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Aims and Scope

"Economy and Sociology" is a high-level scientific platform that discusses the most current economic and social issues at the regional and national levels. Over the years, the Journal has proven to be an academic publication that announces the results of original scientific research with added value to the development of economic and sociological science. By involving a large research community in a peer-review process, the Journal aims to provide an access to quality research papers covering theoretical and applied aspects of economics and sociology.

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- social structure, institutions and social processes
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ENSURING THE EFFICIENCY OF FINANCIAL SUPERVISION THROUGH FEE-BASED SYSTEMS: A COMPARATIVE APPROACH

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SUMMARY

The article examines the role of banking supervision from a new perspective, shaped by the increasingly volatile and complex nature of financial services. Unlike most existing studies, which predominantly focus on compliance or prudential rules, this article highlights the need to transition from compliance-based banking supervision to a proactive supervisory framework that can anticipate shocks. It contributes to the scientific literature on banking supervision by redefining supervision not merely as a regulatory obligation but as a strategic investment in the long-term sustainability of the banking sector. A key innovation of the article lies in linking supervisory efficiency with sustainable funding mechanisms, qualified human capital, and technological innovation. While these elements are often discussed separately in the literature, they are rarely integrated into a comprehensive analysis. The article examines the experiences of various countries in financing banking supervision activities and assesses their impact on institutional efficiency. The study offers a new analytical perspective on how sustainable funding enhances institutional independence, strengthens resilience, and promotes economic growth. This approach opens new avenues for rethinking how supervision should be designed to remain effective in an increasingly complex financial environment.

Keywords: banking system, Basel III, efficient banking supervision, funding mechanism, resilience, viability

INTRODUCTION

After the 2008 global financial crisis, supervisory frameworks evolved considerably – shifting from a compliance-focused to a risk-oriented approach, from microeconomic oversight to the use of macroeconomic instruments, and from reliance mainly on quantitative indicators to integrating more qualitative assessments. The Basel III reforms introduced stricter capital and liquidity requirements to bolster resilience against shocks or crises. However, regulation alone cannot ensure the viability of a poorly managed bank. According to Dahlgren et al. (2023), „there is no reasonable level of minimum capital or liquidity that will make a bank viable if it does not have a sustainable business model and sound governance."

Agustín Carstens, General Manager of the Bank for International Settlements (BIS), stated in a 2023 speech that the root causes of bank failures originate within the institutions themselves, highlighting poor governance, inadequate risk management, and flawed business models. These vulnerabilities can be recognised through stronger supervision that allows for early detection and decisive intervention. This necessitates broader coverage and increased investment in supervisory resources. „Banking supervision must evolve to become more proactive, better resourced, and technologically equipped." (Carstens, 2023).

At the same time, the digitalization of financial services has made supervision even more urgent and complex. Mobile banking, real-time payment systems, and social media can accelerate deposit withdrawals and magnify instability, as seen in the collapse of Silicon Valley Bank in 2023. Supervisory authorities now face growing pressure to adapt by acquiring digital capabilities, developing staff expertise, and adopting real-time data tools such as Sup Tech.

Technology offers significant potential to enhance supervision effectiveness. Sup Tech tools used by supervisory authorities can automate routine tasks, perform text analysis of regulatory reports, and detect early warning signals through sentiment and network analysis. These tools were especially useful during the pandemic, when most on-site supervision shifted to remote working modes (Beerman et al., 2021).

Nevertheless, technology alone is insufficient without skilled professionals. Supervisory authorities, particularly in emerging economies, encounter challenges in attracting and retaining qualified experts in cybersecurity, data science, and financial analysis. A 2023 report by the Cambridge Sup Tech Lab revealed that although over 80% of authorities have adopted or piloted Sup Tech tools, fewer than 10% possess a clear long-term digital strategy or sufficient internal capacity. (Cambridge Centre for Alternative Finance, 2023).

These challenges are especially significant for small and emerging economies like Moldova, where supervisory bodies operate with limited resources, smaller staff pools, and rising expectations from international partners and local stakeholders. As Moldova works to align its financial sector more closely with EU standards and adopts risk-based supervision, the issue of how to sustainably fund supervisory activities becomes increasingly pressing.

A 2022 IMF Technical Note stresses that transparent and risk-sensitive supervisory fee systems are crucial for maintaining the long-term viability of financial oversight. They also aid in safeguarding the independence and effectiveness of supervisory authorities, particularly amid increasing digital and cross-border risks.

The study explores how banking supervision must evolve, not only through more innovative technologies but also through greater investment in personnel, training, infrastructure, and balanced cost recovery systems. Moldova's experience is a timely case study of the opportunities and limitations that smaller economies face in modernizing supervision under financial and institutional constraints.

The issues of supervisory efficiency and financing mechanisms have garnered increasing attention in academic and policy literature. Previous studies have examined the determinants of banks' prudential supervision financing structures (Donato et al, 2007), the influence of digitalisation and SupTech on supervisory practices (Beerman et al., 2021), and the challenges posed by resource constraints in small and emerging economies (IMF, 2022). Most contributions come from international organisations and policy institutions, with limited comparative academic analysis on how fee-based mechanisms influence supervisory efficiency, independence, and sustainability.

In this context, the present article contributes to existing literature with three objectives: (1) to analyse the evolution of supervisory practices and the challenges of maintaining efficiency amidst increasing financial complexity and digitalisation; (2) to examine the experiences of different countries in financing banking supervision activities and to assess their impact on institutional efficiency; and (3) to focus analytically on Moldova, a small emerging economy where supervisory sustainability is both urgent and under-researched, and to evaluate Moldova's potential to adopt a supervision-fee mechanism. Through these objectives, the article aims to contribute to the broader debate on how supervisory authorities can sustain both efficiency and independence in an increasingly volatile and complex financial environment.

DATA AND METHODS

The study aimed to analyze and synthesize existing literature and official sources regarding banking supervision mechanisms, particularly focusing on:

- Supervisory resources and funding models (including fee-financed supervision);
- Availability and role of qualified supervisory personnel;
- Adoption and impact of supervisory technologies (Sup Tech);
- Comparative experiences of advanced and emerging economies;
- Benefits and challenges reported in these contexts.

The study is based on a comprehensive review of secondary sources retrieved from:

- Academic and policy research articles (e.g., IMF, BIS, World Bank reports);
- Official supervisory authority publications and legal frameworks (e.g., ECB fee model, national supervisory bodies);
- Working papers and case studies on supervisory funding and operational capacity;
- Public databases and supervisory reports detailing staffing levels, budget structures, and technology use;

The comparative analysis covers a sample of the following countries: Czech Republic & Slovakia, Georgia, Netherlands, Poland, Switzerland, the United Kingdom and Moldova. These countries were selected to reflect a mix of advanced and emerging economies, diverse supervisory models, and varying approaches to fee-based financing mechanisms. Sources were selected based on relevance, recency, and coverage of both advanced and emerging economies.

In the context of this cross-country analysis, Moldova was chosen as a case study due to its specific characteristics as a small country, with an emerging economy and bank-oriented financial system. These characteristics makes it particularly relevant for examining the feasibility and the potential benefits of adopting a supervision-fee mechanism, especially in light of recent systemic shocks and the ongoing process of supervisory and regulatory reforms aimed at aligning the national framework with EU and Basel III standards.

The analysis of the Moldovan banking sector specifically covers the period from 2008 to 2024, capturing the impact of major international and domestic shocks, including the global financial crisis (2008-2009), the failures of three banks in 2014, the COVID-19 pandemic (2020), and the high inflation pressures resulting from the war in a neighbouring country. This extended period allows for a comprehensive assessment of the sector's main characteristics, enabling conclusions on the relevance and potential effectiveness of a supervision-fee mechanism in this context.

THEORETICAL FRAMEWORK

Legal frameworks provide supervisors with a broad and adaptable toolkit to identify, assess, and, if necessary, address banks' exposure to increased risks. By integrating the results from various components, such as onsite inspections, stress tests, and business model analysis, supervisors can develop an informed, comprehensive understanding of banks' capacity to manage their main risk exposures and the sustainability of their business models." (Carstens, 2023).

Supervisory assessments serve as a foundation for taking early steps to mitigate risks before they materialise. At first, ongoing supervisory discussions and persuasive communication may suffice to address concerns. If issues persist, supervisors generally have the authority to escalate their response by imposing legally binding requirements based on the severity of the identified problem. These measures may include additional capital or liquidity requirements, as well as qualitative actions

aimed at enhancing governance, risk management, and the bank's overall business model. (Coelho et al, 2022). „With such a holistic and forward-looking approach, supervisors can prevent an identified vulnerability from evolving into a threat to the bank's safety and soundness" (Coelho et al, 2023).

Early identification of vulnerabilities is even more important in the light of recent events. The combination of social media and technology appears to have increased the speed at which bank runs can happen. Social media can spread concerns about a particular bank among depositors even more rapidly. Additionally, technology such as a mobile banking app allows customers to open and close accounts and transfer deposits in a matter of minutes" (Federal Reserve, 2023). Therefore, proactive and forward-looking supervision, ready to take decisive action at the earliest signs of trouble, is now more essential than ever.

In such a context, proactive and forward-looking supervision – with the capacity to take early, decisive action – becomes more essential than ever. This proactive approach relies on supervisors having operational independence, a clear mandate, sufficient legal powers, and protection from external pressures. It also demands an organisational culture that enables supervisors to act decisively even when faced with uncertainty.

„Banking supervision needs to identify weaknesses at an early stage and act forcefully to ensure that banks address them. To do this, supervisors will need to have operational independence, strengthen their forward-looking culture and adopt a more intrusive stance. They will also need to continuously seek to improve their capabilities. First, by accessing greater resources. And second, by enhancing their productivity with the aid of technology" (Carstens, 2023)

Supervisors must have operational independence to carry out their duties free from external interference, complemented by strong accountability. They require a clear mandate to focus on the most critical issues, along with the legal authority to enforce their decisions. Adequate resources, specialised expertise, and the ability to exercise sound judgment—supported by a precise understanding of changing conditions, risks, and vulnerabilities—are also vital.

Bank supervision is often seen as a cost, but it should be viewed as a crucial investment in maintaining the resilience of the financial system. The social and economic toll of a banking crisis can be severe, including the loss of public confidence and widespread economic damage. Strong, proactive supervision, supported by skilled staff and advanced technology, provides the best protection against these threats.

The reviewed literature suggests that the emerging model of banking supervision in the context of complex financial systems necessitates substantial investments in supervisory capacity, including human capital, digital infrastructure, and analytical tools, to ensure proactive and effective oversight.

RESOURCES

Following the Great Financial Crisis, supervisory authorities enhanced oversight of systemically important banks by adopting a risk-based approach. This strategy emphasised the allocation of resources to areas of greatest need. However, it also sometimes resulted in increased reliance on automated processes and a decline in resources allocated to less systemically significant financial institutions.

Allocating resources based on a risk-based approach makes sense. It allows supervisors to fulfil their mandate and safeguard financial stability. Supervisory resources are vital for carrying out mandates and maintaining financial stability. However, recent events show that banks not initially considered systemic can still cause systemic distress through contagion when they fail. This highlights the need for sufficient resources to ensure thorough oversight of all financial institutions.

Supervisory resources incur costs. Various funding mechanisms, including the introduction or increase of supervisory fees contributed by the industry, can support essential investments in regulatory capacity. Although some might object, such expenditures are wise given the significant social and financial costs linked to financial crises. By lowering the likelihood of such crises, investing in a stronger supervisory framework provides substantial benefits to society.

For example, in the United Kingdom, the annual expenditure on banking regulation, supervision, and resolution across all federal agencies is approximately 0.03% of GDP (Federal Reserve, 2020; FDIC, 2023; OCC, 2022). In comparison, the average fiscal cost of banking crises is estimated at around 20% of GDP, measured by the rise in public sector debt associated with these crises (Borio et al., 2020). These figures suggest that even a small reduction in the expected fiscal cost of crises, such as 1.5% of the total cost or 0.3% of GDP, would justify a substantial increase in the budget for banking oversight.

TECHNOLOGY

Supervisory efficiency and effectiveness can be enhanced through productivity improvements, which may be facilitated by advanced technology. „Supervisory technology or SupTech is the use of technology by supervisors to deliver innovative and efficient supervisory solutions that will support a more effective, flexible and responsive supervisory system." (European Insurance and Occupational Pensions Authority, 2025)

Supervisors use technology to automate processes, digitise data and tools, and improve analytics and visualisation, thereby increasing the overall efficiency and effectiveness of supervisory resources. Additionally, authorities are increasingly adopting innovative technologies such as big data, artificial intelligence, and machine learning to enhance supervisory effectiveness and efficiency further.

Many supervisors have embraced this approach, with the pandemic acting as a catalyst that hastened the adoption of these technologies. „The Covid-19 pandemic has prompted authorities to rely on virtual inspections, including the increased use of suptech tools to support supervisory risk assessments" (Beerman et al., 2021). Travel restrictions and social distancing forced supervisors to shift most on-site activities to remote surveillance. In response, many authorities devised new tools to continue effectively assessing financial institutions despite these challenges.

One area that has seen notable progress in recent years is data analytics. These super tech tools, which utilise a vast amount of data, both qualitative and quantitative, have the potential to enhance various aspects of the supervisory process. For example, tools for text analysis, text summarisation, and information classification enable faster extraction of useful insights from lengthy documents produced by the supervised entities. Tools for sentiment analysis, network analysis, and peer group identification can provide additional insights into the risks faced by banks and may therefore aid in the challenging task of identifying deficiencies at an early stage. (Beerman et al., 2021).

According to the European Banking Authority (EBA, 2021), supervisory reporting costs represent roughly 33–36% of total compliance costs across banks – around 38% for small and non-complex institutions and 25–27% for medium and large banks. Given that supervisory reporting consumes a third of institutions' compliance costs, the integration of SupTech solutions becomes particularly important. By enhancing reporting systems with digital tools, data analytics, and automation, authorities can improve efficiency, reduce the reporting burden, and increase the accuracy and timeliness of supervisory data.

According to the EIOPA assessment, implementing supervisory technology faces two main challenges:

- Organizational challenges: Authorities must foster an innovative culture and provide staff training on new technologies.
- Technological challenges: Decisions are needed on which technologies and supervisory areas to prioritize, considering technology complexity, maturity, and costs. Authorities also need to adopt new development approaches, such as design thinking. (EIOPA, 2025)

PERSONNEL

Financial market complexity has forced supervisors to broaden their expertise beyond traditional areas (e.g., accounting and credit risk) to include technology, economics, and operational risk, leading to direct competition with the private sector for talent. (Crocket, 2001)

Traditional financial disciplines, such as accounting and risk management, remain essential. However, the changing landscape requires supervisors to gain additional, non-traditional skills. Specifically, the ongoing technological disruption's substantial and wide-reaching impact on banks means that supervisors must develop expertise in areas such as cybersecurity, data analytics, and artificial intelligence. This, in turn, challenges authorities to meet the high demand for professionals with these specialised qualifications across all sectors. (Crisanto et al., 2022)

Traditional financial skills such as accounting and risk management remain essential. However, the changing landscape requires supervisors to gain additional, non-traditional expertise. The substantial and widespread impact of ongoing technological disruption on banks necessitates that supervisors develop strong skills in areas like cybersecurity, data analytics, and artificial intelligence. This also challenges authorities to meet the high demand for professionals with these specialised qualifications across all sectors. (Crisanto et al., 2022)

According to a BIS study (Crisanto et al., 2022), supervisory authorities need to compete with the private sector to attract highly qualified professionals in these fields, which demands substantial increases in their budgets and possibly higher contributions from industry in the form of supervisory fees.

Given the growing demands on supervisory authorities, from recruiting and retaining qualified staff to investing in cutting-edge technologies, an essential question arises: how can these institutions sustainably fund their expanding mandates? One solution lies in the introduction or refinement of supervisory levies, a tool that is increasingly adopted in various jurisdictions and is regarded as a best practice for establishing resilient and proactive supervisory frameworks.

In what follows, the author examines the benefits and challenges of the supervisory fees mechanism, along with international experiences related to supervisory fees, giving special attention to the practices of both advanced economies and countries in transition.

Table 1.
Benefits and Challenges of supervisory fees mechanism

Benefits:	Challenges:
• Ensures stable and predictable funding. • Reduces political interference and dependency on state budgets. • Enables long-term investment in supervisory capacity, including digital tools and human capital.	• Requires transparency and accountability in fee-setting. • May be resisted by smaller institutions due to cost burdens. • Needs legal clarity and robust institutional governance.

Source: created by the author based on Carstens A. (2023)

Economists Michael W. Taylor and Marc G. Quintyn (2002) note in their article that industry-funded supervision can help reduce political interference and enable regulators to allocate resources more efficiently. „One of the disadvantages of fee-based funding for supervisory institutions is the potential conflict that may emerge when, during economic downturns or financial crises, more intensive supervision and monitoring require additional resources from the industry, which may struggle to raise these resources at such times (due to lower profits or a shrinking sector). In the worst-case scenario, this could lead to the lay-off of supervisors precisely when their services are most needed." (Taylor et al, 2002). One solution to such situations is for supervisory authorities to establish financial reserves specifically for these types of economic circumstances.

The paper „Who Pays for Banking Supervision? Principles and Trends" by Donato, M., Nieto, M. J., and Prast, H. highlights that the decision between public and private funding for banking supervision is influenced by a combination of institutional frameworks, historical developments, and geographical considerations. The authors contend that supervisors within central banks are more likely to receive public funding, whereas independent financial authorities typically depend on levies imposed on the regulated banks. Additionally, in bank-oriented financial systems, public funding is more common. (Donato et al, 2007).

COMPARATIVE ANALYSIS OF SUPERVISORY-FEE MECHANISMS

Supervisory fee systems are increasingly regarded as vital tools for ensuring the effectiveness, independence, and sustainability of banking supervision. This section offers a comparative overview of supervisory fee practices across selected jurisdictions. By systematically analysing these practices, the study highlights patterns, benefits, and limitations of various supervisory fee models. These insights aim to inform both international policy debates and the possible adoption of fee-based mechanisms in emerging economies, with particular relevance for Moldova.

Advanced economies are typically characterised by high GDP per capita, well-developed financial markets, strong institutional frameworks, and established regulatory systems. These features enable them to implement and sustain robust supervisory frameworks, often funded through supervisory fees charged to the institutions being overseen.

Transition and Emerging Economies encounter extra hurdles in funding effective supervision, such as limited fiscal space, political constraints, and underdeveloped financial markets, which make it more challenging to implement similar cost-recovery mechanisms. For these economies, adopting such mechanisms, tailored to their institutional capacity and market structure, can help ensure better alignment with EU standards, boost operational independence, and enhance systemic risk management.

Table 2.

Experience with Supervisory Fees: Advanced Economies vs. Transition and Emerging Economies

Advanced Economies	**United Kingdom:** The Prudential Regulation Authority (PRA) is entirely funded through a levy on the firms it supervises. The PRA fee structure is determined by firm size and risk profile, which promotes fairness and lessens cross-subsidisation. This method ensures budget stability and maintains supervisory independence. (Bank of England, 2025)
	Netherlands: De Nederlandsche Bank (DNB) introduced supervisory levies in 2013. The fees are used not only to finance routine supervision but also investments in IT infrastructure, data analytics, and skills development. DNB emphasizes transparency by publishing the cost structure annually. (DNB, 2025)
	Switzerland: The Financial Market Supervisory Authority (FINMA) also functions under a fee-based system. FINMA covers between 80 and 90% of its total expenditure, including allocations to its statutory reserves, through supervisory levies (FINMA, 2025). According to the FINMA Annual Report (2022), this levy model is crucial for maintaining an appropriate staff-to-bank ratio and for funding ongoing staff training and supervisory technology. (FINMA, 2022)
Transition and emerging economies	**Slovakia**: National Bank of Slovakia (NBS) is part of the EU's banking union, that is based on the Single Supervisory Mechanism (SMM). For the purposes of the SSM banks (credit institutions) are categorised as: significant – subject to direct supervision by the ECB in cooperation with NBS (detailed bellow in „EU Framework" chapter; or less significant – remaining subject to supervision by NBS. NBS finances its supervisory activities through a mix of operating revenues defined by Act on financial market supervision (2004), which include: (a) annual contributions paid by supervised entities, (b) fees for supervisory actions and proceedings, and (c) special contributions in the form of surcharges on annual contributions to cover expenses related to financial consumer protection. This framework ensures stable and rule-based financing for supervisory functions while supporting institutional independence. (NBS, 2025)
	Poland: The Polish Financial Supervision Authority (KNF) is funded through supervisory fees calculated as a percentage of supervised institutions' total assets. This model guarantees scalability and sustainability, enabling KNF to adapt to sectoral growth. (KNF, 2023)
	Romania: The National Bank of Romania (NBR) implements a system of administrative fees for licensing and authorisations, but ongoing supervision is still funded by the central bank's operational budget. Discussions have arisen about the possible introduction of a more comprehensive levy-based framework to bolster independence (NBR, 2015).
	Georgia: As part of post-crisis financial sector reforms, Georgia's National Bank (NBG) implemented modest supervisory fees. Although relatively limited in scope, the fees are regarded as a step towards enhancing supervisory capacity. (NBG, 2025)

Source: created by author based on Bank of England (2025), DNB (2025), FINMA (2022, 2025), NBS (2004, 2025), KNF (2023), NBR (2015), NBG (2025)

EU FRAMEWORK

The ECB funds its supervisory duties by imposing an annual fee on all supervised banks. The 2019 Decision (EU) 2019/2158 (ECB/2019/38) provides a clear, standardised framework for calculating supervisory fees across Eurozone institutions under the ECB's Single Supervisory Mechanism.

The fee is calculated according to the bank's importance and risk profile. The total fee for each bank consists of two elements:

1. **Minimum Fee Component**

- Representing 10% of the total fee amount for each category (significant and less significant banks).
- This fixed portion is equally split among institutions in each category.
- Banks with total assets under 10 billion euros (for significant) or 1 billion euros (for less significant) receive a 50% discount on this portion.

2. **Variable Fee Component**

- Constitutes the remaining 90% of the fee pool (after minimum fees and discounts).
- Allocated based on each bank's size (total assets) and risk exposure, meaning larger or higher-risk banks pay more. (ECB, 2025)

Financial institutions submit fee data to the National Competent Authorities (NCAs), which then forward it to the ECB. The ECB performs quality checks and allows institutions to comment on their data before finalising the fee basis (ECB, 2019).

The ECB provides an interactive calculator that enables banks to estimate their annual fee using preliminary cost estimates and commonly available data from the previous year. The calculator is for indicative purposes only; actual fees are based on confirmed data and final costs. Directive 2013/36/EU (CRD IV) allows national competent authorities to levy fees to cover supervisory costs. Many EU member states have aligned their approaches with this principle. The European Central Bank's Single Supervisory Mechanism (SSM), which has been operating since 2014, is fully funded through an annual supervisory fee charged directly to significant institutions and to less significant institutions via national authorities.

CASE STUDY OF MOLDOVA'S SUPERVISORY MECHANISM

In recent years, the Republic of Moldova has taken significant steps to align its financial sector with international standards, particularly following the systemic banking crisis of 2014. Regulatory reforms, ownership restructuring in systemically important banks, and the alignment of prudential requirements with EU and Basel III frameworks represent notable progress. However, modernisation has brought increasing demands that challenge institutional capacity and oversight structures. The IMF's diagnostic review emphasises a key challenge: Moldova's mandates for financial stability, macroprudential surveillance, and crisis preparedness have shifted faster than the resources available to supervisory institutions. Both the National Bank of Moldova (NBM) and the National Commission for Financial Markets (NCFM) continue to face persistent understaffing and limited funding, which restricts their ability to keep pace with heightened regulatory and analytical requirements.

One of the main recommendations highlighted in the IMF Report (2022) is the enhancement of supervisory practices. „Given the progress on the regulatory framework, the NBM should continue to focus on supervision, covering risk assessment, supervisory planning/supervisory stance and allocation of resources, including to systemically important banks, evaluation of governance (including the „independence of mind" test where technical assistance is required) and risk management frameworks. Specialist supervisory resources, including on governance issues, should be increased to support the further development of risk-based supervision." (IMF Report, 2022).

For instance, the Financial Stability Department of the NBM reportedly operates with only 4–6 analysts responsible for macroprudential monitoring and stress testing, significantly below what is needed for effective risk analysis and timely policy design. Despite this, Moldova's supervisors are tasked with implementing complex regulatory frameworks and responding to a volatile macro-financial environment.

According to the latest report by the IMF (2025), although Moldova's banking supervision framework has improved, there is a significant gap between regulatory ambition and operational capacity. The NBM continues to face staffing and resource limitations.

Furthermore, in its 2025 Central Bank Transparency Code Review, the IMF recognised recent progress in institutional governance and transparency, while highlighting the need for improved internal communication and accountability mechanisms. These developments indicate not only a changing governance culture but also the need for sustainable investments in supervisory infrastructure and human capital.

Additional concerns arose during the IMF's Extended Credit Facility (ECF) reviews. The abrupt dismissal of NBM leadership in December 2023 raised alarms about central bank independence – a vital pillar for credible financial oversight. Strengthening institutional autonomy must go hand in hand with improved

operational capacity and predictable budgetary support. Ultimately, Moldova's experience shows that regulatory ambition must be matched by supervisory resources. Without adequate staffing, training, and funding—whether through internal revenues, public budgets or supervisory fees—the effectiveness of financial oversight risks being compromised, regardless of the regulatory framework in place. As Moldova continues its reform journey, ensuring a reliable, rule-based financing mechanism for supervision will be crucial for maintaining trust, resilience, and long-term financial stability.

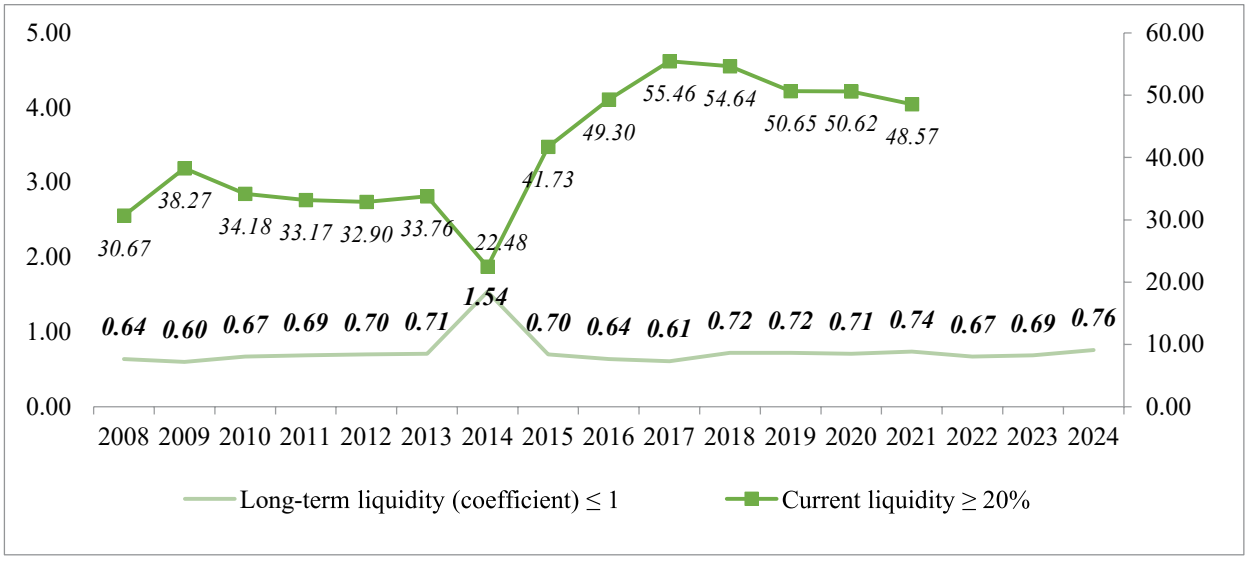
Unlike supervisory authorities that rely directly on state budget allocations, the National Bank of Moldova (NBM, 2024) enjoys a degree of financial autonomy, operating based on its own revenues. Currently, the NBM does not implement a structured fee-based approach for supervised entities; instead, its supervisory function is financed through internal resources, while its annual profit is distributed partly or entirely to the state budget depending on the statutory capital ratio, as required by the Law on the National Bank of Moldova.

Due to the lack of publicly available data on the costs incurred by the NBM in supervising activities, such as staff expenses, technical resources, and other supervisory efforts, the assessment of the appropriateness of supervisory fees in the Moldovan banking sector is based on the IMF's conclusions. It is therefore assumed that the NBM continues to operate under limited staffing and resource constraints.

The NBM currently supervises a banking sector comprising 10 banks, including 4 systemically important institutions. Since 2023, in addition to banks, the NBM's supervisory scope has been extended to non-bank financial entities, including insurance companies and credit unions. This broad scope of supervision, combined with the implementation of complex regulatory frameworks like Basel III and macroprudential tools, places significant demands on the central bank's resources and capacity. To justify introducing a supervisory fee, it is vital to assess whether the sector has the financial strength to bear such a cost, which can be analysed through the banking system's profitability, capital adequacy, and liquidity indicators.

