemic era as a result of high government spending combined with high interest rates, rising primary budget deficits, fiscal pressures for advanced economies from accelerated population ageing and the resulting expansion of social spending, etc., and all these increased fiscal pressures result in a stimulus to monetary growth, with the central bank using inflation to devalue debt and stimulate the economy to reduce the real interest rate and the cost of issuing new securities;

- higher long-term real interest rates, which result in higher nominal interest rates (keeping expected inflation constant), but higher inflation and price dispersion.

B. Views that list the quantity of currency in circulation among the causes

McCallum and Nelson (2009) find that economic theory and economic and monetary policies over the last two decades have greatly reduced the role of monetary aggregates/money supply. Today, most monetary authorities/central banks' policies are mainly aimed at so-called "inflation targeting", which mainly involves the use of period-to-period adjustments of a short-term interest rate, rather than the pursuit of any monetary aggregate. In addition, the model of the behavior of the economy is to be written by monetary authorities/central banks in a way that does not include any reference to any monetary aggregate, although the economy uses a medium of exchange. Thus, explanatory models of inflation behavior, describing movements in aggregate demand and the policy interest rate, ignore the relationship between money and inflation.

Old monetary theories focus on the idea that there will be a long-run relationship between price increases, on the one hand, and exogenous increases in the money stock, on the other (McCallum and Nelson, 2009). Problems with the measurement of money in the economy has led to the abandonment of analyzing monetary aggregates and taking them into account in "inflation targeting" policies.

Studies, in recent high-inflation years, have focused on the idea that money played a minor, auxiliary role because the increase in inflation was purely exogenous, and the expansion of inflation to most goods and services merely reflected the pass-through of the increase in input costs to final consumer prices that would have happened with or without the increase in money (Schnabel, 2023).

Isabel Schnabel, a member of the European Central Bank's Executive Board, believes that the analysis of the post-pandemic inflationary wave misses the question of why the transmission of supply-side shocks to final consumer prices has been so strong. Prices are always the sum of costs and profit margins, and in the past, margins have often been a key damper on price increases. In a recession, unit labor costs typically rise because output falls faster than employment, and because reduced demand limits the scope for price increases, unit profits will normally fall. *"But in recent years, unit profits have also risen strongly, despite large increases in firms' input costs. Such results are atypical for purely exogenous cost-push shocks."* In contrast, they [the authors of the explanatory analysis of the post-pandemic inflationary wave] suggest that *"inflation was the result of endogenous supply and demand interactions, with consumers both willing and able to absorb significant price increases."*

Trying to answer the question of whether money growth has played any role in this post-pandemic inflationary wave, she argues with the evolution of real household disposable

income. *"After the sovereign debt crisis, it took more than four years for real disposable income to return to pre-crisis levels [...]. At the height of the pandemic, it took just three months. And today [2023], real disposable income is higher than a year ago."*

The author believes that these developments are largely

"the result of significant money creation fueled by the fiscal response to the crisis. Public transfers compensated households for the loss of income during the pandemic bottlenecks, and later for the loss of purchasing power due to the energy shock. And by stabilizing aggregate demand, these transfers paved the way for nominal wage growth and employment growth, which increasingly drove income growth. The money that was created was used in different ways by households. Some of it has been used to finance the surge in nominal consumption expenditure, which has allowed households to maintain their real consumption close to the level observed before the pandemic."

The author concludes that the increase in money would have been the element that produced and maintained inflation, demand would have been more resilient than in a typical recession, households would have been less sensitive to price increases, thus facilitating the pass-through of costs to final consumer prices.

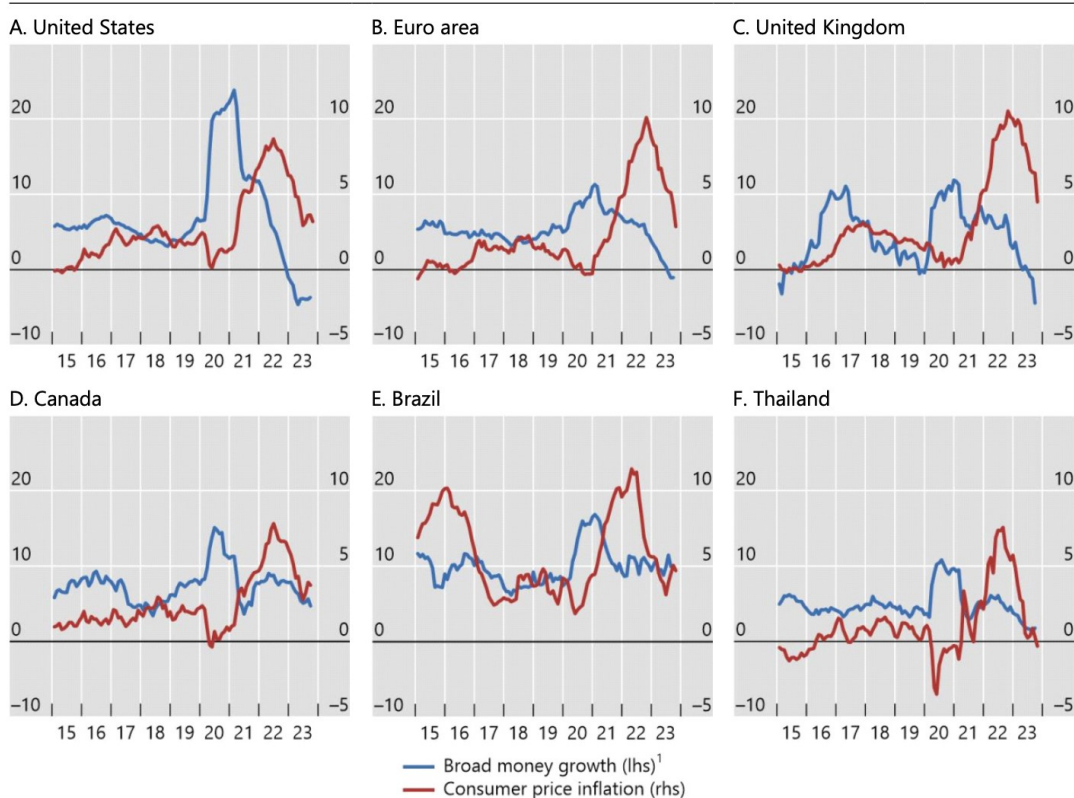
The author also notes,

"The bottlenecks meant that a significant share of the money created was saved, boosting household balance sheets, with households accumulating excess savings (exemplified by the approximately €860 billion, or about 10.6% of disposable income per year, at the Eurozone level). Some of these savings were held in liquid assets. In 2020 alone, households' overnight bank deposits increased by €570 billion. However, over time, most of the excess savings were invested in stocks and bonds or used to repay outstanding loans. As a result, households accumulated more wealth and also made significant gains as asset prices, especially house prices, rose considerably during the pandemic. So overall, households emerged essentially unscathed from three years of crisis."

And that, additionally *"the resilience of household incomes and balance sheets, in turn, is likely to have contributed to the significant demand for credit from firms, which further fueled broad money growth and sustained aggregate demand."* The author's argument in explaining money-based inflation is supported by three elements:

- first, a decomposition of inflation into supply and demand factors, which suggests that demand has played a significant role in generating price increases;
- second, the share of price changes between goods and services that can be explained by a common factor is about twice as large as before the pandemic;
- third, the velocity of money gradually recovered after the pandemic. This is a sign that spending has not been held back by higher prices, helping firms to pass through higher input costs.

Graph 4. Corelații inflație – creșterea masei monetare în unele țări occidentale



Source: Borio, Hofmann and Zakrajšek (2024)

Berger, Karlsson and Österholm (2023) note that the dynamic relationship between money growth and inflation "weakened" after the 1980s and then returns after 2020. The same authors note that there is evidence that this time variation may be related to the pace of inflation (inflation growth) and that this confirms previous findings, which reported that the link between money growth and inflation is stronger among high-inflation countries.

Borio, Hofmann and Zakrajšek (2024) examine the link between money growth and inflation and find that the strength of the link depends on the size of inflation. That is, it is "one-to-one" when inflation is high and is nonexistent when inflation is low.

Figure 4 illustrates the co-movement of money growth and inflation for a number of countries. The statistical observations in the previous charts show that in all cases there was a surge in money growth during 2020, and it was followed by a "burst" of inflation in 2021-2022. After money issuance slowed down significantly from 2021 onwards, the process was followed by a fall in inflation from mid-2022.

Using annual data from 1951 to 2021, Claudio Borio, Boris Hofmann, Egon Zakrajšek show that in the long run there is a direct relationship between inflation and "excess money growth" (the difference between money growth and real GDP growth) in a large sample of advanced and emerging market economies. Also, if we split the observations by high inflation regime countries and low inflation regime countries using 10-year periods, we see that this relationship only exists when the inflation threshold moves out of the low inflation regime

region and, moreover, as expected, the difference shrinks considerably as the inflation threshold rises further.

In other words, money growth is closely linked to common inflation, to "true inflation", i.e. a generalized increase in prices. Conversely when inflation is low, the importance of money in explaining price changes tends to be low.

However, Borio, Hofmann and Zakrajšek (2023) say that the prior relation is not about causality, only that the link helps in forecasting inflation and ask whether the neglect of monetary aggregates has gone too far?

Dinu and Adina Țiței (2022) find that Romania has seen a significant increase in overall money as a percentage of GDP, implying that the money supply has grown faster than value added, with the highest values of the indicator recorded for 2020 and 2021, and their study showed that inflation is both cause and effect, and that the inflation rate is positively correlated with the inflation rate in the previous year and broad money as a percentage of GDP in the previous year, but also that the variable broad money as a percentage of GDP is positively correlated with the inflation rate in year t-1, the inflation rate in year t-2, broad money as a percentage of GDP in year t-1 and broad money as a percentage of GDP in year t-2. The authors also note that inflation is 60% explained by inflation in previous years and by money that the economy was fed in previous years.

3. In case of Romania

In Romania, the monetary authorities consider that post-pandemic inflation originates from domestic structural imbalances, labor market imbalances, energy prices and other imported goods, etc. Also, in line with the axioms of inflation targeting theory, the various monetary aggregates, which measure currency in circulation, are not taken into account in the analysis of inflation.

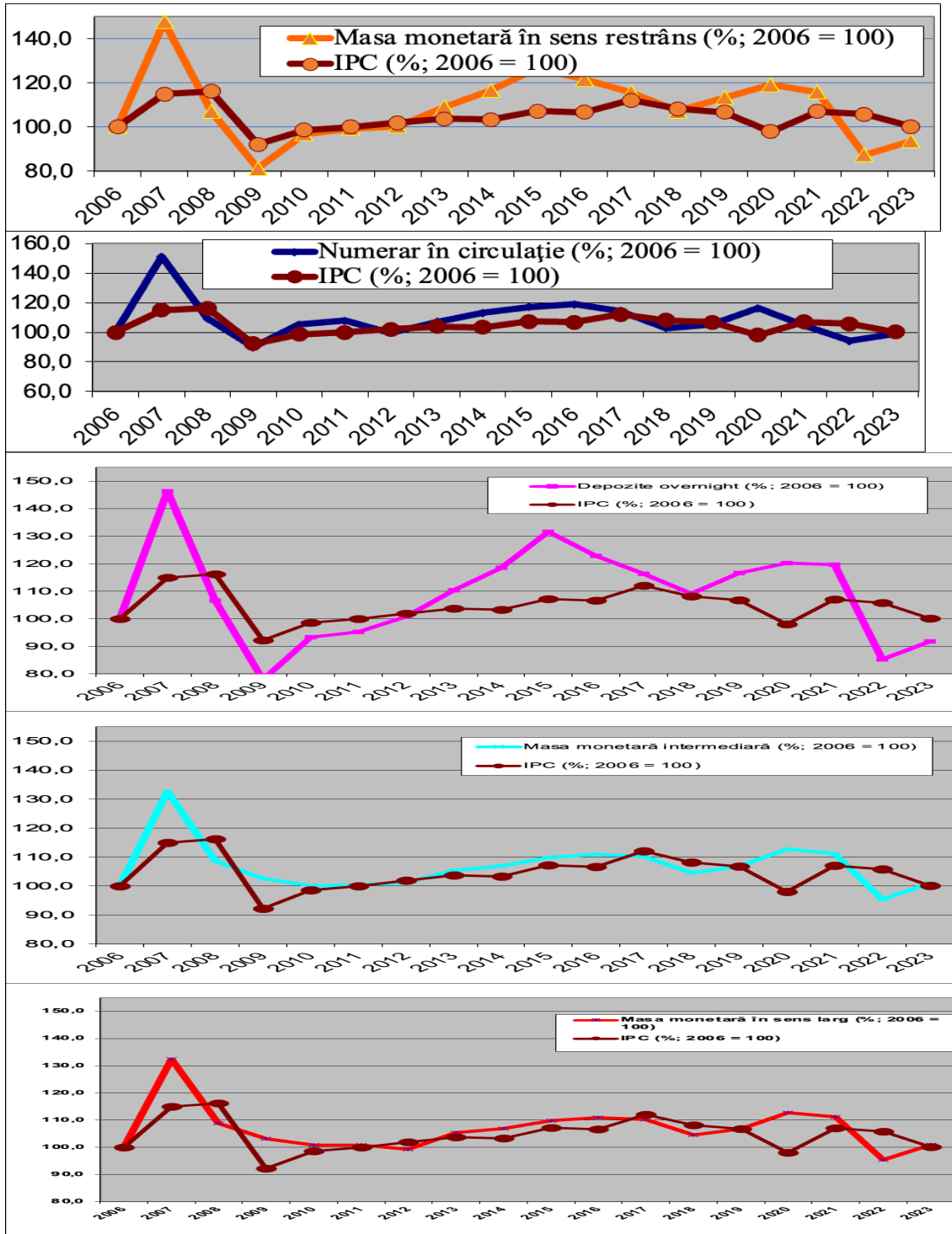
However, the link between the dynamics of inflation and the different expressions of the money supply (expressed in real terms) points to a major connection. Interestingly, the correlation is valid for most monetary aggregates and not only for the post-pandemic period, as it appears in the United States, the Euro Area, etc., but also for the previous period.

Thus, if we exclude 2020 because of the lockdown during the pandemic period, when inflation is very low and the money supply is very high, any increase in money in circulation is reflected in price increases.

Also, there is a somewhat contradictory evolution between inflation and money supply between 2013 and 2017, with prices having lower dynamics than money in circulation in the first three years, only to reverse the trend amid a deflationary episode of a fiscal nature, followed by an inflationary wave that absorbs the additional money.

In addition, we can also observe a lag of about one year in the changes in inflation relative to changes in the money supply.

Graph 5. Correlations between inflation and money supply growth in Romania



Source: author's calculations

4. Conclusions

The collapse of the economy and the ensuing recession after the onset of the Covid-19 pandemic has led to few inflation concerns. The easing of restrictions by mid-2020 and the resumption of some activities in 2021 amid public vaccination campaigns did not change the inflation expectations of governments and particularly monetary authorities, either. It was thought that the sharp fall in labor force participation in the economic process and rising unemployment would cushion the fall in supply, upward pressures on wages and, in principle, price increases. However, starting in late 2020, but much more visibly in the first part of 2021, inflation was returning and becoming a global phenomenon.

Two broad categories of opinion emerge from the recent papers reviewed, which deal with post-pandemic inflation. One that goes along with monetary authorities and sees no link between post-pandemic inflation and money, and another which proposes to take into account the evolution of monetary aggregates in the estimates of inflation trends, even if they do not see money as the source of inflation (although some consider that a causal link between money and inflation is functional). In particular, with regard to the inflation forecast for 2020-2021, the monetary authorities have proved incorrect, sending the wrong signals to the markets.

In Romania, the combination of the inflation dynamics with the different money supply expressions (expressed in real terms) indicates a major link. Interestingly, the correlation is valid for most monetary aggregates and not only for the post-pandemic period, as it occurs in the United States, the Euro Area, etc., but also for the period before, except for 2020 when, due to the lockdown during the pandemic period, inflation falls and money supply increases.

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ASPECTS OF EXTERNAL MIGRATION USING ECONOMETRIC METHODS

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***Abstract:** The phenomenon of external migration represents a major problem Romania is facing, with negative effects on the labor market, economic growth and families. The factors underlying this phenomenon are economic, social and cultural. The present work aims to analyze through econometric methods if the decision to leave the country is taken according to gender and macroregion. The chi-square test was used in data analysis and interpretation.*

***Keywords:** migration, labor market, econometrics, chi-square test.*

***JEL Classification:** C02, E20, O15.*

1. Introduction

The paper aims to analyze the relationship between external migration and the macroregions from which people who choose to emigrate come. The data used in our approach are official data made available to those interested by the National Institute of Statistics through its own website. Thus, in this paper, we used the permanent emigrants from Romania in 2022, by gender and macroregion of origin.