The analysis of liquidity indicators shows that banks in the Republic of Moldova have adhered to the regulatory requirements (Principle I and Principle II of liquidity), even during crisis years (2008-2009 and 2020), maintaining adequate or surplus liquidity levels. Over the period from 2008 to 2024, the long-term liquidity ratio remained around 0.7. The only exception was in 2014, when the maximum regulated level of 1 was exceeded due to the liquidity reports of three troubled banks—Banca de Economii, Banca Socială, and Unibank—each of which ultimately failed in the same year. Regarding current liquidity, the ratio ranged between 20% and 40% from 2008 to 2013. In 2014, due to the same three problematic banks, the current liquidity ratio dropped to 22.5%. From 2015 onwards, it exceeded 40%, peaking at 55.5% in 2017 and remaining close to 50% until 2021. From January 2022, the liquidity principle II was replaced by the liquidity coverage ratio (LCR), with a minimum regulatory requirement of 100%. Moldovan banks greatly exceeded this benchmark, recording an LCR of 235.47% in 2022, 282.12% in 2023, and 274.13% in 2024.

Figure 1.
Liquidity Principle I and Principle II, evolution in the period 2008-2024 (%)



Source: prepared by author based on National Bank of Moldova data [online] [cited March 22, 2025]. Available: http://bnm.md.

To harmonise the legislation of the Republic of Moldova with that of the European Union, Principle III - Liquidity by maturity bands (>1) was introduced in 2016. Until then, there were some gaps in the NBM's regulatory acts concerning liquidity indicators, especially due to the lack of liquidity requirements for the period between 1 month and 2 years. Since banking operations have varying and often uncertain maturities, matching bank liabilities to assets is a complex task. Principle III was introduced to fill these regulatory gaps.

According to data on the economic and financial activity of banks in the Republic of Moldova for the period 2016-2024, the liquidity principle III has exceeded the regulatory threshold of 1 across all maturity bands, remaining well above the minimum required level (Table 1).

Table 1.

Principle III - Liquidity by maturity bands (>1)

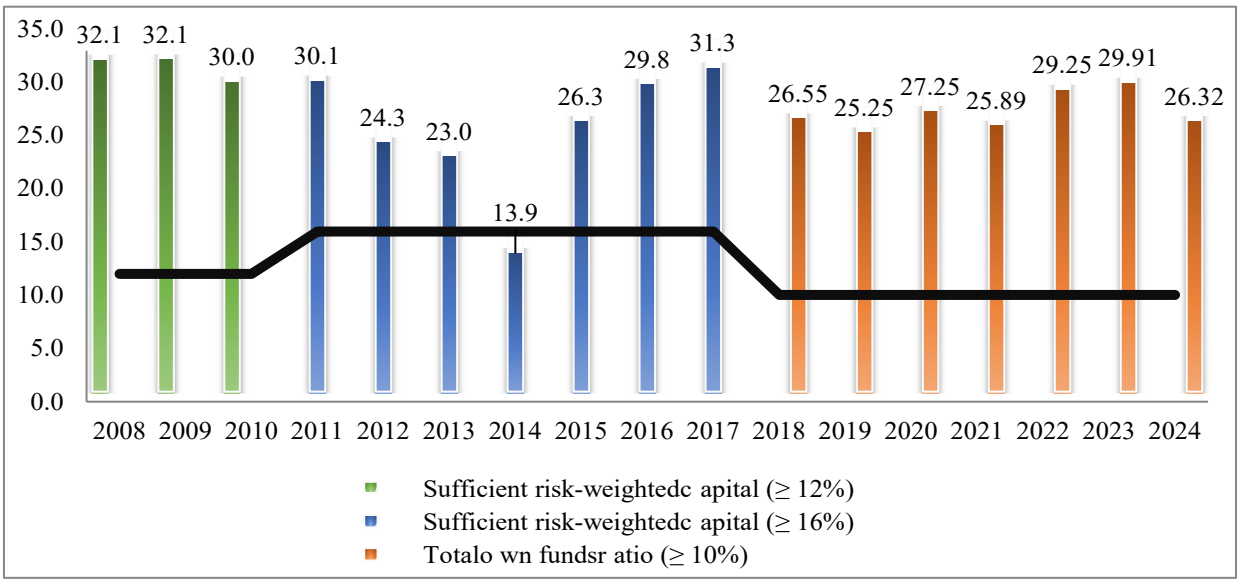
	2016	2017	2018	2019	2020	2021	2022	2023	2024
≤1 month	2.91	2.72	2.94	2.67	2.28	1.89	2.17	2.19	1.79
1-3 months inclusive	14.85	18.40	19.09	18.14	19.86	19.64	20.42	16.07	12.69
3-6 months inclusive	4.75	2.74	3.12	12.90	14.74	14.43	12.10	12.55	12.29
6-12 months inclusive	4.22	3.06	2.37	8.83	9.97	9.92	7.48	9.47	8.33
>12 months	5.32	4.74	4.34	8.74	7.97	8.35	7.25	8.36	8.14

Source: *author based on data from the National Bank of Moldova [online] [cited March 22, 2025]. Available: http://bnm.md.*

Thus, the banking sector of the Republic of Moldova does not face challenges related to liquidity, indicating that it has sufficient resources to meet its obligations and could absorb the impact of a supervisory fee mechanism. At the same time, the sector demonstrates increased resilience to potential external shocks. The persistent over-liquidity observed in the Moldovan banking sector implies a significant opportunity cost, as resources remain underutilised. In this light, implementing a supervision fee represents a reasonable mechanism to internalise the cost of regulation, exerting mild pressure on institutions to optimise liquidity management. This aligns with the theory of efficient resource allocation in financial intermediation (Diamond et al, 1983) and supports a shift from passive reserve accumulation to proactive sector development. The average risk-weighted capital adequacy ratio of the banking system during 2008-2017, shown graphically in Figure 2, consistently exceeded the regulatory level of ≥ 12% - in the period 2008-2010 and ≥ 16% - in the period 2011-2017. An exception occurred in 2014, when this indicator amounted to 13.92%, falling below the minimum regulatory level. The situation in 2014 was not indicative of systemic vulnerability, but was caused by Banca de Economii and Banca Socială - both of which reported critically low capital adequacy ratios, slightly above 3%.

Figure 2.

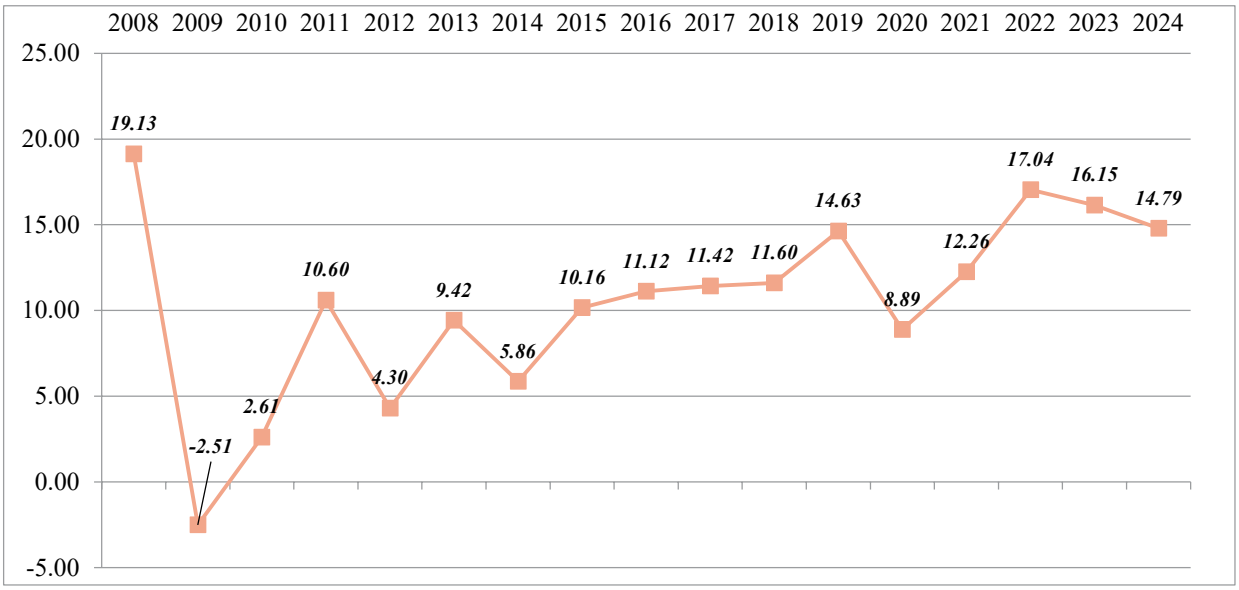
System-wide evolution of risk-weighted capital adequacy between 2008-2017 and total own funds ratio between 2018 and 2024 (%)



Source: *author based on data from the National Bank of Moldova [online] [cited January 22, 2025]. Available: http://bnm.md.*

The evolution of the total own funds ratio during 2018-2024 indicates that banks in the Republic of Moldova remain well capitalised for their risk profile, demonstrating that the sector has adequate financial strength to absorb additional regulatory costs. This strong capitalisation provides a solid foundation for implementing a supervisory fee mechanism that could ensure sustainable funding for effective oversight without placing excessive pressure on banks' financial stability. The author will use the Return on Equity (ROE) indicator to analyse financial performance. The figure illustrates that in 2009 – the year of the global financial crisis – the banking system experienced losses, resulting in negative ROE values. However, in the post-crisis years, banks significantly improved their profitability ratios, except in 2014 – the year marked by the collapse of problematic banks – and 2020 – the pandemic year. By 2024, the ROE had increased to 14.8%.

Figure 3.
Return on Equity evolution 2008-2024 (%)



Source: author based on data from the National Bank of Moldova [online] [cited March 22, 2025]. Available: http://bnm.md.

The above analysis shows that banks in the Republic of Moldova are well-capitalised, maintain high liquidity levels, and have strong profitability ratios. Consequently, introducing supervisory fees, adjusted according to each institution's systemic importance, is unlikely to disturb the stability of the banking sector. Furthermore, since the Moldovan financial system is relatively small and bank-centric, implementing a hybrid model that combines modest supervisory fees, with support from the central bank's own budget, could enhance the operational independence of the supervisory authority without compromising sector stability. Such an approach would also promote compliance with international best practices and EU standards, supporting gradual alignment with regional regulatory frameworks.

Despite the characteristics of the banking sector that allow for the introduction of supervisory fees, this funding mechanism can bring notable benefits in terms of transparency and governance A fee-based supervision framework would strengthen the institutional autonomy of the NBM by reducing potential reliance on state budgetary transfers and ensuring a stable, predictable source of funding for supervisory activities. Importantly, the additional financial resources can be allocated towards strengthening the NBM's capacities – facilitating investments in modern IT tools, expanding staffing, and improving training programs. These measures would have a direct impact on the quality and effectiveness of financial sector oversight.

DISCUSSION

Our study demonstrated that the introduction of supervisory fees in Moldova could provide a sustainable and predictable funding source, thereby enhancing the institutional independence of the supervisory authority. This result is consistent with the findings of Taylor and Quintyn (2002), who argue that industry-funded supervision reduces political interference and strengthens regulators' ability to allocate resources effectively. Similarly, Donato, M., Nieto, M. J., and Prast, H. (2007) emphasise that supervisory independence is reinforced when financing relies on supervision fees rather than state budgets, particularly in bank-oriented systems.

At the same time, the analysis highlights that Moldova's particular circumstances—specifically, the limited resources of the National Bank of Moldova (NBM) and the expansion of its supervisory mandates—make such a mechanism both feasible and necessary. This observation aligns with IMF technical reports (2022, 2025), which highlight persistent gaps in staffing and resources at the NBM, despite progress in regulatory reform and bank capitalisation. In this respect, Moldova shares common challenges with other small or emerging economies but also demonstrates unique structural vulnerabilities.

Our findings also align with Carstens (2023), who underlines the need for well-funded, proactive, and technologically equipped supervision to anticipate shocks and protect financial stability. However, some aspects appear specific to Moldova. The persistent over-liquidity of the Moldovan banking sector creates an opportunity rarely emphasised in advanced economies: supervisory fees could not only secure financial independence for the supervisory authority but also internalise the cost of regulation and indirectly encourage banks to optimise liquidity management.

Furthermore, international experience shows that many central banks, including those in the European Union, rely on supervisory fees to cover the costs of financial oversight independently of government budgets. These institutions typically apply a cost-recovery principle based on actual or budgeted expenditures, with fees allocated according to institution size, complexity, or risk level (ECB, 2019; FINMA, 2022). By contrast, the NBM currently does not implement a structured fee-based model; its supervisory function remains funded through internal resources. Adopting supervisory fees in Moldova would therefore represent a significant step towards aligning with international best practices.

The comparative analysis also showed that while some jurisdictions apply fees solely to banks, others extend the levy to non-banking financial institutions, broadening the revenue base and reducing reliance on public funds (Donato et al, 2007). In Moldova, where the financial system is relatively small and bank-centric, a hybrid model—combining modest supervisory fees with the NBM's own budgetary resources—could enhance operational independence without compromising stability. This solution would also mitigate risks of fee volatility and reduce the potential burden on smaller banks, consistent with recommendations from IMF (2025).

In sum, the Moldovan case supports the broader global trend toward fee-based supervision, while also highlighting the importance of tailoring such mechanisms to the institutional realities of small emerging economies. By integrating sustainable financing into the supervisory framework, Moldova could not only strengthen the independence and efficiency of the NBM but also contribute to the long-term viability and resilience of its banking system.

CONCLUSIONS

The recent bank failures originate from the institutions themselves, not from regulatory actions or rising interest rates. Institutions have no justification for mismanaging interest rate risk or neglecting to address persistent structural weaknesses in their business models. However, banking supervision must enhance its role to protect the stability of financial institutions across different macro-financial scenarios in today's evolving technological environment. This entails supervisors being proactive and assertive. With adequate resources and technological support, supervisors will be able to identify vulnerabilities early and intervene before problems escalate and become too difficult to manage. While such efforts cannot prevent all future bank failures, they can considerably reduce their likelihood and potential impact on financial stability. After the 2008 financial crisis, there has been increasing recognition that effective banking supervision requires not only strong regulatory frameworks but also adequate and stable funding mechanisms. Some jurisdictions have introduced supervisory levies—fees collected from supervised institutions—to ensure the operational independence and financial sustainability of supervisory authorities. Concerning the situation in the Republic of Moldova, it can be concluded that financial supervisory reform remains incomplete. Persistent challenges include insufficient human resources and limited financial autonomy to match the scope of its expanding supervisory mandates. Despite progress in aligning regulatory frameworks with European Union standards and improving transparency, the effectiveness of supervision continues to be limited by resource constraints and potential political interference. The current funding model of the NBM, based primarily on its own revenues, restricts both scalability and flexibility of supervisory functions. Given Moldova's strategic goal of deeper integration with EU regulatory norms, implementing a supervisory fee mechanism is a vital step towards strengthening domestic financial stability and demonstrating compliance with internationally accepted best practices. A fee-based financing model would ensure predictable and sustainable revenues for supervisory activities, supplementing the NBM's internal resources and minimising vulnerabilities related to their fluctuations. Such financial stability is essential for enabling the NBM to expand its operational capacities and effectively manage increasing regulatory complexity. For successful deployment, the supervisory fee system must be based on a solid legal framework and accompanied by transparent engagement with all relevant stakeholders to build trust and ensure equitable application. Moreover, broadening the scope of fee collection to include non-banking financial institutions could improve regulatory coverage and foster fairness across the financial sector. By adopting these measures, Moldova would align with international supervisory standards, thereby strengthening the institutional independence of the NBM and contributing to the resilience and robustness of its financial system.

REFERENCES

Bank of England. (2025, April 10). *Consultation Paper 8/25 - Regulated fees and levies: Rates proposals for 2025/26*. https://www.bankofengland.co.uk/prudential-regulation/publication/2025/april/regulated-fees-and-levies-rates-proposals-2025-26-consultation-paper

Beerman, K., Prenio, J., & Zamil, R. (2021). Suptech tools for prudential supervision and their use during the pandemic. Bank for International Settlements. *FSI Insights on policy implementation*, 37, 23. https://www.bis.org/fsi/publ/insights37.htm

Board of Governors of the Federal Reserve System (BGFRS). (2020). *Supervisory assessment fees*: *Notice of the Board's Supervision and Regulation Assessment for Year 2021*. https://www.federalreserve.gov/supervisionreg/supervision-regulation-assessment-2021.htm

Board of Governors of the Federal Reserve System (BGFRS). (2023, April 28). Barr, M. S. *Review of the Federal Reserve's supervision and regulation of Silicon Valley Bank*. https://www.federalreserve.gov/publications/files/svb-review-20230428.pdf

Borio, C., Contreras, J., & Zampolli, F. (2020). Assessing the fiscal implications of banking crises. *BIS Working Papers,* 893, 25. https://www.bis.org/publ/work893.htm Carstens, A. (2023, June 1). *Investing in banking supervision*. https://www.bis.org/speeches/sp230601.htm

Cambridge SupTech Lab. (2023). State of SupTech Report 2023, Cambridge: University of Cambridge. https://lab.ccaf.io/wp-content/uploads/2024/03/Cambridge-State-of-SupTech-Report-2023.pdf

Coelho, R., Monteil, A., Pozdyshev, V., & Svoronos, J. P. (2022). Supervisory practices for assessing the sustainability of banks' business models. *FSI Insights on policy implementation*, 40, 25. Bank for International Settlements. https://www.bis.org/fsi/publ/insights40.htm

Coelho, R., Restoy, F. & Zamil, R. (2023). Rising interest rates and implications for banking supervision. *FSI Briefs*, 19, 11. https://www.bis.org/fsi/fsibriefs19.pdf

Crisanto, J. C., Prenio, J., Singh, M., & Yong, J. (2022). Emerging sound practices on supervisory capacity development. *FSI Insights on policy implementation*, 46, 40. https://www.bis.org/fsi/publ/insights46.htm

Crocket, A. (2001, March 30). *Banking Supervision and Regulation: International Trends*. https://www.bis.org/speeches/sp010330.htm

Dahlgren, S., Himino, R., Restoy, F., & Rogers, C. (2023). *Assessment of the European Central Bank's Supervisory Review and Evaluation Process*: Report by the Expert Group to the Chair of the Supervisory Board of the ECB. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/annex/ssm.pr230417_annex.en.pdf

Department of the Treasury Office of the Comptroller of the Currency. (2022). *Congressional budget justification and annual performance plan and report*. U.S. Department of the Treasury. https://home.treasury.gov/system/files/266/23.-OCC-FY-2022-CJ.pdf

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy, 91*(3), 401-419. https://www.bu.edu/econ/files/2012/01/DD83jpe.pdf

DNB Annual report 2024. Robust policies in times of uncertainity. (2025). Amsterdam: De Nederlandsche Bank, 176. https://www.dnb.nl/media/pilghmfb/dnb-annual-report-2024.pdf

Donato, M., Nieto, M. J., & Prast, H. (2007) Who pays for banking supervision? Principles and trends. Journal of Financial Regulation and Compliance, *15*(3), 303-326. https://doi.org/10.1108/13581980710762291

European Banking Authority. (2021, June 7). *EBA makes recommendations for reducing supervisory reporting costs*. https://eba.europa.eu/publications-and-media/press-releases/eba-makes-recommendations-reducing-supervisory-reporting

European Central Bank. (2019). Decision (EU) 2019/2158 of the European Central Bank of 5 December 2019 on the methodology and procedures for the determination and collection of data regarding fee factors used to calculate annual supervisory fees (ECB/2019/38). *Official Journal of the European Union,* 327. https://eur-lex.europa.eu/eli/dec/2019/2158/oj

European Central Bank. (2025). *How is the annual supervisory fee calculated?* https://www.bankingsupervision.europa.eu/about/fees/calculator/html/index.en.html

European Insurance and Occupational Pensions Authority (EIOPA). (2020). *Supervision Technology Strategy*. https://www.eiopa.europa.eu/browse/digitalisation-and-financial-innovation/supervisory-technology_en

Federal Deposit Insurance Corporation (FDIC). (2022). *Proposed 2023 FDIC Operating Budget. By Major Expense Category and Budget Component*. https://www.fdic.gov/news/board-matters/2022/2022-12-13-notice-dis-a-fr.pdf

Hernández de Cos, P. (2023, April 12). *Banking starts with banks: initial reflections on recent market stress episodes*. Bank for International Settlements. https://www.bis.org/speeches/sp230412.htm

International Monetary Fund (IMF). (2022). *Republic of Moldova: Technical Assistance Report-Financial Sector Stability Review,* 030, 61. https://doi.org/10.5089/9798400201363.002

International Monetary Fund (IMF) (2025, March 26). *IMF Country Report No. 25/84. Central Bank Transparency Code Review*. https://www.bnm.md/files/1mdaea2025001-print-pdf.pdf

National Bank of Georgia (NBG). (2025). *National Bank Supervisory Reforms*. https://nbg.gov.ge/en/page/supervisory-policy-refor-1

National Bank of Moldova (BNM). (n.d). *Banking supervision statistics*. https://www.bnm.md/bdi/pages/mainPage.xhtml

National Bank of Moldova (BNM). (02.08.2024). *Law on the National Bank of Moldova no 548-XIII of 21 July 1995* https://bnm.md/en/content/law-national-bank-moldova-no548-xiii-july-21-1995

National Bank of Romania (NBR). (2015). *Legal aspects regarding the accession to the Single Supervisory Mechanism*. https://www.bnr.ro/uploads/editor/908612016.pdf

National Bank of Slovakia (NBS). *Act No 747/2004 Coll. on supervision of the financial market*. https://nbs.sk/en/dohlad-nad-financnym-trhom/legislativa/legislativa/detail-dokumentu/act-no-747-2004-coll-on-supervision-of-the-financial-market/

National Bank of Slovakia. (2025) *Areas of supervision*. https://nbs.sk/en/financial-market-supervision1/supervision/banking/

Komisja Nadzor Finansowego. (KNF) (2023). *Payments and fees to cover the supervision costs* https://www.knf.gov.pl/en/MARKET/Payments_and_fees_to_cover_the_supervision_costs

Swiss Financial Market Supervisory Authority (FINMA). (2025). *How FINMA funds its activities*. https://www.finma.ch/en/finma/organisation/

Swiss Financial Market Supervisory Authority (FINMA) (2022). *Annual Report 2022*. https://www.finma.ch/en/~/media/finma/dokumente/dokumentencenter/myfinma/finma-publikationen/geschaeftsbericht/20230328-finma-jb22.pdf?sc_lang=en&hash=D982AD2402AC851F5B5FC4536FB9855F

Taylor, M. W., & Quintyn, M. G. (2002). Regulatory and Supervisory Independence and Financial Stability. *IMF Working Paper,* 046. https://www.elibrary.imf.org/view/journals/001/2002/046/article-A001-en.xml

A COMPARATIVE ANALYSIS OF AGRICULTURAL SUSTAINABILITY AND RURAL MODERNISATION IN ROMANIA AND MOLDOVA, EXAMINING THE CHALLENGES AND POTENTIAL DEVELOPMENT PATHS

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SUMMARY

The study analyses the dynamics of rural sustainability in Romania and Moldova, focusing on the interrelations between the economic, social, and environmental dimensions of agricultural development. Using the Integrated Rural Sustainability Transition Model (IRSTM) and entropy-based composite indices, the research evaluates the evolution of rural systems over the period 2014–2023. The results reveal an asymmetric transition toward sustainability: Romania demonstrates a consolidated trajectory supported by structural modernisation and institutional integration within the European framework, while Moldova displays a more fragmented and vulnerable pattern, constrained by limited resources and structural inefficiencies. The comparative analysis highlights that economic growth alone is insufficient to ensure sustainability without improvements in ecological efficiency and social cohesion. The model's entropy weighting confirms the robustness of the results and the internal balance between the three sustainability pillars. The findings underline the importance of coherent multi-level governance, investment in human capital and infrastructure, and the promotion of territorial innovation to enhance resilience and accelerate the sustainability transition in Eastern European rural regions.

Keywords: rural resilience, territorial innovation, entropy weighting, composite indicators, sustainability transition

INTRODUCTION

Agriculture remains a cornerstone of rural economies in Central and Eastern Europe, serving not only as a key source of income and employment but also as a stabilising force for the social and ecological balance of rural territories. In both Romania and Moldova, the agricultural sector fulfils a dual function: it underpins food security and territorial resilience while shaping the ability of these economies to adapt to the transition toward sustainability. Over the last two decades, structural reforms, European integration, and rural development programs have driven profound transformations in the organisation and performance of agriculture in both countries. Nevertheless, marked disparities persist in productivity levels, rural infrastructure modernisation, and the overall sustainability of agricultural systems.

Scholarly interest in rural sustainability has advanced significantly in recent decades, shifting from predominantly economic interpretations of rural development (Ellis, 2000; OECD, 2008) toward holistic frameworks that integrate economic, social, and environmental dimensions (Marsden, 2013; Wilson, 2010; FAO, 2013). Concepts such as *rural resilience* and *territorial innovation* have been introduced to explain how rural societies respond to external pressures—economic, climatic, or demographic—through adaptation and innovation (Darnhofer, 2014; Béné, 2020). Within the Eastern European context, however, the application of these approaches remains limited, as most studies are descriptive or sector-specific and rarely account for the multidimensional nature of sustainability.

Romania and Moldova offer a significant comparative context for analysing the transition toward sustainable rural development. Both maintain strong agricultural profiles characterised by high rural population shares and significant reliance on natural resources, yet they differ in the pace of agricultural modernisation and institutional integration. Romania, as an EU member state, benefits from the Common Agricultural Policy (CAP), which provides regulatory and financial support for the green transition. Moldova, in contrast, while gradually aligning with EU standards, continues to face structural challenges such as fragmented land ownership, small-scale farms, and limited administrative capacity (World Bank, 2022). These contrasts justify a comparative investigation of agricultural sustainability and rural modernisation.

Despite valuable contributions from previous studies, substantial gaps persist in measuring and integrating the economic, social, and environmental components of rural sustainability across Eastern Europe. Most analyses rely on isolated indicators or static descriptions, which limit our understanding of interdependencies and transition dynamics. Consequently, there is a growing need for standardised empirical instruments that allow cross-country comparisons and inform evidence-based rural development policies (OECD, 2020; FAO, 2017).

This paper addresses these gaps by developing an Integrated Rural Sustainability Transition Model (IRSTM) and applying an original empirical methodology based on composite indices representing the economic, social, and environmental dimensions of agriculture in Romania and Moldova. Unlike earlier approaches, this study combines descriptive analysis with a methodological contribution grounded in the OECD (2008) guidelines for constructing composite indicators and employs entropy-based weighting to reflect the relative significance of each indicator within the overall sustainability framework.

The research pursues three main objectives: (i) to compare the economic, social, and environmental performance of agriculture in Romania and Moldova; (ii) to construct a synthetic Rural Sustainability Index (RSI) that traces the long-term evolution of agricultural systems; and (iii) to identify key challenges and policy directions for sustainable rural transition in both countries. The findings are expected to contribute to both academic discourse on sustainable rural

development and policy design by providing empirical evidence to guide agricultural modernisation and rural resilience in Eastern Europe.

By integrating the theoretical foundations of the IRSTM with a rigorous empirical strategy, the study offers an original contribution to comparative research on agricultural sustainability. At the same time, it underlines the practical relevance of rural transition processes and the necessity of coordinating economic, social, and environmental policies within a coherent model of sustainable territorial development.

THEORETICAL FRAMEWORK

The concept of rural sustainability can be seen as an evolution of the sustainable development paradigm, reinterpreted for the specific realities of rural territories, where the interlinkages among the economy, society, and the environment determine their long-term viability (Marsden, 2013; Wilson, 2010). Within the academic literature, this concept is not confined to a static balance between human activity and natural resources but is rather perceived as a continuous process of transformation, through which agricultural and institutional systems adapt to both structural and ecological changes (Darnhofer, 2014; Béné, 2020). This process-oriented understanding has encouraged the emergence of complementary concepts such as rural resilience and territorial innovation, which serve as analytical frameworks for exploring how rural areas evolve toward sustainability.

Rural resilience refers to the ability of rural communities and systems to respond to and adapt to external disturbances—whether economic, climatic, demographic, or political—while maintaining their essential socio-economic functions (Darnhofer, 2014; Milestad & Darnhofer, 2008). It does not imply a return to a pre-existing equilibrium but a reorganisation that enhances system stability and encourages innovation (Folke, 2016). In agriculture, resilience is expressed through production diversification, the adoption of sustainable technologies, strengthening rural social networks, and developing short supply chains. Consequently, agriculture is understood as a complex socio-ecological system capable of absorbing shocks and maintaining functionality (Walker & Salt, 2012).

In Romania and Moldova, rural resilience is shaped by several structural constraints, including fragmented land ownership, dependence on imported energy and fertilisers, the ageing of the rural population, and volatility in agricultural markets. Policy interventions can enhance this resilience by promoting infrastructure investment, education, and agricultural research, as well as supporting local cooperatives and community-based initiatives (OECD, 2020).