Permanent emigrants or emigrants with a change of residence are persons of Romanian citizenship who emigrate abroad, giving up their residence in Romania and establishing their residence on the territory of another state (Institutul Național de Statistică, 2024a). Further, to make this paper easier to read, we will use the notion of emigrant to designate permanent emigrants or emigrants with a change of residence.

Our approach targeted migration, because Romania is no stranger to this phenomenon, especially after 1989, and in specialized literature this phenomenon has been and still is intensely debated. Population migration is not accidental, but is influenced by social, political, and economic transformations in different regions of the country, says Bălănescu (2011, p.108).

Mîndrican and Matei (2023, p.190) consider that migration has become a social phenomenon over the years. In the work written by the two authors mentioned above, appears the information according to which the main reasons that influence individuals in making this decision are age, marital status, level of qualification from a professional point of view, background, professional perspectives, etc. We have completed these factors that influence the decision to migrate with those that target gender and macroregion of origin.

Table 1. Emigrants - contingency table corresponding to 2022

		GENDER		
		MALE	FEMALE	TOTAL
Macroregions (observed values)	MACROREGION ONE	4121	4601	8722
	MACROREGION TWO	9494	10128	19622
	MACROREGION THREE	5810	6206	12016
	MACROREGION FOUR	3770	4308	8078
	TOTAL	23195	25243	48438

Source: Created by the authors based on data provided by the National Institute of Statistics, <http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table>, Accessed on: 27.03.2024

In 2022, out of the 48438 emigrants, 25243 were female and 23195 were male. Data presented in Table no. 1 shows that most emigrants come from macroregion two. The structure of this indicator by gender demonstrates that for both genders, most emigrants are also from macroregion two. Macroregion two is made up of the northeast region and the southeast region, two of the less developed regions of Romania.

Of the total of 48438 emigrants in 2022, 8412 emigrants chose Italy as their destination country, 7642 emigrants Germany and 7356 emigrants Spain. These countries are in the top three positions in the ranking of the number of emigrants by destination country. Comparing the values recorded for these three countries to the total number of emigrants, we have the following percentages: Italy – 17.36%, Germany – 15.77% and Spain – 15.18%.

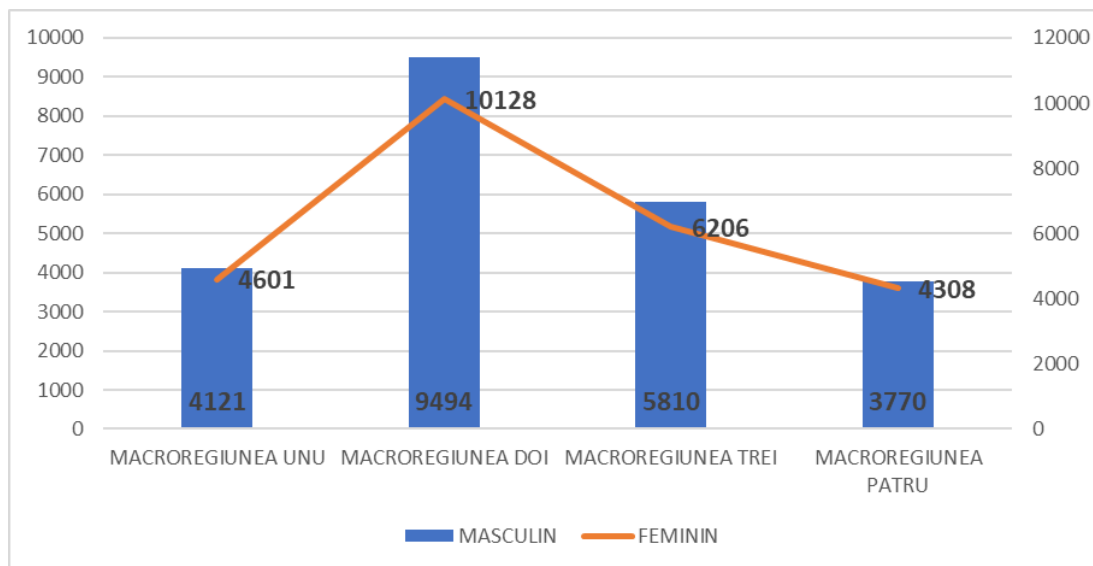


Figure 1. Graphical representation of the values from the contingency table corresponding to the year 2022

Source: Created by the authors based on the data from Table no. 1

In 2022, in terms of male emigrants, the lowest number was recorded in macroregion four (3770) and the highest number in macroregion two (9494). The same situation is found for female emigrants, where the same two macroregions are in first and last place.

Table 2. Structure of emigrants by gender at macroregion level in 2022

		GENDER (%)		
		MALE	FEMALE	TOTAL
Macroregions (observed values)	MACROREGION ONE	47.25	52.75	100
	MACROREGION TWO	48.38	51.62	100
	MACROREGION THREE	48.35	51.65	100
	MACROREGION FOUR	46.67	53.33	100

Source: Created by the authors based on the data from Table no. 1

In Table no. 2, was calculated the structure of emigrants by gender at the macroregion level in 2022. This table allows us to observe which gender has more emigrants from a relative point of view. Thus, at the level of the year analyzed in this paper, it is observed that in percentage terms, females are the ones who emigrate at the level of all development macroregions. The highest percentages are found in macroregion four (53.33%) and macroregion one (52.75%). In the other two macroregions, the percentage of females who emigrated is approximately close (51.62% and 51.65%) (Institutul Național de Statistică, 2024b).

In order to understand the migration phenomenon in the current period, it is necessary to know the following statement by Ari (2023, p.138) “migration is an essential component of human civilization's development, and it is strongly linked to evident disparities in the developmental processes of various locations”.

2. Determining the association of qualitative variables

In this paper, we want to observe whether there is a link between external migration and the macroregions from which people who choose to migrate come. To achieve this, we consider a complete set of data on the distribution of people in gender categories (male / female) and membership in development macroregions (one / two / three / four).

Considered as a way to assess the link between two categorical variables (variables that can be divided into discrete categories), the chi-square test (χ^2) determines whether the difference between the observed data and the expected data is due to chance or if there is a relationship between the variables studied.

Using the Chi-square test, we test whether the decision to leave the country is made according to gender and macroregion, by detailing five steps.

Step 1: Define the following hypotheses (Teselios, Albici and Antonescu, 2013):

H0: There are no significant differences between the observed and expected values, in other words, there is no association between the variables analyzed.

H1: There are significant differences between the observed and expected values, in other words, there is an association between the variables analyzed.

In the case of the present study, we formulate the following hypotheses:

Null hypothesis H0: The decision to leave the country is independent of gender and belonging to one of the macroregions.

Hypothesis H1: There is an association between the variables.

Step 2: We calculate the expected values using the formula:

$$Expected_value_{ij} = \frac{Total_line_i \cdot Total_column_j}{Grand_total} \quad (1)$$

The organization of the expected values obtained according to formula (1) is presented in Table 3.

Table 3. Table of expected values corresponding to 2022

		GENDER	
		MALE	FEMALE
Macroregions (observed values)	MACROREGION ONE	4176.61	4545.38
	MACROREGION TWO	9396.18	10225.82
	MACROREGION THREE	5753.97	6262.02
	MACROREGION FOUR	3868.22	4209.77

Source: Created by the authors based on the data from Table no. 1

Step 3: We calculate the number of degrees of freedom as equal to the number of columns in the table minus one multiplied by the number of rows in the table minus one. In the case of our study there were 4 rows and 2 columns.

Therefore, the number of degrees of freedom $\nu = 3$ (2)

We choose the significance level (i.e. the probability of rejecting the null hypothesis) as 0.05.

Step 4: The theoretical value for the 0.05 significance level and 3 degrees of freedom is:

$$\chi^2_{0,05;3} = 7,81$$

Step 5: To calculate the chi-square value, we must first calculate the ratio of the square of the difference between the observed values and the expected values.

The results of these calculations are presented in Table 4.