Territorial innovation frameworks provide a complementary lens for analysing rural sustainability, emphasising collective learning processes, institutional cooperation, and local knowledge generation (Moulaert & Sekia, 2003). These approaches assume that sustainable development depends not only on natural and physical capital but also on cognitive and social resources that drive innovation in agricultural practices, green technologies, and participatory rural governance (Camagni & Capello, 2013). In Eastern Europe, such models are still emerging, yet offer valuable insights into the territorial dynamics of rural modernisation and sustainable agricultural transition.

Building on these theoretical foundations, this paper introduces the Integrated Rural Sustainability Transition Model (IRSTM), which combines rural resilience and territorial innovation within a single analytical structure. The IRSTM conceptualises rural sustainability as the result of dynamic interactions among three interdependent dimensions:

- the economic dimension, reflecting agricultural productivity, public and private investment, gross value added, and resource efficiency;
- the social dimension, addressing human and social capital quality, agricultural employment, income distribution, and lifelong learning; and
- the environmental dimension, capturing pressures on ecosystems through emissions, chemical input use, water efficiency, and organic farming expansion.

In contrast to conventional assessment methods, the IRSTM integrates these dimensions into a systemic framework where transformations in one sphere influence and are simultaneously influenced by the others. This integrated perspective enables an examination of sustainability transitions rather than static conditions, emphasising adaptation and transformation processes over time.

Each dimension is quantified using a composite index derived from normalised and entropy-weighted indicators (OECD, 2008). These indices are aggregated into a synthetic Rural Sustainability Index (RSI) that captures the overall performance of agricultural systems and enables both temporal and cross-national comparisons between Romania and Moldova.

The proposed model advances existing research by providing a comprehensive and replicable framework for evaluating rural sustainability. It reinterprets rural modernisation as a systemic process combining economic progress, social innovation, ecological balance, and institutional resilience. Moreover, the IRSTM facilitates comparative assessments between countries that share similar agricultural profiles yet follow distinct development trajectories, thus offering a robust empirical foundation for evidence-based rural transition policies. In this respect, the model aligns with current theoretical debates on transformative rural change and territorial sustainability transitions (Marsden, 2013; Béné, 2020; FAO, 2017).

DATA AND METHODS

The empirical analysis is based on the construction of composite indices of agricultural sustainability for Romania and Moldova, following the methodological framework recommended by the Organisation for Economic Co-operation and Development (OECD, 2008) for developing synthetic indicators. The procedure involves a standardised sequence of steps, including indicator selection, data normalisation, weight determination, and aggregation into a final index. In this study, these steps were adapted and integrated into a tailored approach referred to as the Integrated Rural Sustainability Transition Model (IRSTM), which operationalises the three fundamental dimensions of sustainability—economic, social, and environmental—within a unified analytical framework.

The data were collected from official international and national statistical databases: FAOSTAT, Eurostat, the National Institute of Statistics (INS, Romania), and the National Bureau of Statistics (BNS, Republic of Moldova). The analysis spans the period from 2014 to 2023, selected based on the consistent availability of comparable indicators for both countries.

Indicator selection was guided by three main criteria: (i) theoretical relevance, consistent with the literature on rural sustainability (OECD, 2008; FAO, 2013; Marsden, 2013; Talukder et al., 2017; Sinisterra et al., 2024; Zhan et al., 2025); (ii) data; availability and comparability between Romania and Moldova; and (iii) the indicator's capacity to capture structural trends within agricultural systems.

Accordingly, the study selected eight economic indicators, eight social indicators, and five environmental indicators, each representing a distinct dimension of agricultural sustainability. Additionally, four environmental efficiency indicators were computed separately to complement the environmental dimension, but were not included in the main composite index.

All indicators were transformed onto a common scale using the min–max normalisation method, which eliminates unit and scale differences and allows direct comparison across variables. The normalised value (Z_{ij}) of indicator (j) for country (i) was calculated as:

$$Z_{ik} = \frac{X_{ij} - \min(X_j)}{\max(X_j) - \min(X_j)}$$

where

Z_{ij} represents the normalized value of indicator j for year i, and iar X_{ij} is the raw value.

For indicators with a negative influence on sustainability (e.g. CO_2 emissions, pesticide use, nutrient losses), the inverse transformation was applied:

$$Z_{ik} = \frac{\max(X_j) - X_{ij}}{\max(X_j) - \min(X_j)}$$

Normalisation ensures that all values lie in the range [0,1], where 1 indicates maximum performance and 0 indicates minimum performance in terms of sustainability.

To avoid the arbitrariness of assigning equal weights, the information entropy method (Zeleny, 1982; OECD, 2008) was used, which measures the degree of uncertainty and variability of each indicator. The calculation steps are as follows:

The proportion of each indicator is calculated:

$$p_{ij} = \frac{Z_{ij}}{\sum_{i=1}^{n} Z_{ij}},$$

The entropy of each indicator is determined:

$$e_j = -k \sum_{i=1}^{n} p_{ij} \ln(p_{ij}),$$

Where:

$k = \frac{1}{\lg(n)}$, and n is the number of years observed (in this case, 10).

Information diversity is calculated:

$$d_j = 1 - e_j$$

The entropic weight of the indicator is determined:

$$w_j = \frac{d_j}{\sum_j d_j}$$

The weights thus obtained reflect the unique informational contribution of each indicator. Indicators with greater variability between years or between countries receive a higher weight, while stable indicators receive a lower weight. These weights are normalized so that = 1).

For each dimension — economic, social, and ecological — an annual composite index was calculated, using the general formula:

$$I_i = \sum_{j=1}^{m} w_j Z_{jt}$$

where:
I_t represents the composite index of the respective dimension for year *t*, *m* is the number of indicators Z_{ij} included, Z_{ij} are normalized values, and w_j are the entropic weights.

This formula was applied to the following indices: Economic Index (E_t), which measures the productive and investment performance of agriculture; Social Index (S_t, which captures employment conditions, income, and human capital; and Environmental Index (EN_t), which evaluates the ecological impact of agricultural activities.

In parallel, a sensitivity variant with equal weights (1/m) was also calculated to verify the robustness of the results. The differences between the two series are minor, which confirms the methodological stability of the indices.

The three-dimensional indices were integrated into a Global Rural Sustainability Index (RSI), by arithmetic aggregation:

$$RSI_t = \frac{1}{3}(E_t + S_t + EN_t)$$

This formula provides a balanced representation of rural sustainability, avoiding the dominance of a single dimension. Alternatively, a weighted aggregation can be used if one wishes to emphasize a component (e.g., environmental) in the comparative analysis.

To assess the robustness of the constructed indices, a sensitivity analysis was performed by comparing the results obtained with entropic and equal weights, as well as the correlation between the composite indices and the reference variables (e.g., agricultural productivity and public investment), to verify the internal consistency of the models. The results confirmed a significant positive correlation between the dynamics of the economic index and agricultural performance, which attests to the validity of the empirical construct.

Accordingly, the study selected eight economic indicators, eight social indicators, five environmental indicators, and four efficiency indicators related to environmental aspects.

Table 1 presents the list of selected indicators used to construct the economic dimension of the composite sustainability index. Each indicator was chosen based on its theoretical relevance, data availability, and capacity to reflect structural transformations in agriculture.

Table 1.

Indicators, selection criteria, and sustainability dimensions

Nr	Indicator	Unit	Direction	Relevance	Selection criteria
1	Intermediate consumption	million lei	–	Measures input dependency and efficiency of resource use.	Sensitivity to structural changes; availability and comparability of data.
2	Investments in agriculture	million lei	+	Reflects sectoral modernization and development capacity.	Conceptual and policy relevance (CAP, SDG 2).
3	Government expenditure on agriculture	% of GDP	+	Indicates the level of public support for the agricultural sector.	Policy relevance and cross-country comparability.
4	Gross value added (GVA) in agriculture	million lei	+	Measures the overall economic performance of the agricultural sector.	Data availability and statistical robustness.
5	Efficiency ratio (GVA/IC)	coefficient	+	Indicator of economic efficiency—value added per unit of cost.	Theoretical relevance and interpretability.

6	Crop yield	kg/ha	+	Measures production performance and technological efficiency.	Sensitivity to technological and structural changes.
7	Agricultural GVA per worker	lei/worker	+	An indicator of labor productivity in agriculture.	Theoretical relevance; temporal and territorial comparability.
8	Agricultural GVA per hectare	lei/UAA	+	Reflects land-use efficiency and productivity.	Theoretical relevance; regional sensitivity.

Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

Table 2 presents the set of social indicators included in the IRSTM framework, capturing demographic dynamics, labour structure, and human capital development in rural areas.

Table 2.
Selection of social indicators

Nr	Indicator	Unit	Direction	Relevance	Selection criteria
1	Rural population	number	+	Reflects rural vitality, demographic density, and population stability.	Availability and conceptual relevance.
2	Male rural population	number	±	Indicates demographic structure and labour force composition.	Availability and statistical comparability.
3	Rural employed population	number	+	Measures employment and social integration in rural areas.	Theoretical relevance and social sensitivity.
4	Agricultural employment	number	±	Reflects economic dependency on agriculture and structural vulnerability.	Conceptual relevance; redundancy tested for robustness.
5	Adult participation in lifelong learning	%	+	Indicates human capital investment and adaptability of the rural workforce.	Theoretical relevance (human capital theory); policy relevance (SDG 4).
6	Gross monthly wage in agriculture	lei	+	Reflects economic attractiveness and income level in rural sectors.	Socio-economic relevance and cross-country comparability.
7	Rural immigrants	number	+	Indicates rural revitalisation through positive demographic mobility.	Social relevance; sensitivity to migration policy.
8	Rural emigrants	number	–	Measures the loss of rural human capital and depopulation trends.	Social relevance; cross-country comparability.

Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

Table 3 summarises the set of environmental indicators selected for the IRSTM model. The indicators capture both the pressure of agricultural activities on ecosystems and the efficiency of resource use, in line with the OECD (2008) and FAO (2013) sustainability assessment frameworks.

Table 3.

Selection of Environmental Indicators

	Subgrup	Indicator	Unit	Direction	Relevance	Selection criteria
1	Emissions	Total emissions	%	–	Represents the overall pressure of agriculture on the environment.	Conceptual relevance; temporal data availability.
2		Emissions per capita	t/cap	–	Reflects the intensity of pollution per person.	International comparability and consistency.
3		Emissions per agricultural area	t/ha	–	Indicates ecological pressure on cultivated land.	Sensitivity to environmental efficiency.
4	Pesticides	Pesticide use on cultivated land	kg/ha	–	Measures the chemical intensity of agricultural practices.	Environmental and policy relevance (SDGs 12, 15).
5	Nutrients	Use N per ha	kg/ha	–	Indicates soil and water pollution from nitrogen inputs.	Ecological relevance; data availability.
6		Use P_2O_5 per ha	kg/ha	–	Reflects nutrient runoff and impact on aquatic ecosystems.	Conceptual relevance; sensitivity to eutrophication.
7		Use K_2O per ha	kg/ha	–	Captures nutrient balance and soil fertility.	Ecological relevance and completeness of the nutrient dataset.
8	Irrigation	Area equipped for irrigation	thousand ha	+	Indicates adaptive capacity to climate change.	Policy relevance; temporal comparability.
9		Effectively irrigated area	thousand ha	+	Measures the efficiency of irrigation infrastructure use.	Statistical comparability; data availability.
10	Organic farming	Organic agricultural area	thousand ha	+	Reflects the transition toward sustainable farming practices.	Conceptual and policy relevance (SDGs 2, 15).
11		Organic certified area	thousand ha	+	Indicates compliance with environmental standards.	Policy relevance; cross-country comparability.
12		Organically cultivated area	thousand ha	+	Reflects the expansion of sustainable agricultural production.	Sensitivity to green policy implementation.
13		Certified organic cultivated area	thousand ha	+	Indicates the quality of sustainable agricultural management.	Conceptual and statistical relevance.
14		Organic grasslands	thousand ha	+	Contributes to biodiversity and ecosystem preservation.	Ecological and policy relevance.
15		Organically certified grasslands	thousand ha	+	Confirm the sustainability of ecosystems.	Conceptual relevance and availability.

16	Environmental efficiency	Emissions per unit of agricultural production	kg/Int$	–	Reflects the environmental efficiency of agricultural production.	Theoretical and statistical relevance.
17		Pesticide use by production value	g/Int$	–	Measures the intensity of chemical input use.	Ecological relevance; cross-country comparability.
18		N, P, K used by production value	g/Int$	–	Indicates the efficiency of nutrient use in agriculture.	Conceptual relevance; data availability.
19		Water use efficiency in agriculture	USD/m³	+	Measures the economic efficiency of water resources.	Ecological and economic relevance.

Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data.

Research Hypotheses: Grounded in the theoretical foundations and structure of the Integrated Rural Sustainability Transition Model (IRSTM), the study advances the following hypotheses to guide empirical validation:

H1. Economic performance is expected to exert a positive influence on the overall level of rural sustainability. Rationale: Improvements in agricultural productivity, investment intensity, and the efficiency of resource utilisation are anticipated to strengthen both economic resilience and the sustainability of rural systems (OECD, 2020; Marsden, 2013).

H2. Social advancement plays a significant role in the sustainability of rural regions. Rationale: Higher educational attainment, diversified employment, and improved rural income foster adaptability and social cohesion, key drivers of sustainable transformation (Wilson, 2010; Darnhofer, 2014).

H3. Environmental outcomes are negatively affected by intensive farming practices but can be enhanced through efficiency gains and ecological management. Rationale: Decreasing emissions and chemical inputs, together with more efficient irrigation and the expansion of organic farming, are expected to improve ecological performance (FAO, 2013; Folke, 2016).

H4. The three dimensions of sustainability—economic, social, and environmental—are interlinked and exert reciprocal effects. Rationale: Rural sustainability emerges from maintaining a systemic balance between productivity, social inclusion, and ecological integrity (Béné, 2020; OECD, 2008).

H5. Romania's overall sustainability index (RSI) is hypothesised to exceed that of Moldova, owing to institutional convergence and EU policy alignment. Rationale: Integration into the Common Agricultural Policy (CAP) provides Romania with greater financial and regulatory mechanisms for sustainable agricultural transition, whereas Moldova's institutional limitations slow this process (World Bank, 2022).

The hypotheses above summarise the expected relationships among the three sustainability dimensions. They provide the empirical foundation for testing the Integrated Rural Sustainability Transition Model (IRSTM) using composite indices and comparative analysis between Romania and Moldova.

MAIN RESULTS

The subsequent section presents the empirical findings derived from applying the Integrated Rural Sustainability Transition Model (IRSTM) to Romania and Moldova from 2014 to 2023. Following the methodological procedure outlined above, composite indices were developed for each of the three sustainability dimensions—economic, social, and environmental—using normalised indicators and entropy-based weights.

The empirical analysis proceeds in three stages. First, each dimension is examined separately to trace temporal evolution and cross-country variations in performance. Second, the aggregated Rural Sustainability Index (RSI) provides an integrated view of agricultural sustainability across both cases. Finally, a sensitivity assessment tests the robustness of the composite results under alternative weighting assumptions, while a supplementary environmental efficiency index refines the evaluation of ecological outcomes.

Together, these results aim to uncover the main structural disparities and transition dynamics that shape rural development in Romania and Moldova, providing quantitative evidence to support subsequent theoretical and policy-oriented discussions.

Table 4.

Composite economic index (E_t) – Romania and Moldova, 2014–2023

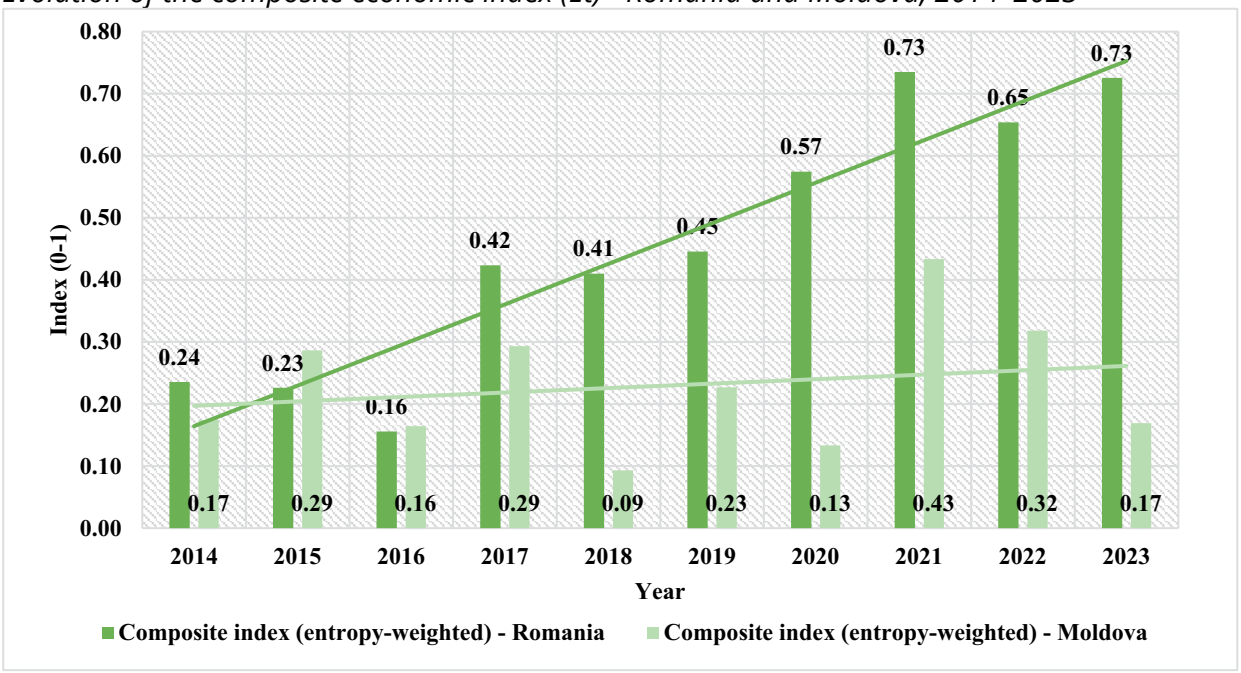
Year	Composite index (entropy-weighted) - Romania	Composite index (entropy-weighted) - Moldova
2014	0.236	0.174
2015	0.226	0.286
2016	0.156	0.164
2017	0.423	0.293
2018	0.410	0.093
2019	0.446	0.227
2020	0.574	0.133
2021	0.735	0.433
2022	0.654	0.318
2023	0.726	0.169

Note: Composite economic index (Et) was calculated based on eight indicators: E1 - intermediate consumption, E2 - agricultural investment, E3 - government expenditure on agriculture, E4 - gross value added, (E5 = GVA/CI) - resource efficiency crop, E6) – yield, E7 - agricultural GVA per worker, and E8 - agricultural GVA per hectare. The weights were determined using the information entropy method (OECD, 2008).

Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

Figure 1.

Evolution of the composite economic index (Et) - Romania and Moldova, 2014–2023



Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

The results presented in Table 4 and Figure 1 indicate a positive trend in the economic composite index in Romania, which increased from 0.236 in 2014 to 0.726 in 2023. This upward trend reflects the intensification of both public and private investments in agriculture, the growth of gross value added, and improvements in resource-use efficiency.

In Moldova, the economic index displays a more fluctuating pattern, remaining at lower levels (between 0.13 and 0.43) throughout the analysed period. These dynamics suggest the persistence of structural constraints such as land fragmentation, limited capital accumulation, and restricted access to external financing.

The consistent gap between the two countries confirms the economic modernisation divide, yet the upward trajectories in both cases indicate a partial convergence toward a more productive and sustainable agricultural model, particularly after 2020, when public investment and policy alignment became more evident.

While economic indicators reveal gradual convergence, the social dimension provides further insights into disparities in human capital, labour dynamics, and rural demographic stability.

Table 5.

Composite social index (S_t) – Romania and Moldova, 2014–2023

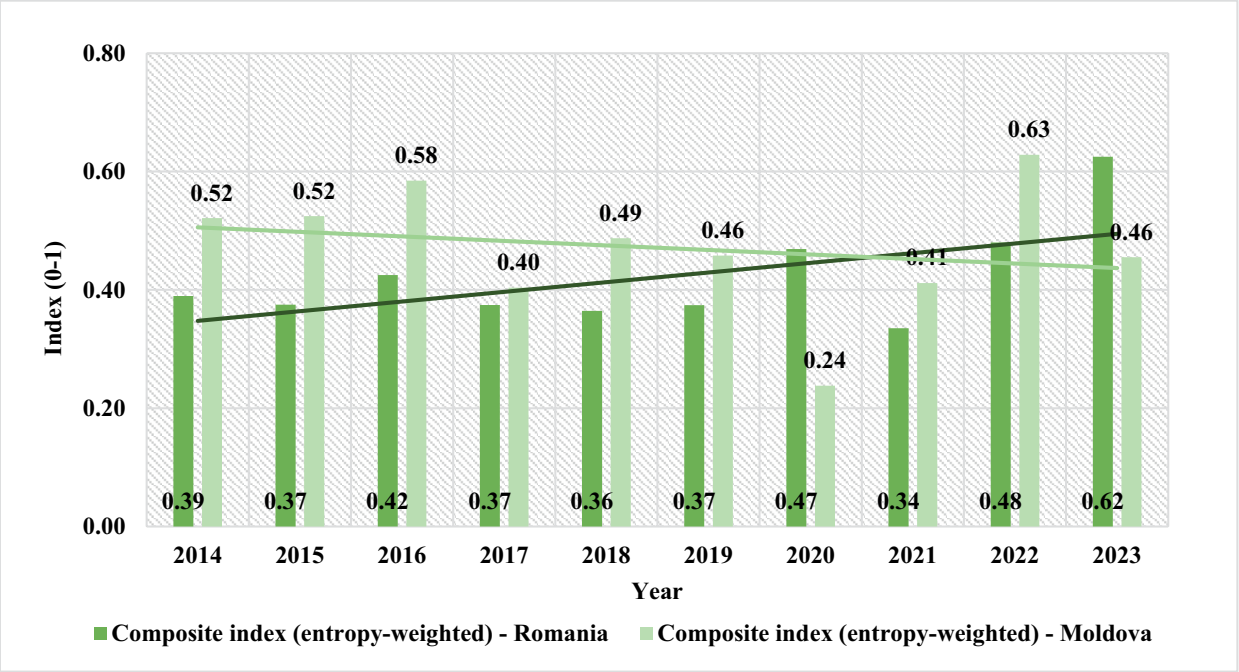
Year	Composite index (entropy-weighted) - Romania	Composite index (entropy-weighted) - Moldova
2014	0.390	0.521
2015	0.375	0.525
2016	0.425	0.585
2017	0.374	0.404
2018	0.364	0.487
2019	0.374	0.458
2020	0.469	0.238
2021	0.335	0.412
2022	0.480	0.628
2023	0.625	0.455

Note: The composite social index (S_t) was calculated based on eight indicators: S1 - Rural population; S2 - Rural male population; S3 - Employed rural population; S4 - Agricultural employment; S5 - Adult participation in lifelong learning; S6 -Average monthly wage in agriculture; S7 - Rural immigrants; S8 - Rural emigrants. The weights were determined using the information entropy method (OECD, 2008).

Source: own calculations based on SNI data, Tempo online (Romania), NBS (Moldova).

Figure 2.

Evolution of the composite social index (S_t) - Romania and Moldova, 2014–2023



Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

The results presented in Table 5 and Figure 2 reveal a complex dynamic of the social dimension of rural sustainability in Romania and Moldova. During the period 2014–2016, Moldova recorded higher values of the social index (0.52–0.58), mainly driven by labour mobility, external remittances, and a higher share of the rural employed population. In contrast, Romania exhibited a slower but more stable trajectory, reflecting a gradual transition toward human capital consolidation and increasing agricultural wages.

After 2019, the trend reversed: Moldova's social index declined sharply in 2020 (0.24) due to pandemic-related restrictions and labour reallocation, while Romania experienced a steady increase—from 0.37 in 2018 to 0.62 in 2023. This evolution reflects improved employment conditions, rising income levels, and greater participation in continuing vocational training.

Overall, the values of the social index indicate a partial convergence between the two countries, although

structural disparities persist, particularly in areas such as rural emigration and access to lifelong learning opportunities. Romania appears to be moving toward a faster and more sustainable social transition, supported by European cohesion policies and increased investment in human resources.

While social indicators highlight gradual progress and partial convergence, the environmental dimension presents a more heterogeneous picture, reflecting the divergent ecological trajectories of the two countries.

Table 6.

Composite environmental index (EN_t) – Romania and Moldova, 2014–2023

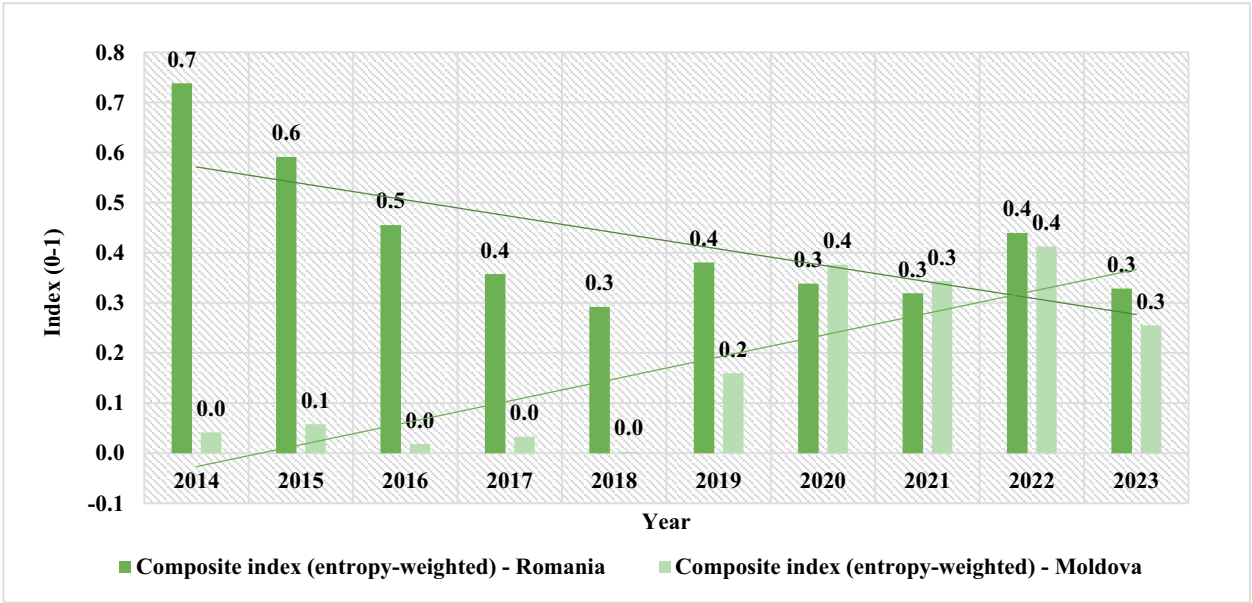
Year	Composite index (entropy-weighted) - Romania	Composite index (entropy-weighted) - Moldova
2014	0.738	0.041
2015	0.591	0.058
2016	0.455	0.018
2017	0.357	0.033
2018	0.292	0.002
2019	0.381	0.160
2020	0.338	0.376
2021	0.319	0.343
2022	0.440	0.412
2023	0.328	0.255

Note: The composite environmental index (ENt) was calculated based on 5 indicators: EN_1 - Emissions (Emissions Share (CO2eq) (AR5); Emissions per capita; Emissions per area of agricultural land); EN2 - Pesticide use per cultivated area; EN3 – Nutrients (Nitrogen use per ha; Phosphorus use per ha; Potassium use per ha); EN4 – Water (Land area equipped for irrigation; Agriculture area actually irrigated); EN5 – Organic agriculture (Agriculture area under organic agric; Agriculture area certified organic; Cropland area under organic agric.; Cropland area certified organic; Perm. meadows & pastures area under organic agric.; Perm. meadows & pastures area certified organic). The weights were determined by the information entropy method (OECD, 2008).

Source: own calculations based on FAOSTAT data

Figure 3.

Evolution of the composite environmental index (EN) - Romania and Moldova, 2014-2023



Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

The results presented in Table 6 and Figure 3 illustrate the contrasting evolution of the environmental dimension of agricultural sustainability in Romania and Moldova. During the period 2014–2016, Romania recorded relatively high environmental index values (0.74–0.45), reflecting more efficient resource use and the gradual expansion of certified organic agricultural areas. However, after 2016, a steady downward trend was observed, driven by production intensification, increased use of chemical inputs, and declining ecological efficiency within the agricultural sector.

In contrast, Moldova started from a very low level (0.04 in 2014) but registered a slow and steady increase up to 2022 (0.41). This evolution can be attributed to a reduction in the use of pesticides and fertilisers, the expansion of organic farming, and a decline in agricultural emissions per unit of land area. Nevertheless, the overall level of environmental sustainability remains below that of Romania, despite the positive trajectory.

Trend-line analysis indicates a partial ecological convergence between the two countries, generated not by simultaneous improvement but by the decline in Romania's environmental performance and the gradual improvement in Moldova's indicators. This pattern underscores the need for more robust environmental policies that focus on reducing emissions and promoting organic agriculture in both states.

To complement the assessment of ecological sustainability, a series of derived indicators was computed to evaluate the efficiency of environmental resource use in agriculture. These indicators relate emissions, pesticide use, and nutrient consumption to the value of agricultural production (Int$), providing a measure of the ecological intensity of agricultural output.

The results indicate a general improvement in environmental efficiency in both countries, albeit at varying rates. In Romania, the decline in emissions and pesticide use per unit of agricultural output suggests a relative decoupling between economic growth and environmental pressure, although absolute emission levels remain high. In Moldova, environmental efficiency exhibits greater variability, influenced by fluctuations in agricultural output and structural constraints, including limited irrigation infrastructure and low adoption of eco-friendly practices.

Overall, these findings support the argument that environmental efficiency represents a cross-cutting dimension of rural sustainability, essential for understanding the transition toward low-emission, resource-efficient agriculture. After assessing the three individual dimensions, the next step aggregates them into a comprehensive measure — the Rural Sustainability Index (RSI) — capturing the overall dynamics of sustainable transition in both countries.

Table 7.

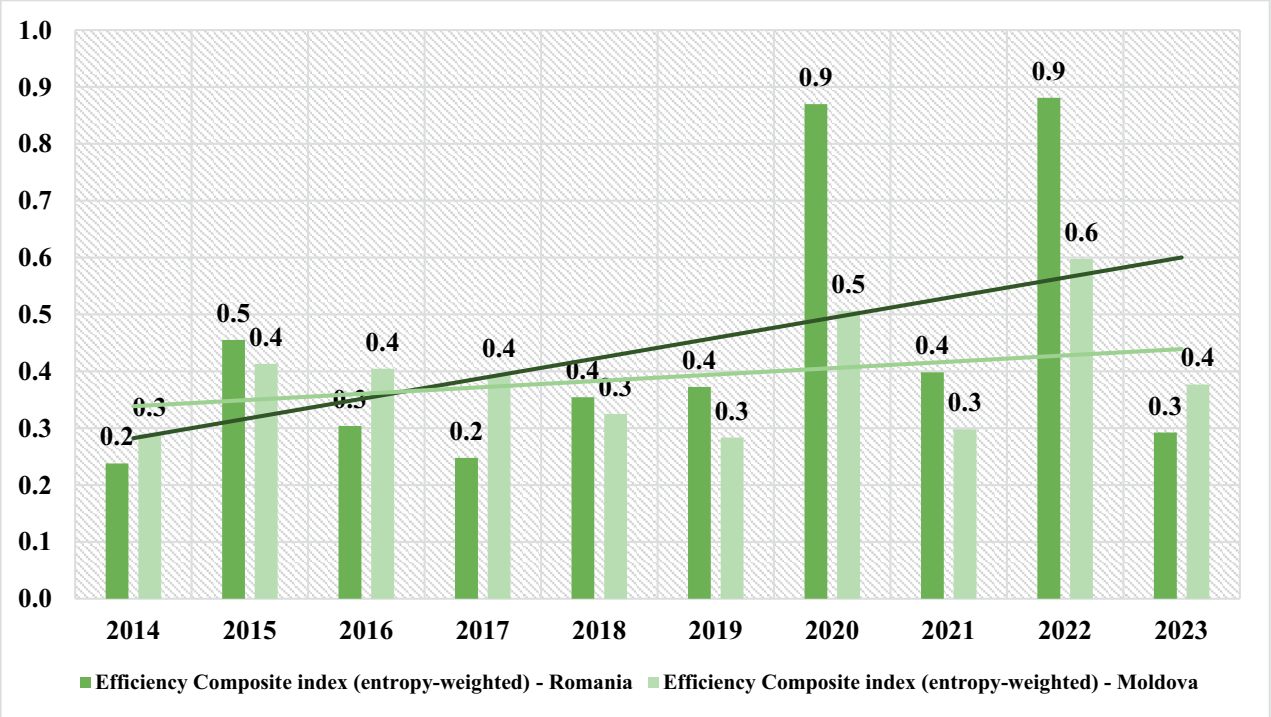
Compozit environmental efficiency index (EEN_t) – România and Moldova, 2014–2023

Year	Composite index (entropy-weighted) - Romania	Composite index (entropy-weighted) - Moldova
2014	0.238	0.289
2015	0.455	0.413
2016	0.304	0.404
2017	0.248	0.393
2018	0.355	0.325
2019	0.372	0.283
2020	0.870	0.506
2021	0.398	0.298
2022	0.881	0.598
2023	0.292	0.377

Note: The composite environmental efficiency index (EEN_t) was calculated based on four indicators: EEN_1 – Emissions related to the value of agricultural production; EEN_2 – Pesticide use related to the value of agricultural production; EEN_3 – Nutrient use (N, P_2O_5, K_2O) related to the value of agricultural production; EEN_4 – Water use efficiency in agriculture. The weights were determined using the information entropy method (OECD, 2008).

Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

Figure 4.
Evolution of the composite environmental efficiency index (EEN_t), Romania and Moldova, 2014-2023



Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

The results presented in Table 7 and Figure 4 reveal a mixed evolution of environmental efficiency in Romania and Moldova over the period from 2014 to 2023. In the early years (2014–2016), both countries recorded moderate levels of efficiency, ranging between 0.25 and 0.40. Moldova displayed slightly higher values, mainly due to the extensive nature of its agriculture and the lower use of chemical inputs, particularly pesticides and fertilisers.

After 2019, a significant increase in environmental efficiency was observed in Romania, reaching peaks of 0.87–0.88 in 2020 and 2022. This trend can be explained by the modernisation of agricultural infrastructure, the adoption of precision farming technologies, the digitalisation of production processes, and the implementation of conservation agriculture practices. The high index values suggest a partial decoupling between economic growth and environmental pressure, indicating progress toward a more sustainable agricultural model. Meanwhile, Moldova recorded a positive but slower evolution, rising from 0.29 in 2014 to 0.60 in 2022, followed by a moderate decline in 2023. This pattern reflects improvements in rational water use and reductions in emissions per unit of output, while also highlighting the structural vulnerabilities of Moldovan agriculture, which remains dependent on climatic conditions and limited technological investment.

Trend-line analysis points to a general improvement in environmental efficiency in both countries, although Romania exhibits greater variability, typical of transitional processes toward high-performance technologies. Overall, the results suggest that environmental efficiency represents a transversal dimension of rural sustainability, complementing absolute ecological indicators with a relative perspective that relates environmental pressure to economic performance.

Although the efficiency index was not included in the computation of the Integrated Rural Sustainability Index (RSI), it provides valuable supplementary information regarding the quality of the ecological transition. In the medium term, integrating environmental efficiency into the global analytical framework could enhance the precision of rural resilience assessments and the evaluation of the decoupling of agricultural growth from environmental impact (Ding et al., 2016; FAO, 2019).

To assess the overall sustainability level of rural agriculture, the Integrated Rural Sustainability Index (RSI) was calculated, aggregating the three fundamental dimensions — economic (E), social (S), and environmental (M). This approach provides a comprehensive overview of rural performance and enables a comparative analysis between Romania and Moldova during the period 2014–2023. The model adheres to the OECD (2008) methodological framework for composite index construction, ensuring a balanced weighting of the three core dimensions of sustainable development.

Table 8.

Integrated Rural Sustainability Index (RSI) – Romania and Moldova, 2014–2023

Country	Year	ECONOMIC (E)	SOCIAL (S)	ENVIRONMENT (EN)	RSI_t
RO	2014	0.236	0.390	0.738	0.454
RO	2015	0.226	0.375	0.591	0.397
RO	2016	0.156	0.425	0.455	0.345
RO	2017	0.423	0.374	0.357	0.385
RO	2018	0.410	0.364	0.292	0.355
RO	2019	0.446	0.374	0.381	0.400
RO	2020	0.574	0.469	0.338	0.461
RO	2021	0.735	0.335	0.319	0.463
RO	2022	0.654	0.480	0.440	0.524
RO	2023	0.726	0.625	0.328	0.560
MD	2014	0.174	0.521	0.041	0.246
MD	2015	0.286	0.525	0.058	0.290
MD	2016	0.164	0.585	0.018	0.256
MD	2017	0.293	0.404	0.033	0.243
MD	2018	0.093	0.487	0.002	0.194
MD	2019	0.227	0.458	0.160	0.282
MD	2020	0.133	0.238	0.376	0.249
MD	2021	0.433	0.412	0.343	0.396
MD	2022	0.318	0.628	0.412	0.453
MD	2023	0.169	0.455	0.255	0.293

Note: The RSI was calculated as the arithmetic mean of the three dimensions (economic, social and environmental), using composite indices normalised and weighted by the information entropy method (OECD, 2008).

Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

The results presented in Table 8 and Figure 5 highlight significant differences between the two countries, both in terms of the average level of rural sustainability and its temporal dynamics. In Romania, RSI values fluctuated between 0.34 and 0.56, showing a general upward trend after 2019. During the first part of the period (2014–2018), sustainability levels were moderate (RSI ≈ 0.35–0.40), reflecting an agricultural economy still undergoing structural modernisation, accompanied by high environmental pressures. After 2020, Romania experienced a steady increase in the integrated index, reaching a value of 0.56 in 2023, the highest recorded during the decade. This positive trajectory results from the combined effect of economic advancement, improved rural social conditions, and, to a lesser extent, stabilised ecological performance.

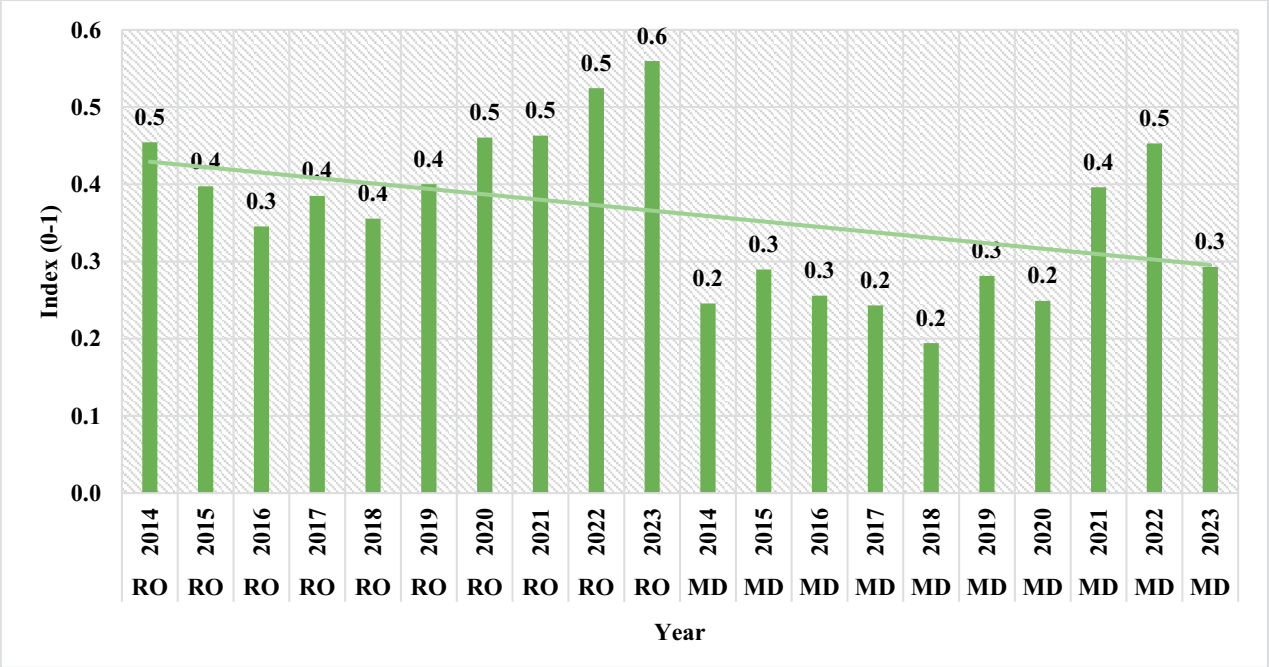
In Moldova, RSI values ranged between 0.19 and 0.45, remaining consistently below Romania's levels throughout the entire period. Between 2014 and 2018, the index registered very low values (0.19–0.29), indicating limited sustainability, which was largely determined by structural vulnerabilities in the agricultural economy and a pronounced environmental impact. After 2019, Moldova exhibited a slight recovery, reaching 0.45 in 2022, followed by a moderate decline to 0.29 in 2023. This pattern reflects the dependence on climatic conditions, the volatility of public investment, and institutional constraints in implementing environmental policies.

From a comparative perspective, Romania exhibits an upward trajectory of rural sustainability, whereas Moldova displays a fluctuating trend, albeit with gradual improvements in certain years. The trend-line analysis (Figure 5) reveals a slow convergence, though a structural gap persists: Romania's RSI values consistently exceed Moldova's by 0.15–0.20 points. This finding confirms the hypothesis of an asymmetric transition toward sustainability between the two states — Romania moving toward a modernised rural model anchored in EU agricultural and environmental policies (CAP, Green Deal), while Moldova continues to face challenges related to agricultural infrastructure and rural social cohesion.

From a policy perspective, the results suggest the need for an integrated rural development strategy in Moldova, focusing on public investment, agricultural digitalisation, expansion of organic farming, and vocational training programs for rural populations. In Romania's case, maintaining the current progress requires redirecting policies toward reducing environmental pressure and strengthening rural resilience.

Figure 5.

Evolution of the Integrated Rural Sustainability Index (RSI) – Romania and Moldova, 2014–2023



Source: Own calculations based on FAOSTAT, INS data – Tempo online, Statistics of Moldova, and Eurostat data

Romania, with an RSI value above 0.5 after 2020, demonstrates a stable tendency toward rural sustainability, supported by agricultural economic growth and the strengthening of rural social capital. Moldova, with RSI values below 0.35 in most years, exhibits a fragile sustainability pattern, characterised by an imbalance between relatively good social performance and weak environmental efficiency. Structurally, the average RSI for 2014–2023 was 0.44 for Romania and 0.29 for Moldova. The overall trend is positive but slow, and the sustainability gap persists, largely due to disparities in investment levels, infrastructure development, and institutional integration.

To assess the stability and robustness of the results, a sensitivity analysis of the Integrated Rural Sustainability Index (IRSI) was conducted, following the methodological recommendations of the OECD (2008). The purpose of this analysis is to examine the extent to which the final RSI values are affected by changes in the weighting scheme applied to the three fundamental dimensions: economic (E), social (S), and environmental (EN).

The baseline model employs entropy-based weights, determined through the internal informational distribution of each indicator set. For verification, the RSI was recalculated using equal weights (1/3 for each dimension), and the comparative results are presented below:

$$RSI_{t\_Romania}^{entropie} = \frac{1}{3}(E_t + S_t + EN_t) = \frac{1}{3}(0{,}459 + 0{,}421 + 0{,}424) = 0{,}435$$

$$RSI_{t\_Romania}^{egal} = \frac{1}{3}(E_t + S_t + EN_t) = \frac{1}{3}(0{,}480 + 0{,}488 + 0{,}456) = 0{,}475$$

$$RSI_{t\_Moldova}^{entropie} = \frac{1}{3}(E_t + S_t + EN_t) = \frac{1}{3}(0{,}229 + 0{,}471 + 0{,}170) = 0{,}290$$

$$RSI_{t\_Moldova}^{egal} = \frac{1}{3}(E_t + S_t + EN_t) = \frac{1}{3}(0{,}270 + 0{,}488 + 0{,}261) = 0{,}340$$

The results show that the differences between the two weighting scenarios are minor: for Romania, RSI values range from 0.435 (entropy weighting) to 0.475 (equal weighting), while for Moldova, they vary from 0.290 to 0.340. These small deviations (below ±0.05 points) confirm the robustness of the model and the internal stability of the index.

Therefore, it can be concluded that the entropy-based method provides a balanced distribution of indicator influence without significantly altering the comparative results. The obtained values confirm that the internal structure of the RSI is both coherent and reliable, and that the conclusions regarding the relative performance of Romania and Moldova remain valid regardless of the weighting scheme applied.

This methodological consistency supports the use of entropy-weighted composite indices as robust tools for comparative rural sustainability analysis (OECD, 2008; Mo & Li, 2025).

DISCUSSIONS

The comparative analysis reveals notable structural disparities between Romania and Moldova in their respective pathways toward rural sustainability and agricultural modernisation. The Integrated Rural Sustainability Index (IRSI) supports the hypothesis of an asymmetric transition: Romania has reached a more consolidated stage of rural transformation, whereas Moldova follows a more fragmented trajectory, shaped by contextual and institutional constraints.

In Romania, the consistent improvement of economic and social indicators after 2018 reflects the influence of public and EU-funded agricultural investments, the modernisation of rural infrastructure, and the strengthening of institutional capacities for implementing development policies. These advances are closely tied to the country's participation in the Common Agricultural Policy (CAP) and its alignment with the European Green Deal, both of which have enhanced productive efficiency and stimulated rural diversification. Nonetheless, the environmental pillar of sustainability remains fragile, as it is affected by pressures on soil and water resources, persistent pesticide use, and elevated levels of agricultural emissions.

In Moldova, the RSI profile reveals a reversal of priorities, with the social component performing relatively better, indicating the adaptability of rural communities and lower inequality, while the economic and environmental dimensions remain considerably weaker. This pattern reflects an extensive agricultural model that is highly exposed to external shocks, market volatility, and climatic fluctuations—factors that undermine both income stability and environmental performance.

Viewed through the framework of rural resilience (Wilson, 2010; Darnhofer, 2014), Romania appears to be advancing toward an adaptive form of resilience characterised by technological innovation, diversification of rural functions (including agrotourism, bioeconomy, and renewable energy), and enhanced institutional coordination. Conversely, Moldova remains in a phase of reactive resilience, focused on maintaining social stability but constrained in its capacity for structural transformation.

From the perspective of territorial innovation models (Camagni & Capello, 2013; Moulaert & Sekia, 2003), Romania is converging toward a decentralised pattern of territorial innovation, supported by regional networks and European financing instruments. In contrast, Moldova continues to rely on a centralised and sector-oriented governance model, marked by limited local participation and weak integration into European value chains.

The comparative behaviour of the composite indices indicates a co-evolution between the economic and social dimensions, but a relative decoupling from the environmental dimension—a phenomenon observed in both countries. This divergence suggests that progress toward sustainability is driven less by resource endowments and more by governance quality and policy coherence (Marsden, 2013).

From a strategic perspective, the findings provide several theoretical and policy implications. They confirm the integrated model of rural transition based on the interdependence among the three sustainability pillars, and they demonstrate the empirical strength of entropy-based composite indices for cross-country agricultural analysis. Furthermore, they indicate that sustainable rural modernisation relies not only on economic performance but also on achieving a balanced interaction among competitiveness, social inclusion, and environmental protection. The results also underline the importance of multi-level policy strategies—spanning local, regional, and transnational levels—to promote territorial cooperation and encourage rural innovation.

Ultimately, the study reaffirms that rural sustainability is a dynamic, non-linear process shaped by the interplay between economic, institutional, and ecological subsystems. The transition toward sustainability should thus be viewed as an adaptive and co-evolutionary process in which resilience, territorial innovation, and social equity become the central mechanisms for reinforcing rural development across Eastern Europe.

CONCLUSIONS

The comparative assessment of rural sustainability in Romania and Moldova underscores the asymmetric nature of their transition toward sustainable agricultural and rural development. Romania has entered a phase of consolidation, defined by structural modernisation, institutional maturity, and gradual alignment with the objectives of the European Green Deal. Conversely, Moldova remains at an earlier and more uneven stage of transition, constrained by agricultural fragmentation, limited financial and technological capacity, and the incomplete development of policy instruments supporting sustainability.

The findings demonstrate that economic growth and rural modernisation do not inherently lead to sustainability unless accompanied by enhanced ecological efficiency and stronger social cohesion. Romania's higher RSI values after 2020 confirm the positive impact of integrated rural and agricultural policies, yet persistent environmental vulnerabilities highlight the need to reinforce ecological governance. In Moldova, the more substantial contribution of the social dimension reflects the adaptability of rural communities but also exposes the dependency of the rural economy on external drivers such as remittances, climatic fluctuations, and cross-border market dynamics.

From a theoretical standpoint, the research validates the Integrated Rural Sustainability Transition Model (IRSTM) as a comprehensive framework for assessing the multidimensional structure of sustainability. By integrating economic, social, and environmental indicators through an entropy-based composite approach, the model provides a robust and comparable analytical instrument that captures both convergence and divergence among countries sharing similar agricultural profiles but differing institutional trajectories.

The main limitations of this study stem from data availability and comparability, particularly regarding environmental indicators, where inconsistencies in frequency and measurement persist between the two countries. The absence of detailed longitudinal or micro-level data limits the ability to identify local variations and causal linkages between policies and sustainability outcomes. Moreover, the national scale of analysis may obscure regional disparities and differences in territorial resilience.

Future research should extend the application of the IRSTM to regional and local contexts, employ spatial and panel data methods to identify sustainability determinants, and develop predictive models linking public investment, human capital, and ecological performance. Another promising direction is to evaluate the effects of European agricultural and environmental policies on rural convergence processes across Eastern Europe.

From an applied perspective, the study emphasises that sustainable rural modernisation requires coherent governance, balanced investment in infrastructure, human capital, and environmental protection, as well as strengthened cross-border cooperation between Romania and Moldova. Enhancing institutional convergence and fostering innovation-oriented policies could accelerate the transition toward resilient, inclusive, and environmentally responsible rural systems throughout the region.

REFERENCES

Béné, C. (2020). *Resilience of local food systems and links to food security: A review of some important concepts in the context of COVID-19 and other shocks. Food Security, 12*(4), 805–822. https://doi.org/10.1007/s12571-020-01076-1

Biroul Naţional de Statistică al Republicii Moldova (BNS). (2023). *Banca de date statistice: Agricultură şi mediu, 2014–2023*. https://statbank.statistica.md

Camagni, R., & Capello, R. (2013). Regional innovation patterns and the EU regional policy reform: Toward smart innovation policies. *Growth and Change, 44*(2), 355-389. https://onlinelibrary.wiley.com/doi/epdf/10.1111/grow.12012

Darnhofer, I. (2014). Resilience and why it matters for farm management. *European Review of Agricultural Economics, 41*(3), 461-484. https://doi.org/10.1093/erae/jbu012

Ding, L., Shao, Z., Zhang, H., Xu, C., & Wu, D. (2016). *A Comprehensive Evaluation of Urban Sustainable Development in China Based on the TOPSIS-Entropy Method. Sustainability*, *8*(8), 746. https://doi.org/10.3390/su8080746

Ellis, F. (2000). *The Determinants of Rural Livelihood Diversification in Developing Countries*. Journal of Agricultural Economics, 51, 289-302. https://doi.org/10.1111/j.1477-9552.2000.tb01229.x

Eurostat. (2023). *Sustainable rural development indicators in the EU*. Statistical Office of the European Union. https://ec.europa.eu/eurostat

FAO (2013). *SAFA: Sustainability assessment of food and agriculture systems – Guidelines, version 3.0*. Food and Agriculture Organization of the United Nations. https://openknowledge.fao.org/handle/20.500.14283/i3957e

FAO (2017). *Measuring sustainable agricultural productivity: A review of relevant frameworks*. Food and Agriculture Organization of the United Nations. https://openknowledge.fao.org/

FAO (2019). *Measuring agricultural sustainability: Environmental and economic indicators framework*. https://www.fao.org/sustainability

Folke, C. (2016). *Resilience (Republished). Ecology and Society, 21*(4), 44. https://doi.org/10.5751/ES-09088-210444

Food and Agriculture Organization of the United Nations (FAOSTAT). (2023). *FAOSTAT Database: Agriculture, Environment and Emissions, 2014–2023*. https://www.fao.org/faostat

Institutul Naţional de Statistică (INS). (2023). *Baza de date TEMPO-Online: Statistica sociala. Statistica economica http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table*

Marsden, T. (2013). *Sustainable place-making for sustainability science: The contested case of agri-food and urban–rural relations. Sustainability Science, 8*(2), 213–226. https://doi.org/10.1007/s11625-012-0186-0

Milestad, R., & Darnhofer, I. (2008). *Building farm resilience: The prospects and challenges of organic farming*. Journal of Sustainable Agriculture, 22(3), 81-97. https://doi.org/10.1300/J064v22n03_09

Mo, W., Xiao, S., & Li, Q. (2025). *AHP–Entropy Method for Sustainable Development Potential Evaluation and Rural Revitalization:* Evidence from 80 Traditional Villages in the Cantonese Cultural Region, China. *Sustainability*, *17*(21), 9582. https://doi.org/10.3390/su17219582

Moulaert, F., & Sekia, F. (2003). *Territorial innovation models: A critical survey*. *Regional Studies, 37*(3), 289–302. https://doi.org/10.1080/0034340032000065442

OECD/European Union/EC-JRC (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*, OECD Publishing, Paris, https://doi.org/10.1787/9789264043466-en

OECD. (2020). *Rural well-being: Geography of opportunities*. Organisation for Economic Co-operation and Development. https://doi.org/10.1787/d25cef80-en

Sinisterra-Solís, N. K., Sanjuán, N. Ribal, J. Estruch, V. Clemente, G. Rozakis, S. (2024). *Developing a composite indicator to assess agricultural sustainability: Influence of some critical choices*. Ecological Indicators. 161. 111934. https://doi.org/10.1016/j.ecolind.2024.111934

Talukder, B., W. Hipel, K., & W. van Loon, G. (2017). Developing Composite Indicators for Agricultural Sustainability Assessment: Effect of Normalization and Aggregation Techniques. *Resources*, *6*(4), 66. https://doi.org/10.3390/resources6040066

Walker, B., & Salt, D. (2012). *Resilience thinking: Sustaining ecosystems and people in a changing world* (2nd ed.). Island Press. https://islandpress.org/books/resilience-thinking#desc

Wilson, G. A. (2010). *Multifunctional "quality" and rural community resilience. Transactions of the Institute of British Geographers, 35*(3), 364–381. https://doi.org/10.1111/j.1475-5661.2010.00391.x

World Bank. (2022). *Sustainable agriculture and resource efficiency in Eastern Europe*. Washington, D.C.: The World Bank. https://data.worldbank.org

Zeleny, M. (1982). *Multiple criteria decision making*. McGraw-Hill.

Zhan, L., Huang, X., Xu, Z., & Huang, Z. (2025). *Assessing the Coordination Development Level of Agricultural Economy and Ecology in China*: Regional Disparities, Dynamics, and Barriers. *Agriculture*, *15*(2), 176. https://doi.org/10.3390/agriculture15020176

GREEN FISCAL POLICY IN MOLDOVA: ALIGNMENT WITH THE EUROPEAN UNION STANDARDS FOR SUSTAINABLE TRANSITION

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SUMMARY

Moldova has been a candidate country for European Union (EU) membership since 2022. With this status came the commitment to align its national policies with European standards. This article analyses the current state of green fiscal policy, the actions needed to meet EU requirements, and highlights its role in the green transition and sustainable development. The methodology used includes both a comparative analysis of the legal framework and a quantitative analysis of green tax revenues between 2018 and 2024, the data being selected from the Eurostat and the Ministry of Finance of Moldova databases. The results suggest that fiscal policies are not yet fully integrated into a coherent strategy for financing the green transition. However, progress has been made towards building an environmental taxation system. Several obstacles have been identified. These include the lack of a comprehensive carbon-pricing system, underfunding of green projects, and structural and administrative barriers. This article is relevant due to the main gaps and opportunities for fiscal alignment that have been identified. It was emphasised that the establishment of a carbon pricing system, climate budget tagging (CBT), and extended producer responsibility (EPR) schemes is necessary. The paper provides insights for policy decisions, helping to transform green fiscal policy from a mere revenue-raising tool into an engine for Moldova's sustainable transition.

Keywords: *Moldova, green fiscal policy, ecological taxes, sustainable transition, fiscal instruments, European standards*

INTRODUCTION

The global challenge of climate change has made it imperative to abandon the traditional model of economic development. Based on these considerations, most states have chosen to green their national economies through specific consumption and production models. Fiscal policy, through its instruments, has a central role in this transformation.

In the case of Moldova, although the basic legislative framework exists, green fiscal policy currently operates with major structural deficiencies that limit its contribution to the sustainable transition. Among the most serious dysfunctions are: the absence of a comprehensive carbon pricing system, the extremely low share of pollution and natural resource use taxes in total environmental taxes, the chronic underfunding of environmental protection expenditures, the lack of green budgeting mechanisms and the recycling of environmental tax revenues into dedicated green projects, and limited administrative capacity for effective monitoring, reporting, and collection of these taxes. These shortcomings mean that green fiscal instruments primarily function as a source of general budget revenue, rather than as real levers for changing economic behaviour and reducing emissions.