Table 4. Ratio between the square of difference among observed and expected values

		GENDER	
		MALE	FEMALE
Macroregions (observed values)	MACROREGION ONE	0.74	0.68
	MACROREGION TWO	1.02	0.94
	MACROREGION THREE	0.55	0.50
	MACROREGION FOUR	2.49	2.29

Source: Created by the authors based on the data from Table no. 3

Chi-square is the sum of all values in Table 3, i.e. $\chi^2_{calc} = 9,21$

To determine whether to reject the null hypothesis H_0 , the value obtained for chi-square must be greater than the theoretical value, for the significance threshold of 0.05.

We observe that the empirical value of the random variable $\chi^2_{calc} = 9,21$ is greater than the theoretical value $\chi^2_{0,05;3} = 7,81$, therefore it can be stated that the difference between the expected and observed values is not due to chance.

3. Conclusions

Migration is a socio-demographic phenomenon with implications for the labor market and implicitly for the economy. In the present paper, it was found that 40.51% of Romanian emigrants in 2022 come from macroregion two. This is a significant percentage, considering that the next macroregion records 24.81% (macroregion three), and the other macroregions have percentages of 20% (macroregion one – 18% and macroregion four – 16.68%).

It is found that the differences between the observed and expected values are statistically significant in order to guarantee with a 95% probability that there is a connection between the variables. Therefore, the null hypothesis H_0 is rejected with a 5% probability, in other words, gender and belonging to one of the macroregions determine the decision to leave the country

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IMPACT OF POPULATION STRUCTURE ON GDP IN THE REPUBLIC OF MOLDOVA

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***Abstract:** The article presents the results of the research of the dependence between changes in population structure and economic development in the Republic of Moldova. The use of econometric method allowed to evaluate the quantitative impact of age changes in population on the value of GDP as the main macroeconomic indicator of sustainable economic development. In the process of the research, the multi-factor regression model was elaborated, which allows to assess the relationship between age groups in population and GDP (age structure of population and economic growth). Based on the results obtained, recommendations for improving public socio-economic policies in the Republic of Moldova were developed.*

***Key words:** population by main age groups, GDP, regression model, factors.*

***JEL Classification:** C20, E21, J11, O11.*

1. Introduction

The presented article is devoted to the research of the relationship between economic development and population. (economy and population). Population is the main component of any state. The reproduction of labour force, which is one of the main factors of production, depends on the number of population. The labour force is part of the working age population. Therefore, the dynamics of structural changes in population affects the economic development of the country. It characterizes assessments of labour force supply (prospective assessments of labour force are based on demographic forecast.) The supply of labour force reveals the limitations on the part of labour resources, namely the number of working age population, which form and determine the requirements for the formation (elaboration) of certain policies in this area. Age changes, which determine the structure of the population, affect the number of working age population, increasing or decreasing its number. The dynamics of the working-age population affects the number of labour force, limiting or expanding the possibilities of its supply. The classical interpretation of labour as one of the factors of production determines the possibility of influence of the age dynamics of the population on the production of material goods, provision of services and their consumption. That is, the change in the age structure through the number of labour force on labour market can either limit or expand the possibilities of production.

The Gross Domestic Product (GDP) indicator was chosen as the main macroeconomic indicator characterising the country's economy, which most fully reflects the economic development in the country. Being one of the quantitative indicators of macroeconomics, GDP characterises production capabilities, including in the point of view the use of factors of production. In perspective, GDP determines the possibilities of the economy.

2. Purpose of the research, data, methodology and methods applied

The principal purpose of the research is to determine the qualitative assessment of the impact the changes in the age structure of the population on economic development in the Republic of Moldova. Economic development is assessed through the macroeconomic indicator of Gross Domestic Product (GDP).

Source data. Official statistical data of the National Bureau of Statistics of the Republic of Moldova (number of population and GDP indicators), indicators calculated by the authors were used for the analysis. The number of population is represented by average annual data of population statistics. The research used the number of population with usual residence, which characterises the place where a person lived predominantly during the last 12 months independently of temporary absences (for recreation (leisure), leaves, visits to relatives and friends, business, medical treatment, religious pilgrimages, etc.).

The choice of the research period from 2014 to 2023 is justified by the availability of relevant statistical data for this 10-year period and incompatibility with the previous period. The value indicator of GDP in dynamics is adjusted in comparable data on the basis of recalculation in 2014 prices (in the text GDP in 2014 prices), thus GDP indicators are deflated. All calculations were carried out on the basis of NBS RM data, and the results are presented in given article.

Research Methodology. The research of the relationship between the age groups of the population and GDP has several stages:

1. A priori (preceding). It is a pre-model analysis of the economic essence of the phenomena under research, formation of initial assumptions. The research includes the analysis of indicators of the total number of population, age structure of the population, GDP.

2. Econometric research:

2.1 The statement stage includes the definition of the purpose and objectives.

- One of the main tasks of modelling is to substantiate the selection of independent factors the impact.
- Assessment of the connection between the dependent and independent variables on the basis of paired correlation coefficients (R).

2.2 The specification stage includes the selection of regression model. Selection of the type of functional dependence in the regression equation, i.e. the form of the connection between the variables. Determination of the formula of the models.

2.3 Parameterisation stage. Quality assessment of regression model parameters using *evaluation criteria*:

2.3.1 *Quality indicators of regression coefficients*:

- standard errors of coefficients (Std. Error),
- t-statistics (t Student's criterion);

2.3.2 *Quality indicators of the regression model as a whole*:

- coefficient of determination (R^2),
- Fisher's criterion (F),
- autocorrelation of residuals based on the Durbin-Watson (DW) statistic,

2.4 Verification, identification stage. Assessment of the accuracy of the regression models data on the basis of comparison of real and modelled data:

- Determination of the average error of approximation of the regression equation (\bar{A}).

Methods. The research was carried out on the basis of the use of complex and systemic approaches, methods of quantitative, qualitative and comparative analysis (including based on time and territorial location), economic and mathematical modelling, authors' calculations and others.

3. Result and Discussions

a. Analysis of GDP and population indicators

The analysis of GDP in the Republic of Moldova for the period 2014-2013 showed that despite the optimistic forecasts of the physical volume of GDP for 2022-2023, the Ministry of Economy (for 2022 - 4.5%, 0.3 (February 2022), for 2023 - 2.5%), international organizations - World Bank (for 2022 - 3.9%, Oct. 2022 - 3.2%, for 2023 - 4.4%, Oct. 2023 2.6%, 2.0%), International Monetary Fund (for 2022 - 0.3%, for 2023 - 2%, World Economic Outlook), and expected the GDP for 2023 at the level of 2.5%, the indicator of the physical volume of GDP after 2019 has no stable growth (unstable). That is, the dynamics of the indicator demonstrates practically about the absence of linear dependence ($R^2 = 0.0118$, Fig. 1.) between the values for different years of research. The insignificant value and the “minus” sign in the equation indicate a slow continuous decline in the indicators of the physical volume of GDP.

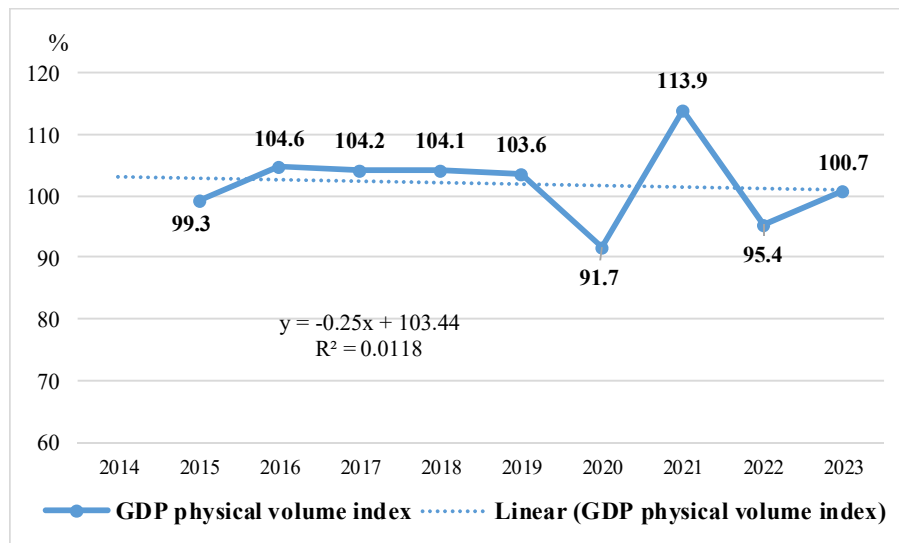


Fig. 1. GDP physical volume index, 2015-2023, %

Source: NBS, www.statistica.md

The analysis of GDP in current prices shows a gradual growth before 2020, and a sharp increase in GDP values over 2020, which correlates with the galloping growth of energy prices and, consequently, the connected subsequent inflation in the country.