The central research question of this study is the following: To what extent do the current green fiscal instruments in the Republic of Moldova effectively contribute to financing and accelerating the green transition, and what are the priority reforms needed for full alignment with European Union standards by 2027–2030?

The identified scientific gap lies in the absence of recent systematic analyses, based on 2018–2024 data, that combine a quantitative assessment of environmental tax revenues and structure with a detailed comparative mapping of alignment with key EU instruments (ETD, ETS, CBAM, CBT, EPR) and an examination of the socio-economic effects on consumers, SMEs, and industry. As a result of its international commitments and EU candidate status, Moldova is under pressure to quickly address the inefficiencies in its green fiscal policy. This situation is confirmed by analyses showing that existing fiscal-budgetary instruments are failing to generate significant benefits. Among the causes of this inefficiency are the suboptimal tax structure and the lack of effective mechanisms to incentivise eco-friendly behaviour. Institutional challenges continue to be a major obstacle to policy implementation. This context explains the slow progress in achieving sustainability goals.

Initially, there were a limited number of fiscal instruments that were neither adapted to real needs nor integrated into a clear strategy, and they failed to bring environmental benefits. Subsequently, both the adjustment of the legal and institutional framework and the development of economic stimulus mechanisms compatible with decarbonization objectives are taking place. European states provide instructive examples, such as the comprehensive integration of the polluter-pays principle across all economic sectors. Key measures have also included implementing carbon taxes, reforming environmental funds, and a strategic shift of the tax burden from labour onto pollution. Each of these tools has the potential to improve the environment and the economy.

To meet its commitments to the European Green Deal, Moldova needs to undergo major structural transformations. These efforts are being hampered by climate risks, whose impacts have been amplified by recent crises. These include dependence on imported energy resources and economic vulnerabilities. This article analyses how Moldova's fiscal policy aligns with green and sustainable transition in light of the current accelerated European integration process. The evolution and structure of budget revenues from environmental taxes are examined in relation to green

fiscal instruments in the EU and Moldova. In addition to identifying the primary strategic gaps, obstacles, and opportunities associated with this transition, the paper attempts to evaluate the financial significance of these instruments and their historical development.

Although the analysis is based on official sources and internationally comparable data (Eurostat, Ministry of Finance), certain limitations must be acknowledged: the lack of complete data on private environmental protection expenditures by economic agents and households, the difficulty of precisely quantifying the effects of "carbon leakage" in the absence of a national carbon pricing system, and the predominantly descriptive nature of some segments of the institutional analysis. However, these limitations do not affect the validity of the conclusions and policy recommendations formulated.

LITERATURE REVIEW

Green fiscal policy has been studied by several researchers, who have analysed it through environmental taxes, tax reform, efficiency, and economic growth, among others etc. The theoretical principles of environmental taxation are attributed to the works of Pigou (1920), Pearce (1991), Baumol and Oates (1971), and Mohr (1990). The concept of externalities was introduced into the literature by Pigou (1920), recommending special taxes to correct negative externalities and compensation for enterprises that improve the environment. Pearce (1991) popularised the concepts of green economy, carbon tax, and double dividend, and developed the idea of the potential of environmental taxes to reduce pollution and contribute to the reduction of other taxes. Baumol and Oates (1971) believed that the state can establish a ceiling level of pollution; at the same time, it is necessary to establish a tax or subsidy that allows reaching this level, which implies a uniform price for polluting emissions. Mohr (1990) defined the concept of environmental fiscal policy as a set of instruments, in the form of environmental taxes and/or levies, through which a price can be charged for environmental goods to protect them, either in the form of incentives offered to decrease the overall demand for polluting activities, or to replace polluting substances with less harmful ones.

The European Union is a pioneer in integrating sustainability into fiscal policy. This leadership position is highlighted by the implementation of concrete measures, including the Carbon Border Adjustment Mechanism (CBAM) and the European Green Deal (European Commission, 2025).

Statistical data have shown an increase in the share of environmental taxes in GDP in the EU Member States, the most prominent tax category being the energy and transport taxes. In countries that have registered higher environmental taxes, greenhouse gas emissions have decreased, and at the same time, investment in renewable energy sources has climbed (Carfora et al., 2021; Degirmenci and Yavuz, 2024; Dogan et al., 2023). Moreover, empirical results uncovered a directly proportional relationship between the degree of harmonisation of environmental tax policies and economic efficiency (Glavaški et al., 2023). This contributes to reducing disparities between developed and emerging economies (Antohi et al., 2025). Against this backdrop, there is a need for public policies at the EU level that harmonise the application of green taxes to minimise the social impact that the green transition may have. The EU could externalise its internal environmental policy and use it as an instrument of global influence (Pander Maat, 2024). To avoid externalising emissions by emerging countries, the CBAM is the solution to ensure the EU's competitiveness in international trade (Fontagné and Schubert, 2023).

Some studies argue that environmental taxes have a positive impact on green public investment. Darvas and Wolff (2022) recommend the formation of a green fiscal pact and a green golden rule, by which green public investment would be excluded from the calculation of the budget deficit of states. In order to have the support of the population for green investments, financing them through public debt in the form of green bonds is more accepted than through tax increases or carbon taxes (Kantorowicz et al., 2024). Furthermore, fiscal instruments contribute to promoting the circular economy, so that, through mechanisms such as environmental taxes, extended producer responsibility, green public procurement, and SDGs for companies, the costs of pollution are internalised, and waste reduction is stimulated (Chenavaz and Dimitrov, 2024). Thus, the combination of strict fiscal regulations and public financing strategies stimulates innovation in circular economy sectors.

One important solution for sustainable and decarbonised economic development can be the simultaneous use of all EU environmental fiscal policy instruments. These can range from eliminating fossil fuel subsidies or setting the right price for carbon to subsidising energy technologies (Antimiani et al., 2023). At the same time, a very important role in the transition to a green economy is played by environmentally oriented research and environmental taxes (Trinh et al., 2023), given that climate change influences the need to invest in green technologies and sustainable infrastructure.

According to Rosales-Asensio et al. (2024), promoting the energy transition requires a rigorous regulation of support mechanisms for renewable energy to avoid high costs and market distortions. Separately, Căpraru et al. (2025) observe that the EU's green fiscal reforms have had spill-over effects, which have influenced Eastern European countries and candidate states to adopt similar policies.

Moldova has the basic legal framework for a green fiscal policy. The state's potential in this area is limited due to structural and administrative challenges. However, EU accession requires rapid adaptation of Moldovan fiscal policy by revising legislation, introducing new fiscal instruments, and along with compensatory measures to maintain fiscal stability (Chironachi, 2024). To strengthen administrative capacity and finance investments in green infrastructure, European funds and technical assistance, models of good practice can be used. Thus, Moldova can transform green fiscal policy from a revenue collection tool into an engine of sustainable transition.

Although there are numerous studies that have analysed the multiple aspects of green fiscal policy and the instruments through which environmental problems can be solved, it is necessary to further develop and study the issue of the efficient functioning of green fiscal instruments.

DATA AND METHODS

This research was carried out using quantitative and comparative analysis of environmental taxes in the EU and Moldova, between 2018 and 2024. This time span was selected to capture both pre-pandemic trends and the impact of successive crises such as COVID-19, the 2021-2023 energy crisis, and the war in Ukraine, as well as the first alignment measures adopted after obtaining EU candidate country status in 2022.

The logical model of the analysis was structured on three successive levels. Initially, the primary quantitative indicators were examined. This consisted of evaluating the evolution and structure of environmental tax revenues, both overall and by category: energy, transport, pollution, natural resources. The indicators were expressed as a percentage of GDP and as a percentage of total tax revenues. At the same time, the dynamics of public spending allocated to environmental protection as a percentage of GDP and of total budget expenditures were analysed.

At the second level, performance and alignment indicators were analysed based on the weight of each tax category in total environmental taxes, the degree of fiscal coverage of polluting activities, as well as the existence/absence of key institutional instruments such as carbon pricing systems, climate budgeting, and extended producer responsibility schemes.

Based on these two levels of analysis, the conclusions and recommendations were synthesised by evaluating the degree of coherence and efficiency of green fiscal policy, identifying gaps compared to EU standards, and formulating short and medium-term reform priorities.

The choice of indicators was justified by the joint Eurostat-OECD methodology for environmental taxes, which allows for international comparability and enables a correct assessment of the tax base, considered to be the physical unit or its equivalent with a proven negative impact on the environment. These indicators were supplemented with data on budget execution to highlight the gap between collected revenues and the expenditures actually allocated to environmental protection, which is an essential element for assessing the "green recycling" of tax revenues.

The information and data used in the article consist of legislative and policy sources, including the national legislation of Moldova, EU directives, and relevant strategy documents. The statistical sources included official data banks of national institutions, such as the National Bureau of Statistics and the Ministry of Finance, but also international databases such as Eurostat. Finally, the specialised literature, consisting of indexed scientific articles, case studies, monographs, and expert reports in the field of green taxation and circular economy, provided the theoretical and conceptual framework necessary for the interpretation of the data and for the formulation of the results. By integrating these methods and sources, the article aims to provide a robust and applicable analysis, which will support the decision-making process in the field of green fiscal policy in Moldova.

ENVIRONMENTAL TAX SYSTEM IN THE EUROPEAN UNION AND MOLDOVA

Green fiscal policy is an integral part of the European Green Deal that aims to create a competitive and sustainable economy. It uses both incentives for green investments and taxes on pollution to promote the environmental transition. The EU launched the Green Deal strategy in response to the worrying acceleration of climate change caused by human activity. This set of policies aimed to decouple economic development from the consumption of energy resources. Through this strategy, the EU aims to achieve climate neutrality by 2050. The areas, objectives, and strategies or Action Plans through which the European Green Deal is intended to be implemented are represented in Figure 1.

Figure 1.

The architecture of the European Green Deal

Zero Pollution → *Zero Pollution Action Plan, Strategy on the sustainable use of chemicals, Clean Air and Water Action Plan*

- goals: Air, water and soil pollution will no longer be considered harmful by 2050; Reducing the health impacts of air pollution by more than 55% by 2030.

Circular Economy → *Circular Economy Action Plan*

- goals: Ensure all plastic packaging reusable or recyclable by 2030; Moving towards circular products and functional market for waste; Recycl or reuse 65% of municipal waste by 2035.

Green ICT → *Digital Strategy*

- goals: Climate neutral data centers by 2030.

Preserving and Restoring Ecosystems and Biodiversity → *EU Biodiversity Strategy for 2030*

- goals: Protection of 30% of EU's land and sea by 2030.

Sustainable Mobility → *Sustainable and smart mobility strategy*

- goals: A 55% reduction in emissions from cars by 2030; A 50% reduction in emissions from vans by 2030; Zero emissions from all cars and vans by 2035.

Sustainable Built Environment → *Renovation Wave for Europe*

- goals: Encouraging the renovation of 35 million buildings and creating an additional 160,000 green jobs in the construction sector by 2030.

Sustainable Agriculture and Food System → *Farm to For Strategy*

- goals: At least 40% of the Common Agricultural Policy budget will be climate -r elevant.

Sustainable Energy System → *Fit for 55 Package and updates via REPowerEU*

- goals: Increase the share of renewable energy in the European energy mix to 40% by 2030; Improve energy efficiency to achieve an overall reduction of 36-39% for final and primary energy consumption by 2030; Review existing energy legislation; Create a European framework for gas; Review the Energy Taxation Directive.

Transformation of agriculture and rural areas → *CAP reform proposal*

- goals*:* Establishing a Vision for Inclusive Rural Areas and an Africa-Europe Agenda.

Achieving Climate Neutrality

- goals: Revising the 2030 Climate targets; Extending the Emissions Trading System (ETS); Implementing the Climate Pact; Enacting the Climate Law; Introducing a Carbon Border Tax.

Just Transition- Leave no one behind → *Green Financing Strategy, Sustainable Europe Investment Plan*

- goals:I mplementingt he Just Transition Instrument,i ncluding theJ ustT ransitionF und;E stablishingt he European Investment Bank as theE uropeanC limate Bank; Mainstreaming climate transition ands ustainabilitya crosst he MultiannualF inancial Frameork (MTF); Mainstreamingt he principles of aJ ustT ransition across the MTF.

Source: Author's representation based on European Commission (2019) and Hedberg & Šipka (2022).

To align the objectives of the European Green Deal, several directives and regulations have been developed or revised over time, such as the Energy Taxation Directive (ETD), the Carbon Border Adjustment Mechanism (CBAM), the Corporate Sustainability Reporting Directive (CSRD), the Circular Economy Action Plan (CEAP), etc. Thus, to ensure the proper functioning of the EU internal energy market, ETD sets minimum rates for taxes on electricity, fuels, and energy products that apply to all Member States. Under this regulation, taxation is based on energy content and CO_2 emissions, while volume-based taxation has been eliminated (European Commission, 2021). In addition, to ensure a green industry and fair competition for domestic producers, CBAM applies taxes on carbon emissions from production activities. This mechanism establishes the tax treatment of goods imported from third countries with a high carbon footprint (European Commission, 2025). CSRD assesses the sustainability performance of large companies, as part of the European Green Deal. Starting from 2024, this directive obliges companies to report social and environmental risks and opportunities, including their impact on the environment, by publishing green tax information, in accordance with the EU taxonomy. Furthermore, CEAP recommends taxes on virgin materials, introduces Extended Producer Responsibility (EPR) schemes, and provides incentives for recycling. This program aims to increase the circularity rate from 12% in 2020 to 24% by 2030.

The new EU budgetary rules for the 2024-2025 period integrate green objectives into the Stability and Growth Pact. It foresees a constant budget deficit for investment in the green and digital transition, with a focus on reducing public debt and prioritising sustainable spending. These standards are binding for Member States and candidate countries, through negotiating chapters such as Chapter 16 Taxation and Chapter 27 Environment and Climate Change.

The architecture of the European Green Deal (Figure 1) clearly shows that the green transition is not just an environmental issue, but a profound reconfiguration of the entire economic and fiscal model. Figure 1 illustrates the main pillars of the European Green Deal and their objectives by 2030–2050. For the Republic of Moldova, as an EU candidate country with the obligation of progressive alignment by 2030, this architecture is a mandatory "roadmap" in the accession negotiations. The degree of alignment and challenges for each pillar are as follows:

1. Regarding achieving climate neutrality, Moldova is at an early stage. Law No. 154/2024 on Climate Change only introduced the MRV (monitoring, reporting, verification) system for 12 major industrial emitters. The lack of a national carbon pricing system makes the country vulnerable to the future European CBAM, which will come into effect in 2026. Consequently, exports of cement, steel, and electricity will be subject to additional taxes, increasing prices by 20–40% if an internal carbon price is not introduced.

2. According to the Sustainable Energy System pillar, the share of renewable energy in Moldova was over 16% in 2024 and continues to grow. Energy taxes are based on volume, not on energy content and CO_2 emissions, as required by the revised ETD. Partial alignment is provided for in the 2025–2027 Economic Reform Programme to achieve the interim target of 30% by 2030.

3. Sustainable Mobility. Moldova's vehicle fleet is one of the oldest in Europe, with an average age of over 17 years. Even though road taxes and fuel excise duties have been increasing, they have not been accompanied by compensatory mechanisms for low-income households or subsidies for vehicle fleet renewal. However, the 2030 Mobility Strategy foresees increasing the share of electric cars to 15% of the total car fleet by 2030. Thanks to tax breaks granted for the purchase of these cars and the development of electric charging infrastructure, this goal could be achieved.

4. The Circular Economy Action Plan sets a municipal waste recycling rate of 65% and EPR targets by 2035. While in Moldova, only 3% of plastic waste is recycled and only 7% of packaging sold is collected for recycling. Extended Producer Responsibility (EPR) schemes exist only for PET packaging and WEEE, and the waste disposal tax is symbolic. Alignment with the CEAP is one of the most urgent priorities. because without rapid reforms, Moldova risks infringement immediately after joining.

5. Regarding Just Transition - Leave no one behind chapter, Moldova still lacks a National Just Transition Fund and clear mechanisms for compensating vulnerable households for rising energy and fuel prices. Revenues from environmental taxes are not "earmarked."

6. Regarding the Just Transition - Leave no one behind chapter, The "European Village" program was implemented under the Sustainable Built Environment pillar, and IFI funds (EBRD, EIB) are financing energy efficiency. However, mandatory deep renovation standards and fiscal incentives such as reduced VAT on insulation materials or tax deductions for energy renovation, which exist in most member states, are lacking.

7. Preserving and Restoring Ecosystems and Biodiversity. In this chapter, Moldova has made notable progress by expanding protected areas and banning the export of raw timber. However, implementation is uneven, and compensation for farmers who adopt ago-ecological practices is insufficient.

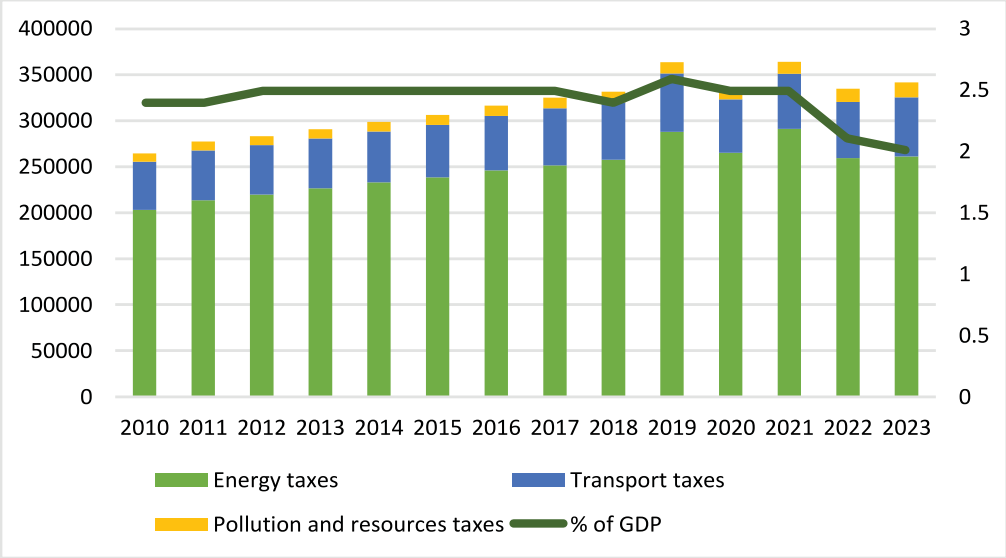
8. Zero Pollution & Sustainable Agriculture. The use of chemical fertilisers and pesticides is high, and agricultural subsidies are not sufficiently conditioned on environmental performance. The post-accession CAP reform will require rapid alignment with "eco-schemes" and the target of 25% organic farming by 2030.

The architecture of the European Green Deal functions as an interconnected system where each pillar is directly or indirectly supported by green fiscal instruments. In the case of Moldova, the lack of carbon pricing, green budgeting, and consolidated EPR schemes creates a domino effect. Although the budget collects green tax revenues, these do not generate the correct price signal and are not recycled into green investments. This means that Moldova remains outside the Green Deal's financial and regulatory circuit, even after the opening of accession negotiations. Under these conditions, rapid alignment with these pillars between 2025 and 2027 becomes not just an accession obligation, but a condition for economic survival in the new European commercial and climate reality.

A central element in achieving the objectives of the European Green Deal is the use of green taxes, which represented around 2.0% of the EU's GDP in 2023, with energy taxes having the largest contribution (Figure 2). These taxes aim to discourage polluting activities and generate revenue for investment in clean technologies. At the same time, the goal is to increase the share of these environmental taxes in GDP by providing necessary fiscal reforms.

Figure 2.

Evolution of environmental taxes by type (in billion euros) and as a share of GDP (% GDP) in the European Union, between 2010 and 2023



Source: Authors' representation based on Eurostat data (2024).

The European Commission, the OECD, and the International Energy Agency define environmental taxes as mandatory taxes and charges, the tax base of which is a physical unit or its equivalent, which has a proven negative impact on the environment and which is defined in the European System of Accounts (ESA 2010) as a tax (OECD, 2010). The tax base is the main criterion for identifying them as environmental taxes, in order to allow international comparison. More than that, depending on the field of use, the Directorate-General for Taxation and Customs Union of the European Commission has classified environmental taxes into four groups: energy taxes, transport taxes, pollution taxes, and taxes for the use of natural resources. In Moldova, at the legislative level, there is no express definition of environmental taxes, but a classification according to the Eurostat methodology can be made. Table 1 presents the range of environmental taxes used in the EU and Moldova.

Table 1.

Environmental tax system in the European Union and Moldova

European Union	Moldova
Energy Taxes (including fuel for transport)	
- *Energy products for transport purposes* (unleaded petrol, leaded petrol, diesel, other energy products for transport purposes like LNG, LPG, natural gas, kerosene, or fuel oil) - *Energy products for stationary purposes* (light fuel oil, heavy fuel oil, natural gas, coal, coke, biofuels, Electricity consumption and production, district heat consumption and production, other energy products for stationary use); - *Greenhouse gases* (carbon content of fuels, emissions of greenhouse gases (including proceeds from emission permits recorded as taxes in the national accounts).	- Excise on petroleum products; - Excise on liquefied gases.
Transport Taxes (excluding fuel for transport)	
- Motor vehicles import or sale (one-off taxes); - Registration or use of motor vehicles, recurrent (e.g., yearly taxes); - Road use (e.g., motorway taxes); - Congestion charges and city tolls (if taxes in national accounts); - Other means of transport (ships, airplanes, railways, etc.); - Transportation infrastructure (ports, harbours and airports, roads, rail, and pipeline networks, etc.); - Flights and flight tickets; - Vehicle insurance (excludes general insurance taxes).	- Excise on imported cars; - Road taxes; - Vignette.

European Union	Moldova
Pollution Taxes	
- Measured or estimated emissions to air (measured or estimated NO_x emissions, measured or estimated SO_x emissions, measured or estimated particulate matter (PM) emissions, measured or estimated volatile organic compounds (VOC) emissions, other measured or estimated emissions to air (excluding energy-related CO_2); - Ozone-depleting substances (e.g., CFCs or halons); - Measured or estimated effluents to water (measured or estimated effluents of oxydisable matter (BOD, COD), other measured or estimated effluents to water, effluent collection and treatment, fixed annual taxes); - Non-point sources of water pollution (pesticides (based on e.g., chemical content, price or volume) and synthetic pesticides; artificial fertilisers (based on e.g., phosphorus or nitrogen content or price); manure); - Solid waste management (collection, treatment, or disposal, individual products (e.g., packaging, beverage containers, plastic bags, batteries, tyres, lubricants, motor oil, hazardous waste); - Noise (e.g., aircraft take-offs and landings); - Other pollution (paint and solvents, biomedical and personal care products, cleaning products, radiation, etc.).	- Payments for environmental pollution caused by emissions of air pollutants from stationary sources, - Payments for environmental pollution caused by discharges of wastewater pollutants into water bodies and sewage systems; - Payments for environmental pollution caused by the landfill of production waste; - Taxes on goods that, in the process of use, cause environmental pollution.
Resource Taxes	
- Fresh water abstraction; - Harvesting of biological resources (e.g., timber, hunted and fished species); - Extraction of raw materials (e.g., minerals); - Landscape changes and cutting of trees; - Semi-natural and natural land conversion to (intensive) agriculture and forestry, urban and infrastructure development, mining, etc.	- Water tax; - Tax for the extraction of useful minerals; - Tax on standing timber; - Tax for carrying out geological surveys; - Tax for carrying out geological explorations; - Tax for the use of underground premises for the construction of underground sites other than for the extraction of useful minerals; - Tax for the operation of underground structures for entrepreneurial activity other than for the extraction of useful minerals.

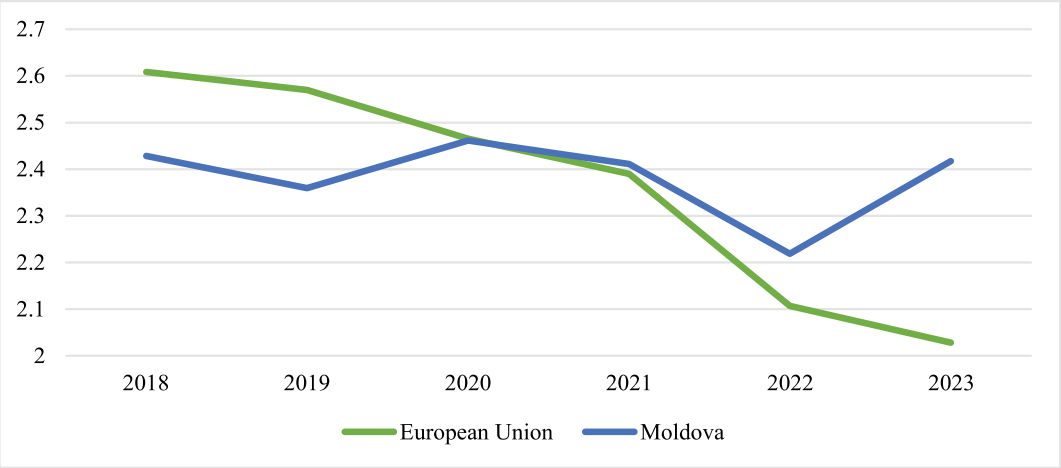
Source: Compiled by the authors based on Eurostat (2024) and Fala (2023).

The EU Regulation No 125/2022 introduced some amendments to Annexes I-V to the EU Regulation No 691/2011. According to it, Member States provide information by breakdown of environmental taxes for CO2 taxes under the EU Emissions Trading System (EU ETS) and other CO2 taxes. These categories include carbon taxes on fuels, sector-specific taxes, taxes on carbon-embedded goods, aviation and maritime taxes, border adjustments, and carbon offsets. The carbon border adjustment mechanism aims to align carbon prices for imported and EU-produced goods with the aim of achieving cleaner industrial production globally. EU ETS was launched in 2005 and covers EU Member States and the EEA-EFTA states Iceland, Liechtenstein, and Norway. The EU ETS is currently in its fourth phase (2021-2030). It is a cap-and-trade system covering around 40% of EU greenhouse gas emissions from over 11,000 power plants, industrial plants, and commercial airlines. In 2023, the EU ETS emissions cap was tightened to reduce emissions by 62% by 2030. At the same time, ETS2 is expected to be introduced in 2027, covering buildings, road transport, and specific industrial fuels. Revenue from both schemes will be directed to finance climate and energy initiatives, including heating and transport, as well as the Social Climate Fund.

To compare the tax burden of environmentally harmful activities, tax revenues from environmental taxes as a % of EU and Moldovan GDP were analysed over the period 2018-2023 (Figure 3).

Figure 3.

Evolution of environmental taxes in the EU and Moldova, between 2018 and 2023 (% of GDP)



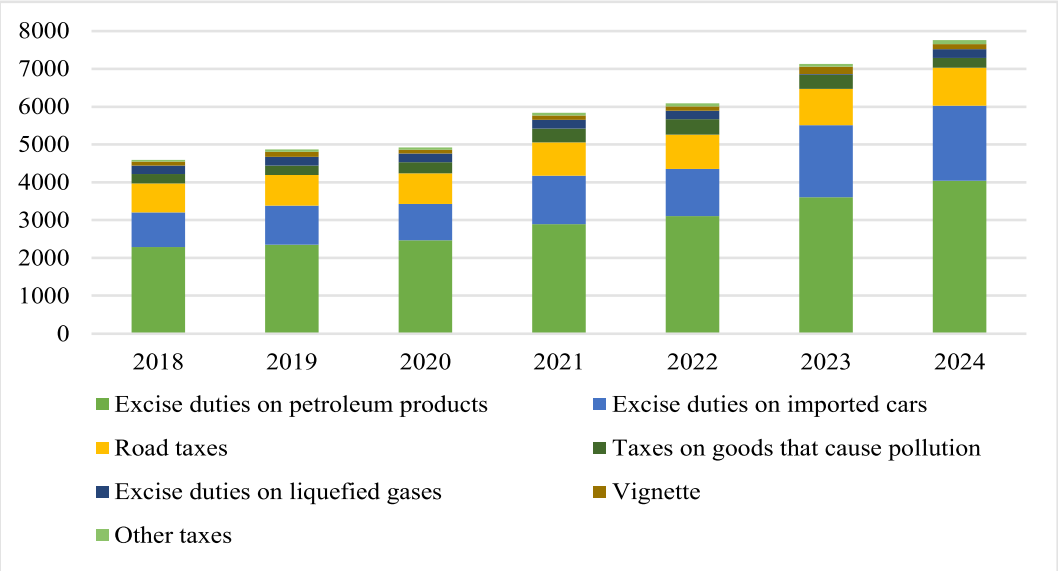
Source: Authors' representation based on Eurostat (2024) data and the Ministry of Finance of Moldova (2025).

In the EU, the share of environmental taxes in GDP decreased from 2.61% in 2018 to 2.03% in 2023. This was due to the reduction of the tax base related to electrification, structural changes in the economy, the absence of energy price subsidies, and resistance to environmental taxes. While in Moldova, the share of environmental taxes in GDP fluctuated from 2.43% in 2018 to 2.22% in 2022, when the lowest share was recorded, and in 2023 it reached 2.2% of GDP. Such fluctuations were determined by the faster growth of the value of environmental taxes collected, in relation to the value of GDP, and by the regional crises that affected the country's economy.

For a better understanding of the situation of environmental taxes in the development of the green economy of Moldova and to identify possible improvement solutions, it is necessary to analyse the changes in the structure of environmental taxes during the 2018-2024 period (Figure 4). The data shows a constant increase in environmental taxes from 4.59 billion lei in 2018 to 7.76 billion lei in 2024. In 2020, due to the COVID-19 pandemic, tax revenues from these taxes had the lowest dynamics. Energy taxes contributed the highest revenues to the national budget, observing a constant increase. More exactly, excise duties on petroleum products contributed 2.29 billion lei in 2018 and approximately 4.04 billion lei in 2024.

Figure 4.

Dynamics of environmental taxes in Moldova by category, between 2018-2024 (in million lei)



Note: Other taxes include tax for the extraction of useful minerals, water taxes, payments for environmental pollution, other payments for environmental pollution, tax for the use of underground, tax for the standing timber, tax for carrying out geological surveys, tax for carrying out geological explorations, tax for the use of underground premises for the construction, tax for the operation of underground structures. Because the value of these taxes is very small, they have been aggregated into the other taxes category.

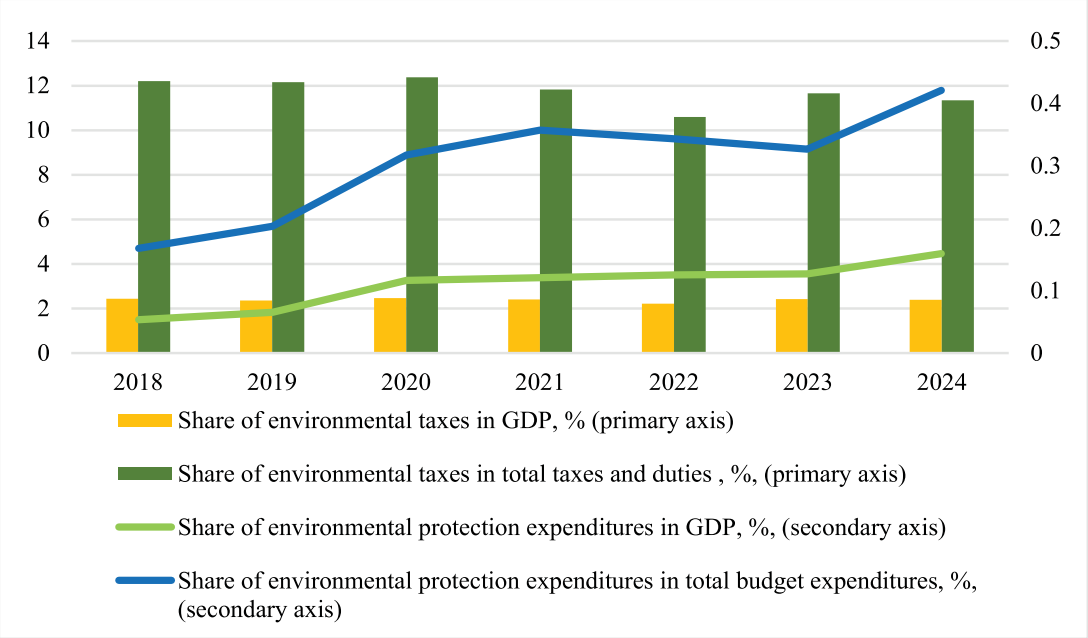
Source: Authors' representation based on the Ministry of Finance of Moldova (2025) data.

This increase was determined by high fuel and natural gas prices, increased excise duties, and energy efficiency policies. Transport taxes doubled during this period from 1.78 billion lei to 3.13 billion lei, due to the expansion of the tax base through registration taxes, road taxes, taxes on large vehicles, as well as through policies to renew the car fleet by discouraging old and polluting vehicles. In this category, the largest revenues were collected from excise duties on imported cars, from 915 million lei in 2018 to 1.99 billion lei in 2024. Pollution and natural resource taxes have a smaller share of total environmental taxes. This evolution was determined by the improvement of environmental practices and stricter application of environmental norms to prevent emissions for taxation. Another reason is the undervaluation or delay in the collection of these taxes. In the structure of pollution taxes, the largest share is the taxes on goods that cause environmental pollution. Natural resource taxes had a moderate oscillation, with a significant increase in 2024, which reflects an increase in royalties for the exploitation of natural resources, in the context of the adjustment of the fiscal-ecological framework.

According to the OECD and the EU methodology, environmental taxes applied in Moldova exceed the average of other European countries. They contribute over 10% to total tax revenues (Figure 5), with a pronounced downward trend from 12.2% in 2018 to 10.6% in 2022, and a slight increase in 2024. This was due to a rise in tax and duty revenues (for goods and services, because of increased imports), compared to the level of environmental taxes, even though environmental fiscal policies remained constant.

Figure 5.

Environmental taxes (% of GDP and % of total taxes) and environmental protection expenditures (% of GDP and % of total budget expenditures), between 2018 and 2024



Source: Authors' representation based on the Reports on the execution of the state budget (2018-2024).

A constant situation is observed in the share of environmental taxes in GDP, which reached a level between 2.2% and 2.5% of GDP during the reference period, reflecting the stability of environmental tax revenues in relation to the size of the economy. In 2022, these taxes recorded the lowest share, at 2.2%, but this was due to the significant increase in GDP, compared to the previous year (Figure 5). Environmental protection expenditures indicate that environmental protection priorities in Moldova are underfunded. Data on environmental protection expenditures contain only data on government expenditures, since Moldova does not keep records of expenditures made by economic agents or households in this regard. In addition, the share of environmental protection expenditures in total state budget expenditures is negligible, but has a growing trend from 0.17% in 2018 to 0.42% in 2024 (Figure 5). Moreover, in 2018, government expenditures for environmental protection represented 0.05% of GDP, reaching 0.16% of GDP in 2024, which reflects an increase in the priority of public investment for the environment.

The share of environmental protection expenditures in the 2018-2024 period denotes a weak prioritisation of the interests of Moldova in terms of preventing, reducing, or eliminating pollution or environmental degradation and suggests the need for a restructuring of green fiscal policies to increase their efficiency and impact on the environmental transition.

The constant increase in fuel excise duties and road taxes between 2018 and 2024 has generated regressive socio-economic effects in the absence of compensatory mechanisms. For final consumers,

especially poor households and those in rural areas, rising energy and transport prices reduced purchasing power during the peak years of the energy crisis, according to World Bank estimates. SMEs in the transport, trade, and agriculture sectors have incurred significant additional costs without benefiting from support schemes equivalent to those existing in EU member states, such as temporary excise duty reductions, electrification grants, or green tax credits.

In industry, the lack of a carbon pricing system keeps costs seemingly low for large emitters, but on the other hand, it exposes exports to the risk of CBAM. The pollution taxes currently collected are less than 60% of the estimated amounts, indicating weak administrative capacity and poor incentives for investment in clean technologies (Fala, 2023).

Thus, in its current form, green fiscal policy functions more like a regressive tax on consumption and economic activity rather than an instrument to stimulate a sustainable transition and protect vulnerable groups.

DISCUSSIONS

According to the data analysed, Moldova has made progress in aligning its environmental fiscal policy with EU directives. This conclusion was reached by the Stockholm Environment Institute, which assessed the progress of Moldova's green transition and highlighted the areas where the country has made significant progress, namely, regarding emission reduction and the circular economy. It was also found that fiscal and budgetary policies are not fully aligned with climate change financing needs. In addition, Moldova does not have a comprehensive environmental taxation system and has not implemented Climate Budget Labelling (CBT). The implementation of these policies is very important to ensure the alignment of public financial flows with the objectives of the green transition and sustainable development (Tammiste, 2025).

The efficiency of environmental tax collection in the Republic of Moldova remains suboptimal, with revenues growing from approximately MDL 4.59 billion in 2018 to MDL 7.76 billion in 2024, yet administrative challenges, including inconsistent enforcement and limited digitalization, result in collection rates estimated at 85-90% for key categories like energy excises, as per Ministry of Finance reports; this inefficiency hinders revenue maximization for green investments, exacerbated by structural vulnerabilities noted in IMF assessments, necessitating reforms in tax administration to enhance compliance and reduce evasion.

Some steps have been made in this direction through the Economic Reform Program 2025-2027, which adopted several fiscal measures to align with EU rules and harmonise with the ETD Directive. More than that, in 2025, Moldova completed the bilateral screening for some chapters, including taxation, and implemented the Reform and Growth Mechanism (EU Regulation 2025/535), which supports green investments through EU funds (Government of Moldova, 2025). In addition, the alignment with the CEAP is achieved by promoting reforms regarding waste management and recycling. For Moldova, the circularity rate has been estimated at 5-10%. In this regard, there are several partnerships with the EU, such as SWITCH to Green. The Reform Agenda under the Growth Plan includes IT strategies for green taxation, increasing revenues through pollution taxes, and alignment with EU customs standards (since 2017). For instance, incorporating the SDGs into fiscal policy with an emphasis on sustainability is part of fiscal alignment with the UN 2030 Agenda. Additionally, the Republic of Moldova has developed the framework and procedures for carbon certification outlined in Article 6.2 of the Paris Agreement. In accordance with the principles of the EU ETS, the 2024 Climate Action Law established essential frameworks for emissions monitoring, reporting, and verification systems. Twelve of the industrial polluters have greenhouse gas licenses that are managed by the Environmental Agency. The Environmental Agency oversees greenhouse gas permits for 12 of the industrial emitters. Feasibility studies are currently being conducted on the establishment of carbon pricing mechanisms.

To illustrate alignment levels, Table 2 provides a comparative overview of Moldova's status relative to the EU on key environmental instruments, based on European Commission enlargement reports.

Table 2.

Alignment of the key instruments of the European Green Deal: European Union and Moldova

Instrument	EU Status	Moldova Status	Alignment Level	Key Gaps/ Progress
ETD (Energy Taxation Directive)	Fully implemented across Member States, with minimum rates on energy products based on CO_2 emissions (revised 2023).	Partial harmonization via Economic Reform Program 2025-2027; excises on fuels increased but not fully aligned with EU minima.	Moderate	Progress in excise adjustments; gap in comprehensive CO_2-based taxation.

Instrument	EU Status	Moldova Status	Alignment Level	Key Gaps/ Progress
CBAM (Carbon Border Adjustment Mechanism)	Operational since 2023, full phase-in by 2026 for high-carbon imports; simplified in 2025.	Not implemented; preparatory studies under EU4Climate project for potential adoption as candidate.	Low	Feasibility ongoing; gap in carbon pricing for imports, risking competitiveness.
CEAP (Circular Economy Action Plan)	Targets doubled circularity to 23% by 2030; EPR schemes widespread.	Reforms in waste management; circularity at 5-10%; partnerships like SWITCH to Green.	Moderate	Progress in recycling policies; gap in EPR implementation and virgin material taxes.
CSRD (Corporate Sustainability Reporting Directive)	Mandatory for large companies since 2024, requiring ESG disclosures aligned with EU taxonomy.	Limited adoption; no mandatory framework, though some voluntary reporting in EU-funded projects.	Low	Initial steps via Association Agreement; gap in enforcement for sustainability risks.
ETD (Energy Taxation Directive)	Fully implemented across Member States, with minimum rates on energy products based on CO_2 emissions (revised 2023).	Partial harmonization via Economic Reform Program 2025-2027; excises on fuels increased but not fully aligned with EU minima.	Moderate	Progress in excise adjustments; gap in comprehensive CO_2-based taxation.

Source: Compiled by authors based on European Commission Enlargement Report (2024) and Tammiste, 2025).

Moldova has made some progress toward aligning with EU green fiscal instruments, especially in the areas of energy and circular economy reforms. However, there are still gaps in comprehensive taxation systems and administrative efficiency. This highlights the need for quicker policy harmonization. To close these gaps and ensure a strong foundation for sustainable development and successful integration into the goals of the European Green Deal, it will be essential to make use of EU partnerships and continuous feasibility studies.

CONCLUSION

The article analysed the current state of green fiscal policy in Moldova, identified directions for harmonisation with the European standards, such as the introduction of the carbon border adjustment mechanism, subsidies and incentives for sustainable investments, and the promotion of the circular economy. The findings unveiled several important conclusions. Moldova has made noticeable steps toward designing a fundamental fiscal-ecological framework, green fiscal policy is still mostly a tool for revenue collection rather than a true catalyst for sustainable transition. Environmental tax revenues are comparable to the EU average in terms of GDP, but their seriously imbalanced structure and lack of recycling into green initiatives almost eliminate the "double dividend" and signalling effect. The urgent priorities for the period 2025–2027 are: introducing a national carbon pricing system (carbon tax or ETS pilot), implementing Climate Budget Tagging, expanding and strengthening Extended Producer Responsibility (EPR) schemes, and increasing the administrative capacity of the Environmental Agency and the State Tax Service for efficient monitoring and collection. In the medium to long term (2027–2030), the key objectives include full alignment with the revised Energy Taxation Directive (ETD), preparing a CBAM-mirror mechanism, developing the green bond market, and integrating the EU taxonomy into national legislation. Limited administrative capacity remains the main structural obstacle. The small number of environmental inspectors, the absence of an integrated electronic emissions register, and poor inter-institutional coordination are hindering the pace of reforms. The Republic of Moldova's green transition is essentially a financial transition. Without a coherent green budgeting system, without a carbon price, and without real just transition mechanisms, the social and economic costs of alignment will increase exponentially after accession. The proposed reforms are not just a condition of the accession negotiations – they represent the only way fiscal policy can move from being a simple source of revenue to becoming a true catalyst for a resilient and competitive economy.

The limitations of the study stem from the lack of complete data on private environmental protection expenditures and the impossibility of precisely quantifying the effects of "carbon leakage" in the absence of a national carbon pricing system. However, the analysis provides a solid and up-to-date basis for policymakers in the context of accession negotiations with the European Union.

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REFERENCES

Antimiani, A., Costantini, V., & Paglialunga, E. (2023). Fossil fuels subsidy removal and the EU carbon neutrality policy. *Energy Economics*, *119*, 106524. https://doi.org/10.1016/j.eneco.2023.106524

Antohi, V. M., Fortea, C., Zlati, M. L., & Dinca, M. S. (2025). The impact of green taxation on sustainable economic development in the European Union. *Journal of Financial Studies*. *10*(18), 240-263. https://doi.org/10.55654/JFS.2025.10.18.12

Baumol, W. J., & Oates, W. E. (1971). The use of standards and prices for protection of the environment. *The Swedish Journal of Economics*, *73*(1), 42-54. http://dx.doi.org/10.2307/3439132

Căpraru, B., Georgescu, G., & Sprincean, N. (2025). Fiscal rules, independent fiscal institutions and sovereign risk: Evidence from the European Union. *International Journal of Finance*. https://doi.org/10.1002/ijfe.3127

Carfora, A., Pansini, R. V., & Scandurra, G. (2021). The role of environmental taxes and public policies in supporting RES investments in EU countries: Barriers and mimicking effects. *Energy Policy*, *149*, 112044. https://doi.org/10.1016/j.enpol.2020.112044

Chenavaz, R. Y., & Dimitrov, S. (2024). From waste to wealth: Policies to promote the circular economy. *Journal of Cleaner Production*, *443*, 141086. https://doi.org/10.1016/j.jclepro.2024.141086

Chironachi, C. (2024, August 23). Fiscal instruments to support sustainable development and encourage environmentally friendly business practices. In: *Development Through Research and Innovation IDSC-2024:* international scientific conference. Collection of articles (5th edition, pp. 259-265). Chișinău: SEP ASEM. https://doi.org/10.53486/dri2024.29

Darvas, Z., & Wolff, G. B. (2022). A green fiscal pact for the EU: Increasing climate investments while consolidating budgets. *Climate Policy, 23*(4), 409-417. https://doi.org/10.1080/14693062.2022.2147893

Degirmenci, T., & Yavuz, H. (2024). Environmental taxes, R&D expenditures, and renewable energy consumption in EU countries: Are fiscal instruments effective in the expansion of clean energy? *Energy*, 299, 131466. https://doi.org/10.1016/j.energy.2024.131466

Dogan, E., Hodžić, S., & Šikić, T. F. (2023). Do energy and environmental taxes stimulate or inhibit renewable energy deployment in the European Union? *Renewable Energy*, *202*, 1138-1145. https://doi.org/10.1016/j.renene.2022.11.107

European Commission. (2019). *The European Green Deal*. COM 640 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN

European Commission. (2021). *Revision of the Energy Taxation Directive*. https://taxation-customs.ec.europa.eu/taxation/excise-duties/revision-energy-taxation-directive_en

European Commission. (2024). *Republic of Moldova 2024 Report*. SWD 698 final. https://enlargement.ec.europa.eu/document/download/858717b3-f8ef-4514-89fe-54a6aa15ef69_en?filename=Moldova%20Report%202024.pdf

European Commission. (2025). *Carbon Border Adjustment Mechanism*. https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en

Eurostat. (2024). *Environmental tax statistics*. Statistics explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Environmental_tax_statistics&oldid=48200

Eurostat. (2024). *Environmental taxes*. A statistical guide. Publications Office of the European Union. https://data.europa.eu/doi/10.2785/730717

Fala, A. (2023). *Pollution tax reform – A necessary step to ensure green economic growth*. Chișinău: Expert-Grup. https://www.expert-grup.org/en/biblioteca/item/2487-reforma-taxelor-pe-poluare-%E2%80%93-un-pas-necesar-pentru-asigurarea-unei-cre%C8%99terii-economice-verzi&category=180

Fontagné, L., & Schubert, K. (2023). The economics of border carbon adjustment: Rationale and impacts of compensating for carbon at the border. *Annual Review of Economics*, *15*, 389-424. https://doi.org/10.1146/annurev-economics-082322-034040

Glavaški, O., Beker Pucar, E., Beljić, M., & Stojkov, S. (2023). Coordination EU vs. competitiveness of effective average tax rates in relation to FDI: The case of emerging economies. *Sustainability*, *15*(1), 227. https://doi.org/10.3390/su15010227

Government of the Republic of Moldova. (2025). *Reform agenda under the Republic of Moldova's growth plan for the years 2025–2027*. https://mded.gov.md/wp-content/uploads/2025/05/Agenda-_260-en.pdf

Hedberg, A., & Šipka, S. (2022). The role of European Union policies in accelerating the green transition. *Field Actions Science Reports. Special Issue, 24, 86-91*. http://journals.openedition.org/factsreports/6989 _

Kantorowicz, J., Collewet, M., DiGiuseppe, M., & Vrijburg, H. (2024). How to finance green investments? The role of public debt. *Energy Policy, 184,* 113899. https://doi.org/10.1016/j.enpol.2023.113899

Ministry of Finance of Moldova. (2025). *Taxes and fees*. https://www.mf.gov.md/ro/impozite-%C8%99i-taxe

Mohr, E. (1990). Environmental policy and international trade: The case of Germany. *The World Economy, 13*(4), 489-504.

Organisation for Economic Co-operation and Development (OECD). (2010). *Taxation, innovation, and the environment*. Paris: OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2010/10/taxation-innovation-and-the-environment_g1g1044d/9789264087637-en.pdf

Pander Maat, E. (2024). How to be a green global standard-setter - The EU's externalization of the environmental integration principle. In: R. A. Wessel, J. Bergamaschine Mata Diz, J. Péret Tasende Társia, & S. E. Akdogan (Eds.), *EU external relations law and sustainability: The EU, third states and international organizations* (pp. 29-64). T.M.C. Asser Press. https://doi.org/10.1007/978-94-6265-655-0_3

Pearce, D. (1991). The role of carbon taxes in adjusting to global warming. *The Economic Journal*, *101*(407), 938-948. https://doi.org/10.2307/2233865

Pigou, A. C. (1920). *The economics of welfare*. London: Macmillan. http://pombo.free.fr/pigou1920.pdf

Rosales-Asensio, E., Diez, D. B., Cabrera, P., & Sarmento, P. (2024). Effectiveness and efficiency of support schemes in promoting renewable energy sources in the Spanish electricity market. *International Journal of Electrical Power & Energy Systems, 158*, 109926. https://doi.org/10.1016/j.ijepes.2024.109926

Tammiste, L., Iordanov, R., Ciobanu, N., Echim, T., & Lahtvee, V. (Coords.). (2025). *National comprehensive green transition assessment report for Moldova*. Green Agenda for Armenia, Georgia, Moldova, and Ukraine. https://green-agenda.org/en/green-transition-assessment

Trinh, H. H., McCord, M., Lo, D., & Squires, G. (2022). Do green growth and technological innovation matter to infrastructure investments in the era of climate change? Global evidence. *Applied Economics*, *55*(35), 4108-4129. https://doi.org/10.1080/00036846.2022.2125493

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ASSESSING THE EXPORT POTENTIAL OF BASIC AGRICULTURAL PRODUCTS IN MOLDOVA THROUGH THE LENS OF FOOD SECURITY

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SUMMARY

Moldova is a small landlocked country with the lowest GDP per capita among European economies, specialising in the export of agricultural products, particularly cereals and fruits. Recent economic crises and the war in Ukraine have amplified existing socio-economic constraints and raised concerns about national food security. This paper investigates the export potential of Moldova's main agricultural products and their implications for food security. The study integrates national data on agricultural production, food balances, international trade, and prices with global datasets and develops a comprehensive system of indicators reflecting agricultural production capacities, trade performance, and export competitiveness, with a focus on key agricultural commodities. An econometric ARDL model is employed to assess the impact of external price dynamics and climatic variability on the growth of cereal exports, which represent a significant share of Moldova's agri-food exports. The results indicate that Moldova has strengthened its export position in staple crops. However, the predominance of low-value-added raw commodities in agri-food exports and the country's exposure to international price volatility heighten pressures on food access and affordability in the domestic market. The findings underline the importance of diversifying agrifood exports and promoting higher value-added production as key strategies for enhancing resilience and strengthening food security policy.

Key words: agricultural production, agricultural exports, food staples, food security

INTRODUCTION

Moldova is one of the smallest economies in Europe in terms of GDP per capita, which amounted to 7.6 thousand USD in 2024. Convergence with EU member states and even with countries from Europe and Central Asia has been occurring at a very slow pace. In the long term, Moldova has experienced a visible slowdown in economic growth, despite still significant income gaps relative to the averages of these country groups. Since 2011, Moldova's GDP per capita, expressed in constant USD (PPP), has increased from around 20% to about 30% of the EU average by 2024.

Although the country has undergone significant structural transformations during its transition to a market economy, including a substantial expansion of the services sector, agriculture remains a key component of the national economy. The sector contributed around 7% to GDP formation in 2023–2024, with an average annual share of approximately 8.5% over 2020–2024. Agriculture also plays a vital role in employment, engaging about 18% of the population aged 15 and over in 2024. Moreover, agricultural products accounted for roughly 25–28% of total merchandise exports over the past five years, including large volumes of staple crops such as maize and wheat.

Agriculture is one of the primary economic activities in rural areas, where most multidimensional poor people live. According to the latest data, the incidence of multidimensional poverty in Moldova was 25.6% in 2024, with significant disparities between rural (37.6%) and urban (10.0%) areas (NBS, 2025).

Agri-food products represent a significant share of Moldova's merchandise exports. The agricultural sector faces structural challenges and has an untapped potential. The sector has low resilience to various internal and external shocks that have increasingly affected agricultural production in the past decade: climatic shocks, the high volatility of agricultural prices on international markets and persistent domestic–international price gaps, as well as the Russo–Ukrainian war, which has amplified global food security risks. In this context, assessing export potential through indicators linked to food security is conceptually and practically relevant for Moldova. The paper provides a robust analytical framework that supports research development in this field and helps justify economic policy measures to enhance the external competitiveness of the agricultural sector, thereby positively influencing national food security.

LITERATURE REVIEW

Food security is a multidimensional concept encompassing four key dimensions: availability (sufficient quantities of food), access (adequate resources for obtaining appropriate foods), utilisation (proper biological use, ensuring diet quality and safety), and stability (reliable access and availability over time) (FAO, 2024). Agricultural exports, including staples, influence these dimensions through various channels, producing both positive and negative effects depending on each country's specific context: its economic structure, global trade, environment, and national policies. Analysis of the export potential of the main agricultural products and their implications for food security requires understanding the main theoretical approaches and empirical findings at the intersection of these two important economic variables.

Mercantilism, one of the early trade theories, emphasised the importance of foreign trade for national economic prosperity. To be prosperous, countries should have a positive external trade balance. They advocated for stimulating the export of processed products and the import of raw materials as the price of

the former is higher compared to that of the resources used in their production, making it possible to increase the value added in the country and consequently the accumulation of the population's wealth (Bjornskov, 2005). Meanwhile, this doctrine emphasises the role of trade in economic development, but it also promotes policies that conflict with global economic efficiency and food security. While the globalisation process and trade liberalisation have extended, protectionist policies have proved to be limited in explaining the realities. Therefore debates shifted towards revealed comparative advantages and efficiency gains that countries can have from free trade.

The Theory of Comparative Advantage (Ricardo, 1951) argues that countries benefit from external trade by specialising in merchandise with lower relative opportunity costs. In the agricultural sector, specialisation in high-value-added activities can improve farmers' export revenues, increase their capacity to import technology and agricultural inputs, and increase resilience to economic and climatic shocks. The entire population, especially the most vulnerable people, has greater access to affordable, diversified and higher-quality food. Thus, specialisation can strengthen all four dimensions of food security. Balassa's Revealed Comparative Advantage Index and Laffay Index have been widely used in empirical studies to measure a country's competitive position in international markets.

The Lafay Specialisation Index (1992) measures an economy's specialisation, taking into account the contributions of various sectors to achieving a balanced trade balance. Thus, a positive value of the index reveals a comparative advantage, and its increase – a higher level of specialisation. On the contrary, a negative value denotes a comparative disadvantage. The Balassa index (1965) compares the structure of a country's exports with world exports or those of trading partners, based on the assumption that countries can obtain a greater benefit from foreign trade if they specialise in those sectors in which they can benefit from a relative advantage. A value of revealed comparative advantage (RCA) less than 1 means that no comparative advantage is assessed for those goods. An RCA greater than 1 means that those goods have a comparative advantage, as attested.

John Stuart Mill's contribution to economic theory is relevant in this context. He highlighted the role of terms of trade, which depend on the demand for exported goods from trade partners. Favourable terms of trade enable a country to maximise the benefits from its exports, while adverse conditions may constrain producers' access to essential imports, including food staples and agricultural technologies (Fujimoto, 2017).

In the context of small economies, the Small Open Economy Model offers a relevant analytical framework. Such economies are considered price-takers in international markets (Guerron-Quintana, 2013) which are highly vulnerable to external shocks determined by the evolution of international food prices. Such events cause large fluctuations in domestic market prices, as during the 2007 and 2011 crises (Pourroy, Carton and Coulibaly, 2012), affecting the affordability and availability of agrifood products in local markets. Policy responses such as diversification, reducing product and export market concentration, and upgrading quality are essential for increasing the resilience of local food production. Also, focusing on markets that offer higher prices can increase exporters' revenues and human capital.

Meanwhile, existing literature highlights important trade-offs between agricultural products exports and food security. While exports may generate income, stimulate investments, and enhance competitiveness as mentioned earlier, excessive orientation toward foreign markets can reduce domestic food availability or divert resources away from staple production (Fiankor et al., 2021). Developed country markets, though more profitable, impose stricter standards, limiting export opportunities for many higher-value-added products, such as animal products, some fruits and vegetables, and processed agricultural products, for many developing economies.

Hence, the literature suggests that agricultural exports represent both opportunities and challenges for food security. Their impact depends on structural competitiveness, external demand, and domestic policies aimed at balancing export growth with national food needs. This ambivalence underscores the importance of evaluating the export potential of agricultural products not only from a competitiveness perspective, but also through the lens of food security.

DATA AND METHODS

To conduct this study, we identified a set of indicators that, on the one hand, reflect the export potential of the main agricultural products and, on the other hand, enable us to determine the challenges export activity poses for food security. The indicators, calculation formulas, data sources, and interpretations of the results from the perspective of food security are presented in Table 1 below.

Quantitative analysis was developed using primary national statistics on agricultural production, food balance sheets, and international merchandise trade obtained from the National Bureau of Statistics (NBS). To explore international trends and ensure comparability with other countries, data were obtained from the UN Comtrade database of the Food and Agriculture Organisation of the United Nations (FAO). The UN Comtrade (WITS) and FAO data used in this research for Moldova are consistent with the official statistics reported by the National Bureau of Statistics (NBS).

The study utilises time series of varying lengths, determined by data availability, consistency, and indicator relevance. Specifically, data spanning 1994–2024 are used for agricultural production, while the period 2010–2024—particularly 2020–2024—is employed for indicators such as the agricultural products self-sufficiency ratio and those assessing export performance and competitiveness. For the econometric analysis, the time series spans 2006–2024, the most extended available period for data derived from the Food Balance Sheet.