Consideration of GDP in 2014 prices shows the real situation with GDP production. The dynamics of the indicator is limited and there is no growth in values. The values of the GDP indicator in 2022-2023 are at the level of 2019, i.e., practically after 2019 there is no GDP growth.

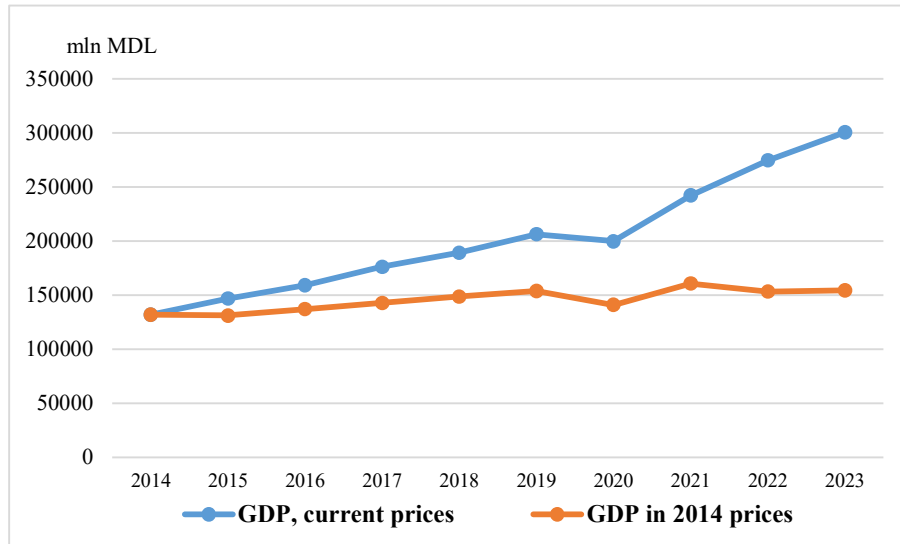
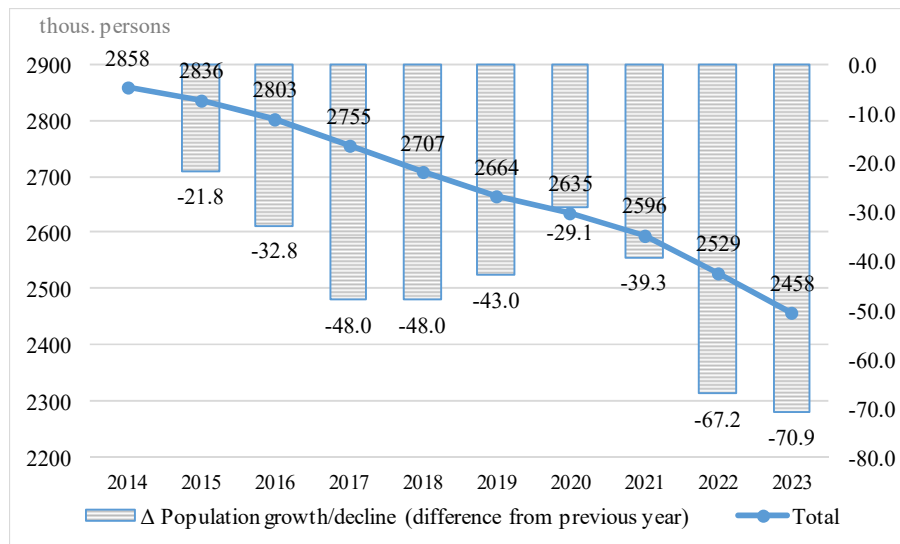


Fig. 2. GDP, RM, 2014-2023, current prices and in 2014 prices, mln MDL

Source: NBS, www.statistica.md, authors' calculations

The analysis of the population of the Republic of Moldova showed that the number of population in the Republic of Moldova decreased annually (for 2014-2023 fluctuations of the indicator of annual population growth/decline per year in the range [-70.9; -21.8]), Fig. 2.



Note: calculation data are rounded automatically

Fig. 3. Population, 2014-2023, thousand persons

Source: authors' calculations based on NBS RM data

There were *two waves* in the total population decline over the period since 2014: from 2014 to 2020 and from 2021 to 2023(further). In 2019, the total population declined by about 10% and in 2020 compared to 2019, the drop was compressed (by 32.3%), i.e. the *first wave* ended by 2020, with the beginning of the COVID - 19 pandemic. One of the consequences of

the pandemic in Moldova was a decrease in population migration (abroad), which caused the end of the first wave. The temporary tightness of the number of migrating citizens reduced the drop in the country's population during the COVID-19 pandemic in 2020-2021, despite the increase in the number of deaths in these years. In 2022 and 2023, the declining trend in the number of births in the country that was observed after 2014 continued, coinciding with an increase in poverty in the country. That is, the subsequent wave of population decline continued from 2021 to 2023.

Fertility and mortality (vital statistics) do not have an essential impact on the change of the total population in the country (Table 1.). Population migration determines today the change in the number of population in the Republic of Moldova. Migration processes in the country cannot be considered in isolation from the national economy, without taking into account changes in the world economy and international distribution of labour. Since the transfer of surplus qualified labour force from one sector to another can be difficult, as narrowly qualified labour force has low mobility (Ryazantsev S.V. et al, 2024, p. 43).

If consider the population in the view of age structure (Table 1.), the total population decline correlates with the population loss of the 20-59 age group compared to the 15-64 age group.

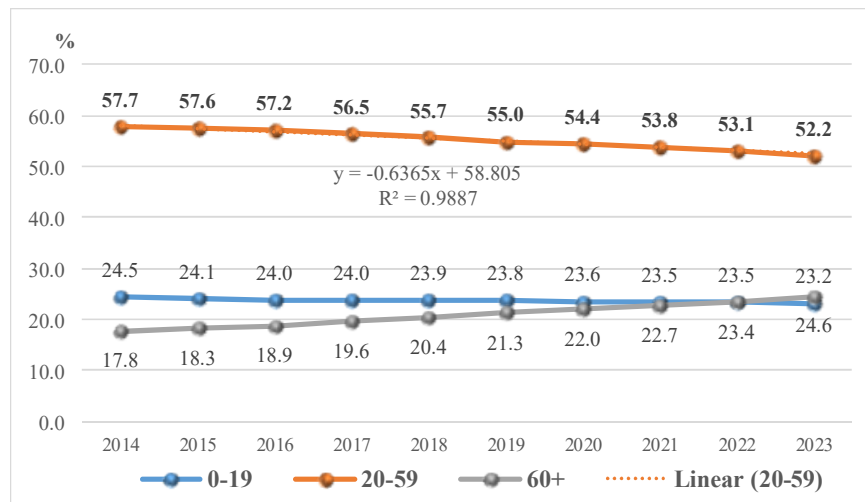
Table 1. Population, 2014-2023, thousand persons

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Population, total										
Population growth/decline, thousand persons		-	-	-	-	-	-	-	-	-
Vital statistics, thousand persons	1.187	0.747	1.228	-0.416	-2.726	-3.988	-9.883	-	-9.178	-9.700
Population migration, thousand persons		-	-	-	-	-	-	-	-	-
15-64										
Population growth/decline, thousand persons		-34.1	-45.2	-57.8	-51.4	-42.7	-29.1	-35.1	-58.0	-62.7
20-59										
Population growth/decline, thousand persons		-16.8	-30.6	-47.3	-48.1	-43.3	-31.7	-35.7	-55.2	-58.7

Note: data of calculations are rounded automatically

Source: authors' calculations based on NBS RM data

The analysis of the population structure showed that the change in the population structure is connected with an annual decrease in the number of the country's population with a usual place of residence. This essentially impacts the change in the age structure of the population. The share of the 0-19 age group is slowly decreasing, while the number of the 60+ age group is rapidly increasing. The share of the 20-59 age group, where the majority of the working age population is found, is decreasing. Thus for the period 2019-2023 the decrease is almost 3 p.p. The negative coefficient of the linear function of change in the values of given age group is increasing.



Note: calculations data are rounded automatically

Fig. 4. Population, age groups, 2014-2023, %

Source: authors' calculations based on NBS RM data.