In the context of the present research, Agricultural and food products include the first 4 sections of the Harmonized Commodity Description and Coding System (HS): Live animals, animals products (I); Vegetable products (II): Animal, vegetal or microbial fats and oils (III); Prepared Foodstuff, beverages, spirits and vinegar, tobacco (IV).

Table 1.

Indicators for assessment the export potential of main agricultural products with respect to their implications for the country's food security

	Indicator	Formula	Data source	Interpretation of results
Production capacity and food and domestic food availability	**Production index**	PI=natural indicators (quantity) x comparable prices	*NBS*	Reflects the ability to sustain exports without depleting domestic supply. Low values of these indicators can influence both the capacity for export and food security.
	Yield per hectar	Yield/hectar =Total harvest/Total cultivated area	*NBS, FAO stat*	
	Self-sufficiency coefficient, %	SSC= Production/Internal consumption	*SSC according to NBS data*	The indicator gives an indication of a country's capacity to produce to cover its own needs. A value below 100% indicates that food production is insufficient to meet internal demand.
Export performance and competitiveness	**Export value (mln. USD), share in agricultural exports (%)**	EXP share = EXP value $_{I}$/EXP value $_{total}$	*NBSs, UNComtrade data*	Higher value and shares indicate better capacity to export the commodity. Especially for staples, higher values can increase pressure on local supply and prices
	Trade balance, mil. USD	TBij=Xij-Mij where Xij are exports of product I from country j and Mij are imports of product I of the country j	*NBS*	A positive balance of trade indicates that the country is a net exporter of that product/group of products. A positive balance of trade strengthens the financial capacity to import deficit products. In case of staples that may point to a country's low capacity to produce and export processed products, which will lead to higher earnings.

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	World export market share -n % years change	World market share = [[(EXPi,c,t/ EXPworld,i,t)-(EXPic,t-n/ EXPworld,t-n)]/(EXPi,c,t-n/ EXPworld,i,t-n)]*100 - where EXPi,c = exports of product i from country j in period t and accordingly t-n, and EXPworld,i = world exports of product I in period t and accordingly t-n	*UN Comtrade*	An increase in market share indicates that exports of the evaluated country grow faster than world exports, which is an indicator of export competitiveness. That would lead to revenue growth. Although if the increase in market share is the result of massive export of staples, this can indicate the reduced capacity to export high-value products. Also, if the products are staples, prioritising exports may reduce local availability and raise prices
	Export value growth rate, yoy, %	Export growth rate (%) = (EXPij$_{1}$-EXPij$_{to}$)*100-100 where Xij$_{1}$ are the value of the exports of product i form country j in period t and Xij$_{to}$ are the exports of product i form country j in period $_{to}$	*NBS and UN Comtrade*	Accelerated growth will contribute to income growth and can indicate an improvement in competitiveness. Exporting staples can threaten food security by creating a shortage of products on the domestic market and, accordingly, increasing prices.
	Compound Annual Growth Rate (CAGR), %	CAGR=((EXP$_{t}$/EXP$_{t-5}$)^(1/t-n)-1)*100	*Computed according to NBS data*	

	Indicator	Formula	Data source	Interpretation of results
Export performance and competitiveness	**Unit Value Index, %**	$UVI = \frac{\sum Pi,t * Qi,t}{\sum Pi,t0 * Qi,t} * 100$ where Pi,t are prices of the exported product at the observation period t, Qi,t is the exported volume of the product in the period t, Pi,o and Qi,o are corresponding prices and volume in the base period	*NBS*	High UVE may indicate quality/value addition, an increase in incomes; however, higher export prices can drive up domestic prices, reducing affordability for the low-income population.
	Export volume Index, %	$PVI = \frac{\sum Pi,t0 * Qi,t}{\sum Pi,t0 * Qi,t0} * 100$ where Pi_{to} are prices of the exported product in the base period, Qi,t is the exported volume of the product in the period t, Pi,o and Qi,o are corresponding prices and volume in the base period	*NBS*	Export volume growth can result from production development. Although, an accelerated growth of the exported volume compared to production can lead to shortages of basic food in the local market.
	Balassa Revealed Comparative Advantage Index	RCA = $(X_i / X_i) / (W_i / W_t)$ where X_i = exports of product i from country, Xt = total exports, W_i= world exports of product i, W_t = total world exports	*Computed by authors based on UN comtrade statistics*	Values higher than 1 indicate that a country has a revealed comparative advantage of the analysed product. High RCA indicates strong export competitiveness, which can increase incomes but also risk diverting supply from domestic markets if not balanced.
	Export concentration index, %	HHI= $\sum(s_i^2)$ where s_i is the share of product i in total exports	*UNCtat statistics*	Values close to 10000 indicate a high concentration, and values closer to 1 indicate a low concentration. Lower concentration reduces producers' vulnerability to external price and demand shocks, ensuring stable incomes and supply.

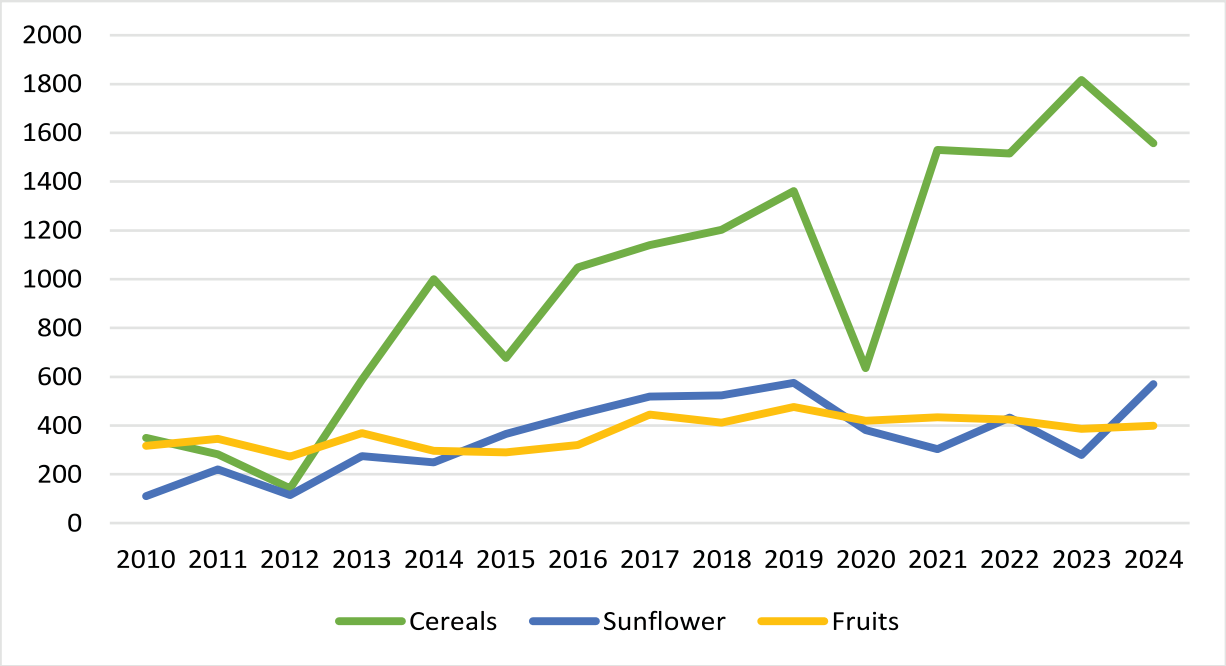
Source: developed by the authors

Furthermore, the authors have conducted statistical analyses of agricultural export growth to assess its volatility. This is essential for assessing the sustainability of the agricultural sector's performance. High fluctuations in export growth point to vulnerabilities to different shocks such as climate change or international price variations.

To better understand the factors that influence the export of vegetable products in Moldova, we investigate the relationships between economic and climatic factors and the export of cereal products. The cereal was selected because, from a quantitative point of view, cereal represents the leading share of vegetable exports. In the last year, the exported mass of cereals exceeded several times the mass of exported sunflowers or the mass of exported fruits.

Figure 1.

The mass of the main exported agricultural products, thousand tons



Source: developed by the authors based on the NBS data

The dependent variable for the model was selected as the export growth dynamics, represented by the logarithmic first difference of cereal exports (*Δlog(export)*). A similar log-difference specification was employed by Khalilov, Fikratzade, and Huseyn (2025), who analysed agricultural productivity as a function of macroeconomic and environmental factors.

As the main economic explanatory variable, we include the difference between the changes in external and internal cereal prices: dlog (External prices) – *dlog (Internal prices)*, which reflects the evolution of relative price competitiveness.

Incorporating climatic factors into the model poses some challenges. Some studies use the levels or logarithms of temperature and precipitation as explanatory variables. For example, Amouzay and El Ghini (2025) adopt such an approach in their analysis of the impact of climate variability on agricultural production in Morocco. However, climatic effects are often non-linear: both insufficient and excessive precipitation, as well as unusually low or high temperatures, can reduce agricultural output. This is why many studies model these variables in a quadratic form, including both the level and its squared term in regression models. This specification enables the identification of threshold effects, where moderate temperature or rainfall may enhance agricultural output, while extreme values in either direction become detrimental. Such an approach has been widely applied in the empirical literature, including by Norboev, Fabri, Passel, and Moretti (2025) in *"Comparative Analysis of Climate Change Impact on Italian Agriculture: A Ricardian Regression Analysis"*, Belloumi (2014) in *"Investigating the Impact of Climate Change on Agricultural Production in Eastern and Southern African Countries"*, and Khalilov, Fikratzade, and Huseyn (2025) in *"The Influence of Average Annual Climatic Indicators on Agricultural Productivity: Considering the Threshold Effect."*

However, due to the limited sample size in this study (annual observations for the 2006–2024 period), introducing both levels and squared terms for each climatic variable would considerably increase the number of regressors, thereby reducing the degrees of freedom and potentially leading to biased coefficient estimates. To preserve parsimony while still capturing non-linear effects, this study adopts an alternative specification: the squared deviations of annual temperature and precipitation from their long-term averages (2006-2024), denoted *(Temperature-Average temperature)*^{2} and *(Rain-Average rain)*^{2}.

The empirical analysis relies on annual data for 2006–2024, collected from several official statistical sources. For example, data on cereal exports were obtained from the National Bureau of Statistics (NBS), specifically from the Food Resources Balance datasets. External price dynamics are proxied by the FAO Wheat Price Index, expressed with a base period of 2014–2016 = 100, while internal cereal prices are derived from nominal producer prices per tonne reported by the NBS, also converted into an index using the same base period (2014–2016 = 100). This approach ensures comparability between domestic and international price developments and captures the impact of relative price movements on export growth. The precipitation and temperature data were obtained from the NBS.

MAIN RESULTS

MAIN TRENDS AND PROSPECTS OF INTERNATIONAL TRADE WITH AGRICULTURAL PRODUCTS

According to the Global Report on Food Crisis 2025, in 2024, about 295.3 million people faced high levels of acute food insecurity in 53 of the 65 countries/territories selected for the analysis (GNAFC, 2025). As a result of the significant influx of refugees from Ukraine amid the war on the eastern border, as well as the economic shock from heightened geopolitical tensions, Moldova was included in this Report for the first time. Focusing on economic access to nutritious foods, updated estimates in the State of Food Security and Nutrition in the World Report (2024) show that more than one-third of people worldwide – about 2.8 billion – could not afford a healthy diet in 2022.

Agricultural international trade is very important for alleviating the severity of the global food crisis. Over the last 10 years, about 22% of global calories have been traded across borders, up from 17% two decades ago (OECD, 2025).

Over the last decade, international trade in agricultural products has grown but has been exposed to numerous shocks, mainly due to climate change, the COVID-19 crisis, geopolitical tensions, and trade barriers imposed by some countries amid the food crisis (WTO, 2024). Global agricultural production has expanded mainly in emerging economies, shifting toward higher-value and resource-intensive products such as oilseeds, fruits, and livestock, supported by technological innovation and productivity gains (OECD & FAO, 2024). However, rising input costs, environmental degradation, and increasing frequency of extreme weather events are constraining yield growth, particularly in poorer regions. Projections suggest that, to support the growing demand over the next decade, global agricultural and fish production will expand by 14% in constant prices. Middle-income countries are expected to play a leading role in the global agricultural production growth. Increasing capital investments and the adoption of innovations to strengthen resilience, along with inclusive trade policies coordinated with food security policies, will be important factors in supporting global agricultural production and food security (OECD, 2025).

AGRICULTURAL TRADE AND EXPORT POTENTIAL OF THE MAIN AGRICULTURAL PRODUCTS IN MOLDOVA

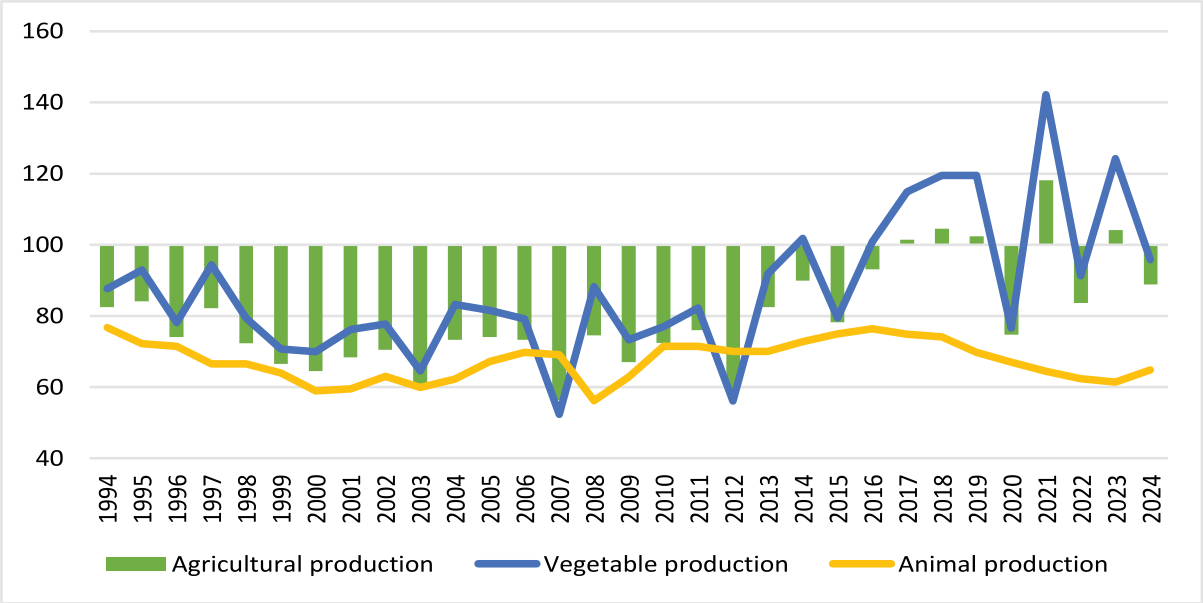
In Moldova, agricultural production relies on fertile chernozem soils and focuses on maize, wheat, sunflower, fruits (e.g., apples, plums), and viticulture (World Bank, 2016).

During the first two decades, the sector followed a generally downward trend, characterised by unstable output and frequent oscillations caused by high exposure to climate variability and insufficient adaptation capacity to climate conditions and transition reforms. In the second half of the 2010s, agricultural production began to recover and reached the 1992 level in 2017, primarily supported by the expansion and modernisation of vegetal production (figure 2). Despite this partial recovery, the sector remains highly vulnerable to adverse climate conditions, soil degradation, and fragmented farm structures, which limit productivity and competitiveness. Moreover, external factors—such as international price volatility, limited access to capital, and tariff and non-tariff barriers to trade—continue to constrain the sector's competitiveness in global markets and diminish long-term resilience.

Since 2020, Moldova's agricultural sector has been exposed to severe climate shocks occurring roughly every 2 years, resulting in substantial losses in crop yields and farm income (2020, 2022, 2024). In 2020 and 2022, Moldova recorded year-over-year reductions in cereal yields per hectare of more than 50%, including declines of approximately 45–46% in wheat yields and around 70% in maize yields. Sunflower seed production also fell by about 40% In 2024, the year-over-year contraction in cereal yield per hectare was less pronounced compared to 2020 and 2022 years—around 30% —yet decreases were registered across all major crops, including a 23% reduction in wheat and barley yield and a 44% decline in maize. In the case of fruits, this volatility is less pronounced. In 2024, Moldova's average yields (kg per hectare) were approximately 3,240 for wheat, 1,620 for maize, 1,480 for sunflower seeds, 10,770 for apples, and 5,480 for plums.

Figure 2.

Agricultural production index, 1992=100%



Source: developed by the authors based on NBS data

According to FAO data, yield volatility in Moldova was significantly higher than in countries such as Ukraine, Romania, Lithuania, Georgia, and Armenia during the period 2019–2023. In drought-prone years affected by other natural disasters (e.g., 2020 and 2022), cereal crop yields in Moldova fell below the levels recorded in these benchmark countries. In more favourable years, such as 2021 and 2023, Moldova achieved relatively high wheat yields — 4,133 kg/ha in 2023 — comparable to those of Ukraine (4,642 kg/ha), Lithuania (4,738 kg/ha), and Romania (4,152 kg/ha), and considerably higher than those of Georgia (2,639 kg/ha) and Armenia (2,527 kg/ha). In contrast, maize yields in 2023, although higher than in 2022, remained significantly lower in Moldova (2,804 kg/ha) compared to Armenia (7,749 kg/ha), Ukraine (7,806 kg/ha), and Lithuania (8,111 kg/ha), and to a lesser extent Romania (3,982 kg/ha). Apple yields in Moldova were consistently lower than those in Ukraine but exceeded those of the other benchmark countries in years with favourable weather conditions.

Despite the marked volatility observed in agricultural production, the data indicate that, for the most important agricultural crops, fruits, sunflower seeds, and grapes, domestic output is largely sufficient to meet Moldova's internal consumption needs. In the cases of wheat, maize, sunflower seeds, and fruits, production levels consistently remain above or close to internal consumption, sometimes even during years affected by adverse weather shocks. At the same time, in 2020, when productivity declined sharply due to extremely unfavourable climatic conditions, the self-sufficiency rate fell well below 100% for both wheat and maize. A similar situation occurred in 2022, when drought conditions led to a 70% decline in maize production compared to 2021. Nevertheless, the volume of maize exports in 2022 increased 2.4 times, driven by the considerable rise in international cereal prices amid the Russia–Ukraine war (Table 2).

Table 2.

Self-sufficiency ratio in Moldova computed as production to internal consumption, %

	2020	2021	2022	2023	2024
Cereals crops, incl.	71.0	219.8	95.8	190.2	148.2
Wheat	87.7	236.5	130.5	242.4	137.2
Maize	61.1	216.8	79.6	157.9	162.6
Sunflower seeds	215.7	301.8	191.2	203.3	182.1
Fruits, incl.	212.7	258.0	205.3	227.0	172.0
Apples	217.5	266.0	206.0	237.4	168.9
Grapes	102.6	109.1	109.4	112.6	113.2

Source: developed by the authors based on the Food Balance of the Republic of Moldova, NBS

The climate-related negative impacts on agricultural production in 2020 and 2022 coincided with two additional major and complex crises with far-reaching socio-economic implications at both regional and global levels: the COVID-19 pandemic and the war in Ukraine. The overlapping nature of these shocks has placed considerable pressure on agricultural producers, trade flows, and rural livelihoods. Consequently, the period has been marked by very weak economic performance. The stagnation of economic growth in recent years underscores the country's heightened vulnerability to compounded crises and raises concerns about its food security.

These food security concerns are also closely linked to Moldova's agricultural sector's trade openness. Moldova is not a major player on the international agri-food market, nor at the regional level. In 2024, it accounted for about 0,086% of global agricultural exports, increasing its share by 48% compared to 2010 and by 23% compared to 2020. In particular, Moldova has a more substantial presence on the global market for sunflower seeds, cereals, fruits, and sunflower oil (Appendix 1).

At the same time, agricultural and food products account for about half of Moldova's merchandise exports, amounting to 1.6 million. USD in 2024, or about 46% of merchandise gross exports (including 32% are agricultural products). In absolute terms, the value of agri-food exports of Moldova is comparable with countries of a similar development level, such as Georgia (1,7 mild USD) and Armenia (1,3 mild USD, but remains 5 times lower than that of Lithuania (7,8 mild USD) and 7 times lower than that of Romania (11,7 mild USD). Ukraine's agricultural exports amount to 24,6 mild USD. Their considerably larger geographic areas explain the significantly higher value in Romania and Ukraine.

In relative terms, Moldova's share of agri-food products in total merchandise exports far exceeds those of its regional peers: Armenia (10%), Georgia (26%), Lithuania (20%), and Romania (12%). This highlights the structural importance of the agricultural sector Moldovan economy, making it one of the major pillars of its export potential and food security resilience (Table 3).

Table 3.

The share of agri-food exports in merchandise gross exports of Moldova, Georgia, Armenia, Ukraine, Lithuania and Romania

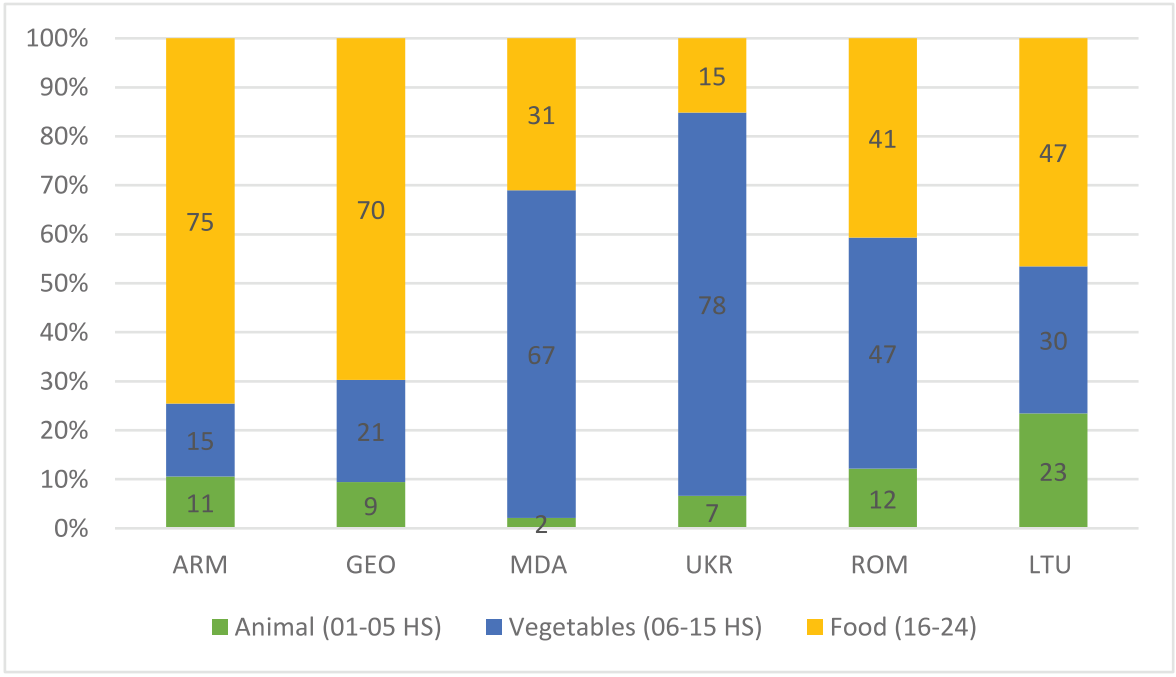
Country/ Year	2010	2015	2019	2020	2021	2022	2023	2024
ARM	16	26	30	30	29	23	13	10
GEO	21	28	23	28	27	22	24	26
LTU	18	19	18	21	18	18	20	20
MDA	48	46	44	44	46	45	43	46
ROM	8	11	10	11	13	13	13	12
UKR	-	38	44	45	40	53	61	59

Source: authors' calculations based on WITS statistics

However, Moldovan agricultural production, as seen earlier, and accordingly exports rely mainly on low value-added products. Moldova, like Ukraine, exports predominantly vegetable products, including vegetable and animal fats and oils, which accounted for 67% and 78% of their agri-food exports in 2024. In Moldova's case, processed food products represented about one-third of exports, compared to only 15% in Ukraine, while animal products formed a very marginal share (2%) (Figure 3). The transition period was characterised by a significant decrease in exports of processed agricultural products and accelerated growth in raw materials exports, which implies a substantially lower production and marketing effort for farmers. In contrast, the structure of agricultural exports in EU member states is more diversified and oriented towards adding value. For instance, in 2024, EU countries mainly exported processed food products (56.8%) and animal products (19.8%), whereas vegetable products accounted for about 24% of agricultural exports (Eurostat, 2025).

Figure 3.

The structure of agri-food exports decomposed by animal, vegetable and food products, 2024



Source: *authors' calculations based on WITS data*

The descriptive statistics presented in Table 4 indicate that the average annual growth rate of agricultural exports in Moldova between 2012 and 2024 was 7%, with a standard deviation of 21.4, suggesting relatively high volatility compared to other countries. The median value being lower than the mean further indicates that, in half of the analysed years, Moldova experienced annual export growth of less than 3.7%. This suggests that a few years of exceptional performance elevate the average, while most years see modest growth — confirming the episodic nature of export expansion.

Furthermore, due to Moldova's relatively small agricultural exports, the average growth rate stays modest. Essentially, the structure of agricultural production — and therefore exports — which mainly focuses on primary agricultural commodities, explains the slow and uneven pace of export growth. As a result, long-term export expansion depends mainly on increases in export volumes, while unit values tend to grow much more slowly. This pattern shows the limited value added domestically, as most products are exported in raw form. Consequently, the export sector remains very sensitive to changes in production volumes, weather patterns, and external price shocks.

In 2019, the unit value index of exported vegetable products and of vegetable and animal oils and fats accounted for approximately 71% and 81% of their 2010 levels, while their volume indices rose much more sharply, reaching about 298% and 232%, respectively. Beginning in 2020, the unit value of vegetable products grew faster, peaking at 114% in 2022 before easing to 94% in 2024 relative to 2010. During the same period, export volumes continued to expand, with the volume index reaching 315% in 2023 and 300% in 2024. For vegetable and animal fats and oils, both unit value and volume indices increased rapidly. In 2023, the unit value index climbed to 170%, while the volume index surged to 586% compared with 2010. In 2024, however, both indicators declined, with the unit value index dropping to 104% and the volume index to 338% relative to 2010.

Table 4.

Descriptive statistics on agricultural exports growth for the period 2012-2024

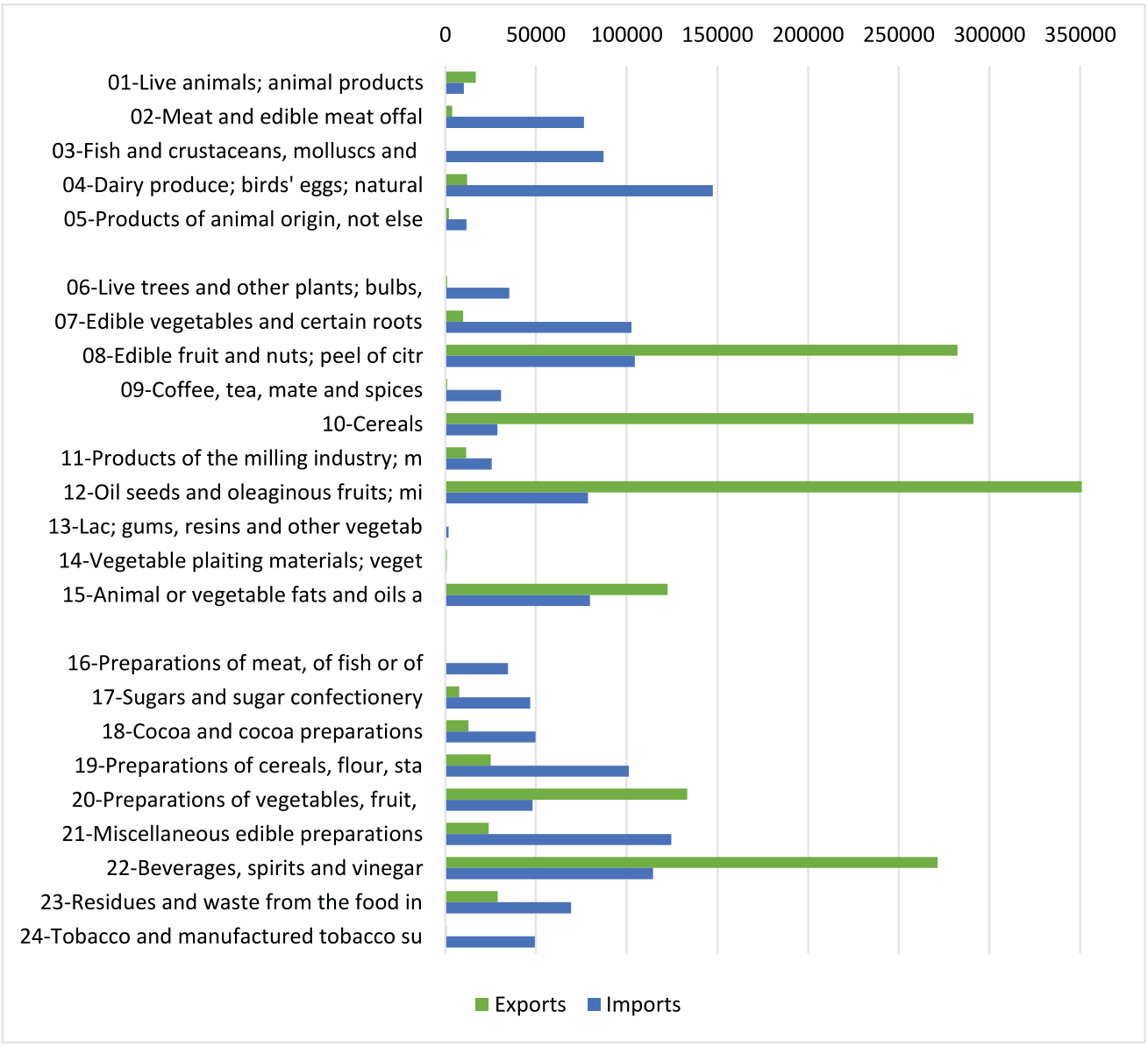
	ARM	GEO	LTU	MDA	ROM	UKR
Min	-29.4	-23.2	-18.4	-16.8	-22.6	-11.0
Max	55.2	51.5	21.4	45.0	60.6	45.1
Mean	20.2	8.2	3.3	7.0	6.5	7.0
Median	22.2	8.5	2.4	3.7	2.1	4.3
Standard Deviation	24.0	19.3	12.1	21.4	22.9	16.1

Source: *authors' calculations based on WITS statistical data*

According to 2024 data, the trade balance for vegetable products (HS06-14) and vegetable oils and fats totalled about 600 million USD, while the trade balance for animal products remained negative, amounting to 300.6 million USD in 2024 (Figure 4). Among Moldova's most exported agricultural products, which have also experienced rapid growth since 2010, are staple goods such as wheat, maize, sunflower seeds, apples, and grapes (table 4), for which the country has a positive trade balance (Appendix 2).