Analysis the number of the population by age groups showed the dynamics of changes in the ratio of age groups in the composition of the country's population. We can note a significant decrease in the share of the age group of population 20-59 years old with working age population (Fig. 4.). Since the number of working age population inseparably connects to the reproduction of the principal factor of production - labour force, the reduction in the share of working age population will affect to the country's economy, including such an indicator of economic development of the country as GDP.

b. Building and analysing regression models

The above analysis showed that there is a change in the ratio of age groups of the population: the age group 20-59 is slowly declining, while 60+ is increasing, the share of the age group 0-19 is slowly decreasing.

As it was mentioned above, for a quantitative assessment the impact of age changes in the population' composition on the GDP value, it is necessary to use the method of econometric modelling. The main objective of building regression models is to base the choice of influence factors, determine their changes and assess the impact of these changes on GDP.

Gross Domestic Product (GDP) is taken in the quality of the dependent variable (resultant sign) Y_t , and independent, explanatory variables (sign - factors) X_{it} shares of age groups 0-19, 20-59, 60+ of the country's population. The value indicators of GDP adjusted into comparable (in 2014 prices) by the deflation method. The research period was from 2014 to 2023, i.e. the number of observations in the regression models is 10.

The principal characteristics and evaluation criteria of the calculated regression models presented below in the form of formulas, graphical and tabular form (Fig. 5., Table 3.).

Estimation of paired correlation

Correlation coefficients are used for primary analyses of the interrelation between GDP and age groups in the population (stochastic or random variables X and Y). Given

coefficient presents a relative measure of interrelation. The *correlation coefficient* (R_{xy}) is a measure of linearity of interrelation of variables, the degree of closeness to linear dependence. It is important to note, firstly, for any random variables X and Y the correlation coefficient will be $-1 \leq R_{xy} \leq 1$, secondly, if random variables X and Y are independent, that is the *correlation coefficient* can be equal to zero ($R_{xy}=0$), the reverse is incorrect, as at equality 0 of the correlation coefficient random variables X and Y may be dependent (Ibragimov M., p. 4). The meaning of the correlation coefficient is the location of the sampled population on the Cartesian coordinate axis depending on the value of the correlation coefficient itself: at $R_{xy} \approx 0$ the population is located inside the entire ordinate system, at $R_{xy} > 0$ the sample is located in the 1st and 3rd parts of the coordinates and at $R_{xy} < 0$ in the 2nd and 4th parts of the coordinates (Ibragimov M., p. 8). According to the location of the sample can estimate the value of the correlation coefficient (R_{xy}).

To assess pair correlation, Scatter Plot were constructed, which most rightly reflect the intensity of the connection between variables X and Y (Fig. 5.). Let consider graphically the pair correlation between GDP indicators and relative shares of age groups 0-19, 20-59 and 60+ and their corresponding sampled correlation coefficients, respectively. The pair correlation between GDP indicators and relative shares of population age groups is characterised by the corresponding pair correlation coefficients R_{xy} , which are negative values for the age groups 0-19 and 20-59 respectively -0.813 and -0.860 and the “minus” sign means the *inverse nature of the connection*. The positive correlation coefficient between GDP and relative shares of the age group 60+ ($R_{xy} = 0.859$) indicates the *direct nature of the connection*. So pair correlation explains the connection between GDP and age groups 0-19, 20-59 and age group 60+. All values of pair correlation coefficients characterise the connection as high according to the Cheddock scale².

At the same time, it should be noted that there is an inverse connection between indicators of age group 60+ and age groups 0-19 and 20-59 (-0.960 and -0.999 respectively).

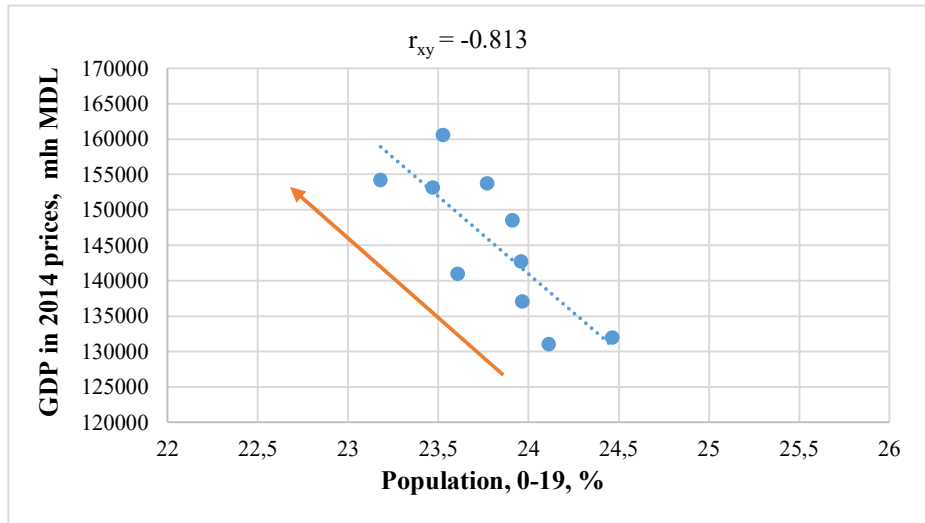
$$R_{xy} = -0.813$$

² Criteria for assessing the tightness of the relationship between independent factors and GDP on the Cheddock scale.

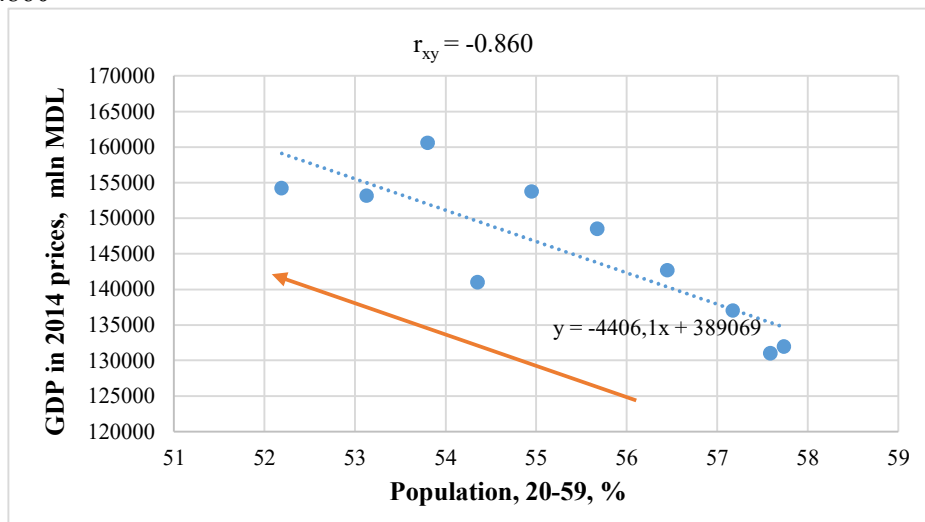
Table. Cheddock scale

Quantitative characteristic of tightness of connection			Qualitative characteristic of tightness of connection
$0,1 <$	r_{xy}	$< 0,3$	Weak
$0,3 <$	r_{xy}	$< 0,5$	Medium
$0,5 <$	r_{xy}	$< 0,7$	Noticeable
$0,7 <$	r_{xy}	$< 0,9$	High
$0,9 <$	r_{xy}	< 1	Very high

Source: Correlation and Regression. <https://math.semestr.ru/corel/primer.php> (accessed 09.08.2024).



$R_{xy} = -0.860$



$R_{xy} = 0.859$

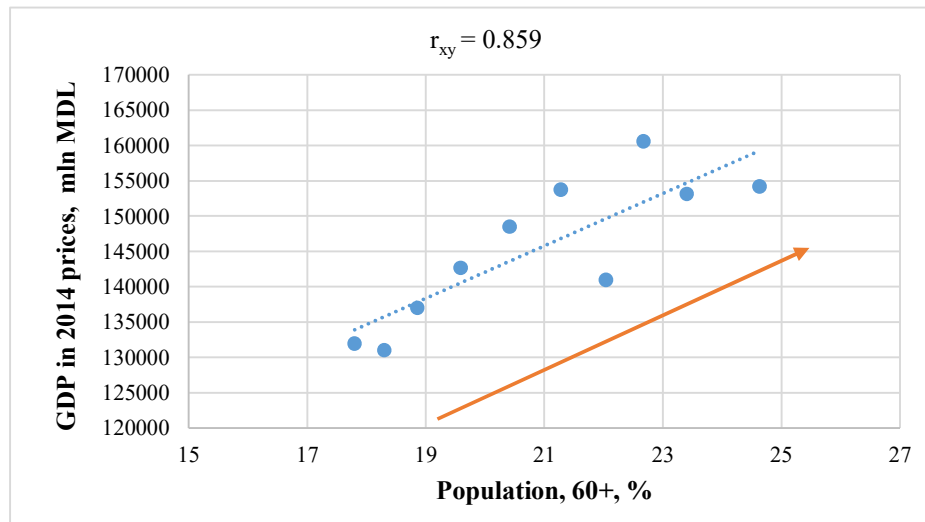


Fig. 5. Scatter diagrams of GDP from the factors of models (pair correlation coefficients)

Source: Authors' calculations

The estimation results should have a sensible economic interpretation and answer the question whether the coefficients showing the directions of influence of these factors are positive or negative and whether the signs of the coefficients correspond to the economic meaning (Ibragimov M., p.12). Considering the economic sense of the *inverse connection* between GDP and relative share of the age group 20-59 years of population ($R_{xy} = -0.860$, $R_{xy} < 0$), can note the following: the reduction of relative share of this age group is accompanied by the growth of GDP and its absence in the last years 2022 and 2023 (Fig. 5.). This can be explained by the following: the number of this age group is declining, while GDP was growing, so the decrease in the share of this age group could be compensated by the growth of the age group 60+, as well as by the shift of the centre of gravity due to the deficit of the factor of production - labour force to the factor of capital. It has been observed that the share of capital in GDP production is increasing, while the contribution of labour is dropping according to world tendencies of GDP growth (Motilal O.).

Regression models

For the elaboration the regression models, the following are necessary to take into account:

1. The interrelated between economic variables is analysed by regression equations. The obtained results should have an economic explanation, the semantic adequacy of econometric models is of paramount importance.
2. Regression allows the total influence of factors to be decomposed into its component parts, revealing the marginal contribution of each factor. The coefficients of regressions show the direction of the influence of the explanatory factors.

As a hypothesis in general form for each year (observation), the regression equation is as follows general form for one year and for the total period of observation:

$$y = a_0 + b_1x_1 + b_2x_2 + b_3x_3 + \varepsilon, \quad (1)$$

$$y_t = a_0 + b_1x_{1t} + b_2x_{2t} + b_3x_{3t} + \varepsilon_t, \quad (2)$$

Based on this formula, two linear regression models (Model 1., Model 2.) were calculated in order to assess the impact of given factors on GDP dynamics. The obtained equations of Model 1. and Model 2. belong to the *first order regression equation*.

Model 1.

$$Y_t = -68187601.13 + 4718944.073X_{1t} + 4868485.790X_{3t} + \varepsilon_t, \quad (3)$$

Model 2.

$$Y_t = 416511690.0 - 4893992.209X_{2t} + \varepsilon_t, \quad (4)$$

where, Y_t - GDP, in 2014 prices, thousand MDL;

X_{1t} - share of population in the age group 0-19, %;

X_{2t} - share of population in the age group 20-59, %;

X_{3t} - share of population in the age group 60+, %;

ε_t - random variable, sampling error on unaccounted factors;

t - year of observation.

Model 1. includes two explanatory variables (factors) and Model 2. includes only one variable. Model 2. is a *pair regression*. This econometric model consists of one explanatory variable, and is a regression between two variables y and x . In a pair regression equation, only one factor will affect the final result y . The model has the form $y(x)=f(x)$ and there is no strict functional dependence between the variables y and x . Due to this, the value of y consists of the value of the resultant characteristic based on the pair regression equation and ε - a random variable (Model 2.).

One of the main problems solved through the regression equation is to determine the values of regression coefficients. In conditions when the available sample of observations is limited in volume, it is impossible to obtain the true values of regression coefficients (Ibragimov M.). In this case, it is important to determine statistical assessments a and c of the unknown true parameters (coefficients) of the regression. Given statistical assessments and are called regression coefficients (Model 1., Model 2.).

The economic meaning of the *coefficients of the linear regression equation* is to explain how much the result will change when a concrete factor changes by 1 unit. The regression equation itself reflects the general tendency in the change of the variables under consideration.

According to Model 2., used for *quantitative assessment of the factor impact* - the share of population of age group 20-59 years (X_{2t}), reducing it by one unit equal to 1%, GDP in 2014 prices will decrease by 4893992.209 thousand MDL.

Looking at Model 1., it can be observed that the regression coefficients have positive values, while according to the values of pair correlation, the GDP indicator has a negative dependence with the age group 0-19 and positive with the age group 60+. The inverse connection between the GDP indicator and the share of the population of age group 0-19 years is not reflected in the equation of Model 1. This non-conformity in the sign of the

indicator coefficient characterising the age group 0-19 years in Model 1. casts doubt on the significance of given regression coefficient ($b_1=+4718944.073$).

A statistical assessment of the degree of accuracy and reliability of application of the regression parameters is necessary. Reliability is the probability that the value of the parameters is not equal to zero, i.e. connection is absent and the variables are random variables. Accuracy of regression parameters is determined by calculations of criteria of parameters at independent regression variables. Characteristics of conformity the Model 1. and Model 2. parameters with the criteria for assessment the quality of regression models are presented in Table 3.

Table 3. Criteria for assessments the quality of regression models
(Comparative characterisation of the quality of regression models)

Indicators		Characteristics	
		Model 1.	Model 2.
$Y_t = -68187601.13 + 4718944.073X_{1t} + 4868485.790X_{3t} + \epsilon_t$ (1)		$Y_t = 416511690.0 - 4893992.209X_{2t} + \epsilon_t$ (2)	
<i>Quality indicators of regression coefficients (a, b)</i>			
Standard errors of coefficients (<i>Std. Error</i>) or standard deviations of assessments of coefficients <i>a</i> and <i>b</i>	$S_a, S_{b1}, S_{b2}, S_{b3}$	$S_a = 588\ 902\ 434.3$ $S_{b1} = 21\ 892\ 243.64$ $S_{b3} = 3\ 357\ 483.372$	$S_a = 57\ 001\ 954.03$ $S_{b2} = 1\ 028\ 456.345$
t statistic (Student's t test)	$ t > t_{\text{tabl.}}$; $t_{\text{tabl.}} = t_{1-\alpha; n-m-1}^{**}$	$t_{\text{tabl.}} = t_{0.95;7} = 2.3646^1$ $t_a = -0.116$; $t_{b1} = 0.216$; $t_{b3} = 1.450$ $ t < t_{0.95;7}$	$t_{\text{tabl.}} = t_{0.95;8} = 2.3060^1$ $t_a = 7.307$; $t_{b2} = -4.759$ $ t > t_{0.95;8}$
<i>Quality indicators of regression model as a whole</i>			
Coefficient of determination (R^2)	$0 \leq R^2 \leq 1$	$R^2 = 0.739$	$R^2 = 0.739$
F - Fisher's criterion	F fact. > F tabl., $F_{\alpha; k1; k2}$ $\alpha=0.05$	F fact.=9.906; F tabl.= F ($\kappa_1; \kappa_2$)*= F(2; 7) = 4.74 ² ; F fact. > F(2; 7) at $\alpha=0,05$.	F fact.=22.644; F tabl.= F ($\kappa_1; \kappa_2$)*= F(1; 8) = 5.32 ² ; F fact. > F(1; 8) at $\alpha=0,05$.
Autocorrelation of residuals (Durbin-Watson statistic, <i>DW</i>)	If $1,5 \leq DW \leq 2,5$ no autocorrelation of residuals	$DW = 2.789$ $DW \geq 2,5^3$	$DW = 2.788$ $DW \geq 2,5^3$
* $k1 = m$; $k2 = n - m - 1$, where <i>m</i> is the number of variables in model, <i>n</i> is the number of observations in model. ** $1 - \alpha$, where, α is the significance level; $n - m - 1$ is the number of degrees of freedom.			
¹ Special table “The values of Student's t criterion at the significance level of 0.10, 0.05, 0.01”. Afanasiev Econometrics Appendix 2, p. 251.			
² Special table “Values of $F_{\alpha; k1; k2}$ -Fisher-Snedekor criterion”. Kremer N.S., Putko B.A. (2007). Econometrics. Moscow: UNITI-DANA, Mathematical and Statistical Tables. Table IV., pp. 295-297.			
³ Special table “Values of the Durbin-Watson criterion at the significance level $\alpha=0.05$ ” (starts at <i>n</i> equal to 15 observations). Kremer N.S., Putko B.A. (2007). Econometrics. Moscow: UNITI-DANA, p. 298.			

Source: Authors' calculations

It should be noted that the parameter a does not carry economic meaning, if $x=0$ shows the value of the resultant sign y .

Table 4. Stage of verification of regression models

Indicators		Characteristics	
		Model 1.	Model 2.
Average approximation error	$\bar{A} < 10\%$	$\bar{A} = 3.127\%$ $\bar{A} < 10\%$	$\bar{A} = 3.130\%$ $\bar{A} < 10\%$

Source: Authors' calculations

Detailed explanation of Table 3. Quality assessment criteria for regression models are presented in Table 5.

Table 5. Explanation of the obtained assessments of regression models quality

Indicators	Explanation of the obtained assessments
Standard errors of coefficients (<i>Std. Error</i>) or standard deviations of assessments of coefficients a and b	<p>Estimation of statistical significance of coefficients in independent variable regression is performed by determining their random errors. Estimation of the <i>standard error of the coefficients</i> is based on the logic of comparison with the values of the free term a and coefficients b.</p> <p>Model 1. $s_a > a, s_{b1} > b_1, s_{b3} < b_3$ - the errors are higher than the values of the coefficients, which is not logical.</p> <p>Model 2. $s_a < a, s_{b2} < b_2$ - errors are lower the value of the coefficients, logic is observed. The values of the coefficients are presented in the models equation.</p>
t statistic (Student's t test)	<p>A formal method for testing the statistical significance of regression coefficients b and free term a.</p> <p><i>Student's t-criterion</i> is the ratio of the regression coefficient to its standard error: $t_{bi} = b_i / s_{bi}$, where s_{bi} is the standard error for the coefficient b_i.</p> <p>The coefficients b and the free term a have a Student's distribution with $n-m-1$ degrees of freedom, which is compared with the tabular at a significance 0.05 and $n-m-1$ degrees of freedom.</p> <p>The <i>null hypothesis</i> that the t-statistic and, consequently, the coefficients b and the free term a are equal to zero is tested ($H_0: t=0$, then $a=0, b_1=0, b_2=0$, Model 1.; $H_0: t=0$, then $a=0, b_1=0$, Model 2.). The null hypothesis H_0 is rejected if $t > t_{\text{tabl}}(t_{1-\alpha; n-m-1})$, where t_{tabl} is the boundary of the Student's distribution field for the number of degrees of freedom $n-2$ for pair regression Model 2., $n-3$ for multiple regression Model 1. and significance level $\alpha=0.05$.</p> <p>Model 1. $t < t_{0.95;7}$. t Student's t distribution for regression coefficients and free term is less than $t_{\text{tabl}} = 2.3646$. The <i>null hypothesis</i> H_0 is accepted and the random nature of the formation of a, b_1, b_2 is recognized, they are not statistically significant.</p> <p>Model 2. $t > t_{0.95;8}$. t Student's t distribution for the free term and regression coefficient is greater than $t_{\text{tabl}} = 2.3060$. The null hypothesis H_0 is rejected and parameters a, b_1 are non-random and formed under the influence of factor x. The coefficient on the independent variable and the free term are statistically significant.</p> <p>The procedure for testing the significance of the coefficients and free term of multiple regression and pair regression is the same.</p>
Coefficient of determination (R^2)	<p>It is used to test the overall quality of the regression equation.</p> <p><i>Coefficient of determination</i> characterises the tightness of the connection between a set of</p>

	<p>factors under study and GDP, the share of explained variation of the dependent variable or the share of explained dispersion in the total dispersion of the dependent variable Y. Equal to the square of the correlation coefficient between variables X and Y. $R^2 = (R_{xy})^2$</p> <p>Model 1., Model 2. $R^2=0.739$, is in the interval [0; 1], the connection is high, the change in GDP depends on the factors included in the models.</p>
<i>F</i> - Fisher's criterion	<p>It is used to determine the <i>statistical significance</i> of the coefficient of determination.</p> <p>The null hypothesis (H_0) is put forward for the <i>F</i>-statistic: all regression coefficients except the free term are made equal to zero, in this case the coefficient the determination R^2 and the <i>F</i>-statistic are also equal to zero ($H_0: R^2 = 0$ is equivalent to the hypothesis $H_0: b_1 = \dots = b_n = 0$).</p> <p>The null hypothesis is rejected if <i>F</i> fact. > <i>F</i> tabl.</p> <p><i>F</i> fact. > <i>F</i> tabl., Model 1. 9.906 > 4.74; Model 2. 22.644 > 5.32.</p> <p><i>F</i> - Fisher's criterion confirms the presence influence of factor variation on the resultant sign: the influence of the change in the age structure of the population on GDP is practically reliable.</p> <p><i>For pair regression</i>, the null hypothesis test for the <i>t</i>-statistic of the regression coefficient is equivalent to the null hypothesis test for the <i>F</i>-statistic.</p>
Autocorrelation of residuals (Durbin-Watson statistic, <i>DW</i>)	<p>The presence of autocorrelation indicates the influence of the result of the previous observation on the subsequent one. The test for the presence of autocorrelation is based on the <i>hypothesis</i>: if the autocorrelation of regression errors is not equal to zero, then it is present in the regression residuals (e) as a result of applying the <i>least squares method</i>. The closeness of the test to 0 determines the presence of <i>positive</i> correlation, to 4 - <i>negative</i> correlation.</p> <p>According to the test of autocorrelation ($DW \geq 2.5$) - Model 1. and Model 2. enter into the zone of uncertainty - there is no possibility to affirm that there is no autocorrelation. It should be noted that the <i>Durbin-Watson test</i> does not represent a statistical criterion, as it depends on the number of observations n, the number of regressors x. The presence of uncertainty zones does not allow us to reject the hypothesis about the absence of autocorrelation.</p>
Average approximation error	<p>Approximation reproduction of factual data of an economic phenomenon by an analytical function. <i>The average approximation error</i> is the deviation of calculations from the factual data.</p> <p>For Model 1. the average deviation (\bar{A}) was = 3.127 %, for Model 2. $\bar{A} = 3.130$ %. The calculated average deviation in both models is within acceptable limits ($\bar{A} < 10$ %). The constructed equations reflect the dependence between the studied factors.</p>

Source: Authors' calculations

The main task of modelling is to justify the choice of influencing factors, determine their changes and assess the impact of these changes on the value of GDP. The authors have successfully coped with this task.

In the conditions of population decline, reduction in the share of working age population and, as a consequence, reduction in the number of employed population, the role of STP, namely, innovation factors is increasing. The share of capital in the composition of GDP is not decreasing. This indicates that the share of labour in GDP is freezing or decreasing. At the same time, it is necessary to note the increase in the number of the employed population with professional education (Zaharov S., 2020).

4. Conclusions

Based on the analysis of the connection between age groups in the population and GDP as the main macroeconomic indicator, the following conclusions can be formulated:

- The application of econometric method allowed to assess the quantitative impact of age changes in the composition of the population on the value of GDP,
- On the basis of econometric estimation, using calculations based on NBS data, the negative impact on GDP of the decreasing share of the age group 20-59 (on the GDP value) and the positive impact of the increasing share of the age group 60+ was revealed.
- The use of regression analysis made it possible to note the prospectivity of the age group of the elderly population (60+) according to the value of t - Student's criterion (Table 1., Model 1., $t_{x3} = 1.450$) compared to the tabulated value ($t_{\text{tabl.}} = t_{0.95;7} = 2.3646$).

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Annexe 1. Table 1. Calculated data of GDP and population by age groups for calculation

	GDP, 2014 prices, thousand MDL	Population with usual place of residence, %		
		0-19	20-59	60+
2014	131964258	24.5	57.7	17.8
2015	131018040	24.1	57.6	18.3
2016	137040143	24.0	57.2	18.9
2017	142698570	24.0	56.5	19.6
2018	148530262	23.9	55.7	20.4
2019	153736059	23.8	55.0	21.3
2020	140979525	23.6	54.4	22.0
2021	160590390	23.5	53.8	22.7
2022	153145666	23.5	53.1	23.4
2023	154199330	23.5	53.1	23.4

Note: calculation data are rounded automatically

Source: Authors' calculations