Figure 4.

Moldova's agricultural products exports and imports by product category in 2024, thousand USD



Source: authors' calculations based on the NBS data

Some vegetables exhibit relatively high RCA values compared to the benchmark countries in the region. But Moldova, along with Armenia and Romania, has a comparative disadvantage in the export of animal products, and its RCA for food is significantly lower than that for vegetable products. This trend emphasises food security challenges related to the export structure.

The risk of orientation toward external markets for the country's main agricultural raw materials, particularly staple crops and sunflower seeds, is increasing. Coupled with other relevant indicators—such as the high concentration of agricultural exports in a limited number of markets and the significant volatility of international prices—these factors increase the pressure on farmers' export incomes and heighten risks to food accessibility in the domestic market (Table 5).

Table 5.

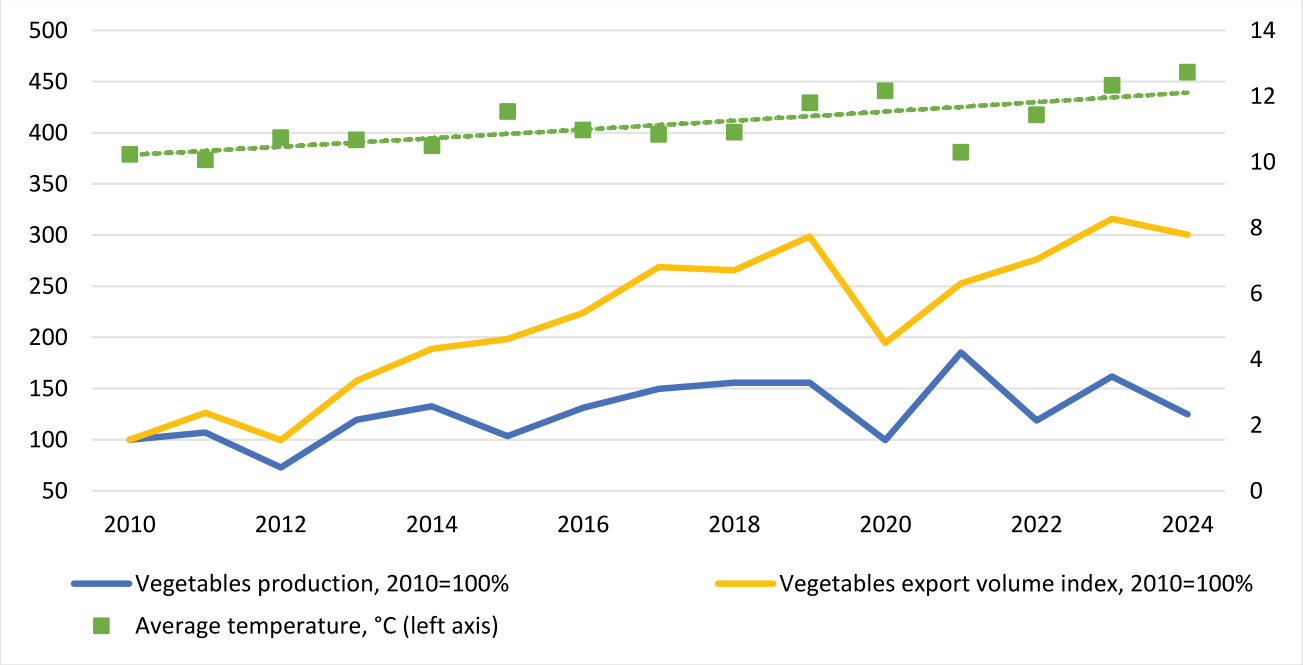
Revealed Comparative Advantage (RCA) and Herfindahl Hirshman Market Concentration Index (HHMI) for the main exported agricultural products by the Republic of Moldova

Product HS code	Product description	RCA 2010	RCA 2024	HHMI 2010	HHMI 2024
1206	Sunflower seeds, whether or not bro	228.75	398.3	0.0877	0.2857
1001	Wheat and meslin.	10.51	27.9	0.0295	0.4550
2204	Wine of fresh grapes, including for	46.13	22.4	0.1907	0.1015
1512	Sunflower-seed, safflower or cotton oils	97.31	50	0.3517	0.1038
2009	Fruit juices (including grape must)	18.02	29	0.1253	0.2962
0808	Apples, pears and quinces, fresh.	57.42	43.3	0.8403	0.3937
0809	Apricots, cherries, peaches (include)	49.55	41.6	0.6521	0.0830
1005	Maize (corn).	5.82	8.9	0.1031	0.1063
0806	Grapes, fresh or dried.	16.34	29.1	0.5566	0.2135
1205	Rape or colza seeds, whether or not	20.51	23.4	0.2410	0.3703

Source: developed by the authors based on the WITS database

Figure 5.

Temperature, Production, and Vegetable Exports in Moldova



Source: developed by the authors based on the NBS data

The growth in agricultural production over the past decade has supported the expansion of Moldova's agri-food export volumes, with both series following an upward trajectory (Figure 5). Rising average temperatures are also visible, but their trend does not appear to disrupt the overall co-movement between production and exports. At the same time, Moldovan export prices closely mirror international food price dynamics, indicating that the country is largely a price-taker in global agri-food markets.

ECONOMETRIC ANALYSIS

The first step for empirical analysis is to verify the stationarity of the variables to be included in the model and to select the most appropriate regression specification. For this purpose, the Augmented Dickey–Fuller (ADF) test is employed. Given the annual frequency of the data, a maximum of two lags is considered sufficient to capture possible dynamics without overparameterizing the test.

Table 5.

The results of the ADF test

Null Hypothesis: *dlog(EXPORT)* has a unit root			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.982609	0.0096
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	
Null Hypothesis: *(Rain-Average rain)²* has a unit root			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.651775	0.0129
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	
Null Hypothesis: *dlog (External prices)-dlog(Internal prices)* has a unit root			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.097618	0.0000
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	
Null Hypothesis: (Temperature-Average temperature)2 has a unit root			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.024562	0.9504
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

Source: authors' estimates

Since the unit root tests indicate a mix of stationary and non-stationary variables, the modelling strategy must accommodate variables of different orders of integration. Specifically, the change in cereal exports, the difference between the change in external and internal prices, and the squared deviation of annual precipitation from its long-term mean are stationary, while the squared deviation of annual temperature from its long-term mean is non-stationary. To handle this structure, we employ an Autoregressive Distributed Lag (ARDL) model, which includes a lagged dependent variable and is particularly suitable when regressors are a combination of I(0) and I(1) processes. The regression for the change in export of cereals takes the following form:

$$dlog(export_t) = \alpha_o+\beta_1 \cdot dlog(export_{t-1})+\beta_2 \cdot [dlog\ (External\ prices_t)-dlog\ (Internal\ prices_t)]+\beta_3 \cdot (Temperature_t-Average\ temperature)^2+\beta_4 \cdot (Raint-Average\ rain)^2+\varepsilon_t$$

The results, expressed by F-statistic of 4.29 (p = 0.022), show that explanatory variables, taken jointly, have statistically significant explanatory power for the variation in cereal export growth. This confirms that the model provides a meaningful in-sample predictive relationship between exports and the included determinants. If we look at variables separately, the estimation output indicates that changes in external prices relative to internal prices have a statistically significant influence on the variation in cereal exports (Table 6). In contrast, the climatic factors exhibit statistically insignificant effects, suggesting that short-term fluctuations in weather conditions have a limited impact on export dynamics.

Table 6.

Change in the regression of cereal exports. The estimation output

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
$dlog(EXPORT_{t-1})$	0.228126	0.222061	1.027312	0.3245
$dlog(External\ prices_t)$-dlog(Internal pricest)	1.970071	0.617096	3.192485	0.0077
$(Temperature_t$-Average temperature)^2	-0.124495	0.127140	-0.979196	0.3468
$(Rain_t$-Average rain)^2	-7.27E-07	8.21E-06	-0.088547	0.9309
Constant term	0.248704	0.164861	1.508568	0.1573
R-squared	0.588554	F-statistic		4.291352
Adjusted R-squared	0.451405	Prob(F-statistic)		0.021984
Durbin-Watson stat.	2.219196			

Source: author's estimates

The F-bounds test developed by was applied to verify the existence of a long-run relationship among the variables. The calculated F-statistic (6.81) exceeds the 5% upper critical value (5.07) for the finite-sample distribution, allowing rejection of the null hypothesis of no cointegration (Table 7). This confirms a stable long-run equilibrium relationship between cereal exports and the explanatory variables

Table 7.

The result of F-Bound test

Test Statistic	Value	Signif.	I (0)	I (1)
Actual Sample Size	17		Finite Sample: n=30	
F-statistic	6.806289	10%	4.025	4.025
k	0	5%	5.07	5.07
		1%	7.595	7.595

Source: author's estimates

Note: Null hypothesis - no level relationship

The Breusch–Godfrey LM test was employed to verify the absence of serial correlation in the residuals of the estimated model. This test is preferred because it is valid even when the model includes lagged dependent variables, as in the ARDL specification. The obtained p-values (0.62 and 0.46) exceed 0.05 (Table 8), indicating that no autocorrelation is present, and the model's residuals are independent over time.

Table 8.

The Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.507452	Prob. F(2,10)	0.6167
Obs*R-squared	1.566366	Prob. Chi-Square(2)	0.4569

Source: author's estimates

Note: Null hypothesis - no serial correlation at up to 2 lags

The Breusch–Pagan–Godfrey test was applied to assess heteroskedasticity in the residuals of the estimated model. This test assesses whether the errors' variance remains constant across observations. The high p-values, all above 0.05 (Table 9), indicate that the null hypothesis of homoskedasticity cannot be rejected, confirming that the model's residuals have a constant variance and are thus well-behaved.

Table 9.

Breusch-Pagan-Godfrey Heteroskedasticity Test

F-statistic	0.594706	Prob. F(4,12)	0.6732
Obs*R-squared	2.812468	Prob. Chi-Square(4)	0.5897
Scaled explained SS	0.730010	Prob. Chi-Square(4)	0.9476

Source: author's estimates

Note: Null hypothesis - Homoskedasticity

The distribution of residuals was tested to verify compliance with the normality assumption, which is particularly important for small samples such as in this study. The Jarque–Bera statistic (1.16) with a p-value of 0.56 indicates that the residuals follow a normal distribution.

The Cumulative Sum of Recursive Residuals (CUSUM) test was used to evaluate the stability of the estimated coefficients over time. The test results show that the CUSUM statistic stays within the 5% significance boundaries, indicating that the parameters of the ARDL model are stable across the sample period. This suggests no significant structural breaks in the model during the analysis period.

The estimated ARDL regression provides statistically consistent results, even within the limitations of a small sample. The results confirm cointegration, indicating a long-run equilibrium relationship between cereal exports and the explanatory variables. The residual diagnostics show that the model is free of autocorrelation and exhibits homoskedasticity, and that the residuals are normally distributed, which is especially important in a small-sample context, as it reduces the risk of inconsistent estimates. Furthermore, the CUSUM test confirms the stability of model parameters. In addition, the F-statistic demonstrates that the explanatory variables, taken jointly, have significant explanatory power, confirming that the model provides a meaningful in-sample predictive relationship.

DISCUSSIONS

The results of the research underscore Moldova's agricultural volatility to climatic shocks and export dependence on low-value commodities, aligning them with global trends of shock-exposed agricultural trade (WTO, 2024; OECD & FAO, 2024). Yield declines from climate shocks in the recent years: 2020, 2022, 2024 mirror findings in Vicente-Serrano et al. (2024), who concluded in their study that the weather conditions in Moldova will continue to get worse in the future. These factors significantly undermine farmers' incomes and reduce investments in high-value-added agricultural activities, thereby directly affecting the domestic availability of food products. Stratan et al. (2025), who examine the relationship between climate shocks and food security resilience, argue that climate pressures in Moldova are intensifying more rapidly than the adaptive capacity of its food system. If this trend persists, the risk of food insecurity will rise substantially.

Despite the considerable volatility in agricultural production, the data show that domestic output of the main crops—wheat and maize, fruits, sunflower seeds, and grapes — is generally sufficient to satisfy Moldova's internal consumption needs. These results are supported by Stratan et al. (2024). However, the self-sufficiency ratio for the main crops in 2020 and for maize in 2022 decreased, underscoring the low resilience of the agricultural sector and the food security system in conditions of extreme weather, amid two overlapping severe socio-economic international crises. This aligns with the IMF (2023) conclusions, which highlight the economy's heightened sensitivity to climatic conditions and its limited adaptive capacity to climate shocks that can have a major impact on crop yields and food security.

The structure of agri-food exports is dominated by primary agricultural products, whose share has been steadily increasing in total merchandise exports at the expense of processed agricultural products, reflecting post-transition deindustrialisation, as confirmed by Litvin (2024) and Coşer & Cimpoieş (2014). It is contrasting the EU agri-food exports diversification

(Eurostat, 2025), which focuses more on high-value-added products like food, while animal products have a significantly higher share in Moldova. Consequently, Moldova's food security remains vulnerable, as reliance on raw commodity exports increases exposure to production fluctuations, market volatility, and external shocks.

Descriptive statistics reveal modest, volatile growth in agricultural exports over the last decade (mean 7%, SD 21.4% during 2012-2024), driven predominantly by faster quantity increases than unit-value growth, increased volatility in international food prices, and making Moldova a price-taker. Surges in international food prices increase the risk of diverting basic agricultural products from the domestic market to export markets that offer higher prices, thereby reducing access to essential food products for the poor (Varghese, & Suppan, 2023; Aragie et al., 2023). A recent example derived from the research findings is the substantial increase in maize exports in 2022, which occurred amid a sharp rise in international prices. This happened despite the decline in agricultural production, including for this crop, which also led to a reduction in the self-sufficiency rate. Economically, the findings suggest that relative price competitiveness—measured as the difference between changes in external and internal cereal prices—plays a dominant role in explaining export dynamics. When external prices rise relative to domestic prices, Moldovan cereal exports tend to increase, reflecting more substantial incentives for producers to sell abroad.

Despite the positive trade balance generated by Moldova's agricultural sector, particularly vegetable exports, which partially offset the country's substantial merchandise trade deficit (Fala, 2024), the high market concentration of certain agricultural exports poses significant economic risks. Reliance on a narrow range of low-value-added export commodities and market concentration exposes the sector to international price volatility, demand shocks, and trade disruptions, increasing the vulnerability of export revenues. In Moldova, this dynamic is especially relevant because fluctuations in export income can impact not only the balance of payments but also household livelihoods and food security. As a result, policies focused on diversifying agricultural exports and strengthening domestic value chains are vital for reducing the risks associated with concentrated markets, supporting sustainable economic growth, and ensuring national food security.

CONCLUSIONS

The analysis indicates that Moldova has made some progress in strengthening its agricultural export potential, especially in international cereals markets. Despite recurring climate shocks, structural constraints, and soil degradation, domestic production of key staples—such as wheat, maize, sunflower seeds, and fruits—has generally remained sufficient to meet internal consumption, reflecting a relatively resilient primary production base. At the same time, the country holds a competitive advantage in global markets for certain vegetable products, as confirmed by export volumes and comparatively high revealed comparative advantage (RCA) values.

However, these achievements conceal significant vulnerabilities with direct consequences for Moldova's food security. The agri-food export structure remains heavily reliant on low-value-added raw materials, especially cereals and oilseeds. While exporting such staples provides short-term revenue, it adds little to long-term income growth and limits the ability to improve agricultural productivity. Furthermore, the country's heavy reliance on unprocessed commodity exports makes it vulnerable to international price fluctuations, increasing external risks and potentially affecting domestic food affordability. Econometric results also show that cereal exports are very sensitive to foreign price changes, meaning that periods of high international prices can boost exports while simultaneously decreasing domestic supply, creating conflicts between export motives and internal food security requirements.

To mitigate these risks and bolster food security, Moldova should pursue policies that diversify agricultural production and increase the proportion of high value-added agri-food products, such as fruits, vegetables, meat, and processed foods. Expanding the processing sector and improving value-chain integration would enable producers to earn higher incomes, build resilience, and contribute to a more stable domestic food supply. Simultaneously, public authorities must closely monitor international price trends and ensure sufficient domestic reserves and storage capacity to safeguard food availability during periods of increased external demand or unfavourable global market conditions.

Future research could further aid food security-focused policymaking by examining more closely the factors causing variations in agricultural output, as well as by directly predicting the production levels of key crops. Using econometric models with higher-frequency time series (quarterly or monthly data) would improve understanding of short-term changes and structural shifts in both production and export values.

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REFERENCES

Amouzay, H., & El Ghini, A. (2025). Climate variability impact on agricultural production in Morocco: New evidence from a spatial econometric analysis. *New Medit, Mediterranean Journal of Economics, Agriculture, Environment and Food*, 1, 39-68. https://doi.org/10.30682/nm2501c

Aragie, E., Balié, J., Morales, C., & Pauw, K. (2023). Synergies and trade-offs between agricultural export promotion and food security: Evidence from African economies. *World Development*, *172*, 106368. https://doi.org/10.1016/j.worlddev.2023.106368

Belloumi, M. (2014). *Investigating the impact of climate change on agricultural production in Eastern and Southern African countries*. Working Paper 0003. African Growth and Development Policy Modeling Consortium (AGRODEP), & International Food Policy Research Institute (IFPRI). https://agrodep.org/sites/default/files/AGRODEPWP0003.pdf

Bjornskov, C. (2005). *Basic of International Economics -Compendium*. Copenhagen: Ventus.

Coşer, C., & Cimpoieș, L. (2014). Quantifying agri-food export potential and east-west orientation approach: Evidence from Moldova. *Scientific Papers. Series Management, Economic Engineering in Agriculture and Rural Development*, *14*(4), 51-60. https://ibn.idsi.md/vizualizare_articol/207349

Eurostat. (2025, April). *Extra-EU trade in agricultural goods*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Extra-EU_trade_in_agricultural_goods

Fala, V. (2024). Measuring external macroeconomic imbalances and competitiveness in the Republic of Moldova. *Akademos,* 2(73), 106-114. https://doi.org/10.52673/18570461.24.2-73.11

FAO, IFAD, UNICEF, WFP & WHO. (2024). *The State of Food Security and Nutrition in the World 2024. Financing to end hunger, food insecurity and malnutrition in all its forms*. Rome, Italy. https://doi.org/10.4060/cd1254en

Fiankor, D., Curzi, D., & Olper, A. (2021). Trade, price and quality upgrading effects of agri-food standards. *European Review of Agricultural Economics*, *48*(4), 835-877. https://doi.org/10.1093/erae/jbaa026

Food Security Information Network (FSIN) & Global Network Against Food Crises (GNAFC). (2025). *Global Report on Food Crises 2025*: *Analyses, assessments and case studies of food security and nutrition in countries facing acute food crises*. Rome, Italy: FSIN, GNAFC. https://doi.org/10.71958/wfp130664

Fujimoto M. (2017). J. S. Mill's idea of international trade. The inheritance from Ricardo's free trade and Torrens' reciprocity. In: *Ricardo and International Trade* (pp. 237-253). Routledge. https://doi.org/10.4324/9781315168500-13

Guerron-Quintana, P. (2013). The Economics of small open economies. *Business Review,* Q4, 9-18. https://www.philadelphiafed.org/-/media/frbp/assets/economy/articles/business-review/2013/q4/brQ413_economics_small_open_economies.pdf

International Monetary Fund (IMF). (2023). *Republic of Moldova*. Country Report No. 429 Washington: IMF. https://www.imf.org/en/-/media/files/publications/cr/2023/english/1mdaea2023005.pdf

Khalilov, H., Fikratzade, F., & Huseyn, R. (2025). The influence of average annual climatic indicators on agricultural productivity: Considering the threshold effect. *Agriculturae Conspectus Scientificus*, *90*(1), 7-19. https://acs.agr.hr/acs/index.php/acs/article/view/2575

Litvin, A. (2024). *State of Art of Agriculture in Moldova in the process of EU integration*. https://seerural.org/wp-content/uploads/2025/01/State-of-Art-of-Agriculture-in-Moldova-in-the-process-of-EU-integration.pdf

National Bureau of Statistics. (2025). *Multidimensional poverty in the Republic of Moldova in 2024*. https://statistica.gov.md/en/multidimensional-poverty-in-the-republic-of-moldova-in-2024-10102_61803.html

Norboev, O., Fabri, C., Van Passel, S., & Moretti, M. (2025). Comparative analysis of climate change impact on Italian agriculture: A Ricardian regression analysis. *Agricultural and Food Economics, 13*(1), 69. https://doi.org/10.1186/s40100-025-00404-3

Organisation for Economic Co-operation and Development (OECD) & Food and Agriculture Organization of the United Nations (FAOUTN). (2025). *Agricultural Outlook 2025-2034*. Paris: OECD Publishing, Rome: FAO. https://doi.org/10.1787/601276cd-en

Pourroy, M., Carton, B., & Coulibaly, D. (2012). *Food Prices and Inflation Targeting in Emerging Economies*. CEPII, WP 33 https://www.cepii.fr/pdf_pub/wp/2012/wp2012-33.pdf

Ricardo, D. (1951). *The works and correspondence of David Ricardo. On the Principles of Political Economy and Taxation*. Vol. 1. Cambridge University Press. https://competitionandappropriation.econ.ucla.edu/wp-content/uploads/sites/95/1970/01/Principles-of-Political-Economy-and-Taxation-1817.pdf

Stratan, A., Lopotenco, V., & Staver, L. (2024). Resilience of Agri-Food Security in the Republic of Moldova. In: *Agricultural Value Chain - Past Trends and Emerging Issues* (pp. 1-25). https://doi.org/10.5772/intechopen.1008164

Stratan, A., Lopotenco, V., & Staver, L. (2025). The Impact of Climate Change on Food Security in the Republic of Moldova. *International Journal of Conservation Science*, *16*(3), 1559-1568. https://doi.org/10.36868/IJCS.2025.03.22

Varghese, S., & Suppan, S. (2023). *As global hunger remains intractable, food price volatility accelerates*. Institute for Agriculture and Trade Policy (IATP). https://www.iatp.org/global-hunger-remains-intractable-food-price-volatility-accelerates

Vicente-Serrano, S. M., Juez, C., Potopová, V., Boincean, B., Conradt, T., Domínguez-Castro, F., Eklundh, L., Peña-Angulo, D., Noguera, I., Jin, H., García-Herrera, R., Garrido-Pérez, J. M., Barriopedro, D., Gutiérrez, J. M., Iturbide, M., Lorenzo-Lacruz, J., & Kenawy, A. E. (2024). Drought risk in Moldova under global warming and possible crop adaptation strategies. *Annals of the New York Academy of Sciences*, *1538*(1), 144-161. https://doi.org/10.1111/nyas.15201

World Bank, Climate Change, Agriculture and Food Security (CCAFS) & International Center for Tropical Agriculture (CIAT). (2016). *Climate-smart agriculture in Moldova*. CSA Country Profiles for Africa, Asia, Europe and Latin America and the Caribbean Series. Washington D.C.: The World Bank Group. https://climateknowledgeportal.worldbank.org/sites/default/files/2019-06/CSA%20Moldova.pdf

World Trade Organization (WTO). (2024). *World Trade Report 2024*: *Trade and inclusiveness. How to make trade work for all*. Geneva: WTO. https://www.wto.org/english/res_e/booksp_e/wtr24_e/wtr24_e.pdf

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APPENDIX

Appendix 1.

Moldova's world agricultural market share

HS product code		Moldova's agricultural exports world share, %						Change in market share 2024/2010, %	Change in market share 2024/2020, %
	Product description	2010	2020	2021	2022	2023	2024		
Agricultural products HS 01-15		0.058	0.070	0.085	0.111	0.096	0.086	47.8	22.8
'01	Live animals	0.061	0.044	0.030	0.026	0.032	0.057	-5.5	31.1
'02	Meat and edible meat offal	0.011	0.005	0.005	0.002	0.003	0.002	-78.8	-50.4
'03	Fish and crustaceans, molluscs and other aquatic invertebrates	0.000	0.000	0.000	0.000	0.000	0.000	1.0	491.8
'04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere ...	0.007	0.019	0.020	0.017	0.012	0.010	38.3	-46.0

HS product code		Moldova's agricultural exports world share, %						Change in market share 2024/2010, %	Change in market share 2024/2020, %
	Product description	2010	2020	2021	2022	2023	2024		
'05	Products of animal origin, not elsewhere specified or included	0.001	0.005	0.005	0.005	0.012	0.018	1416.1	255.2
'06	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	0.009	0.010	0.005	0.005	0.006	0.004	-57.1	-61.0
'07	Edible vegetables and certain roots and tubers	0.016	0.004	0.008	0.010	0.011	0.010	-36.1	141.5
'08	Edible fruit and nuts; peel of citrus fruit or melons	0.224	0.169	0.159	0.178	0.181	0.174	-22.1	3.1
'09	Coffee, tea, maté and spices	0.001	0.002	0.002	0.002	0.002	0.002	15.7	-25.3
'10	Cereals	0.084	0.095	0.240	0.227	0.236	0.189	125.9	100.1
'11	Products of the milling industry; malt; starches; inulin; wheat gluten	0.004	0.007	0.007	0.020	0.032	0.041	831.5	467.4
'12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal ...	0.133	0.203	0.197	0.257	0.190	0.272	105.0	33.7
'13	Lac; gums, resins and other vegetable saps and extracts	0.000	0.000	0.000	0.002	0.002	0.002	263.3	578.5
'14	Vegetable plaiting materials; vegetable products not elsewhere specified or included	0.025	0.061	0.049	0.059	0.059	0.046	84.4	-24.8
'15	Animal, vegetable or microbial fats and oils and their cleavage products; prepared edible fats; ...	0.058	0.101	0.081	0.213	0.167	0.082	40.0	-19.5

Source: authors' calculations based on INTRACEN trade statistics

Appendix 2.

Top agricultural products exported by Moldova

HS code	Product	2010			2024			Compound annual growth rate (2010-2024), %
		Exports, mil. USD	% of agricultural exports	Trade balance, mil. USD	Exports, mil. USD	% of agricultural exports	Trade balance, mil. USD	
1206	Sunflower seeds, whether or not bro	57.3	7.8	50.5	305.9	18.8	269.6	12.7
1001	Wheat and meslin.	35.5	4.9	34.4	197.7	12.2	197.0	13.0
2204	Wine of fresh grapes, including for	137.9	18.8	269.6	143.5	8.8	131.1	0.3
1512	Sunflower-seed, safflower or cotton oils	41.1	5.6	40.3	113.3	7.0	58.6	7.5
2009	Fruit juices (including grape must)	24	3.3	19.5	95.5	5.9	91.9	10.4
0808	Apples, pears and quinces, fresh.	51.3	7	49	76.0	4.7	73.2	2.8
0809	Apricots, cherries, peaches (includ	22.9	3.1	11	72.2	4.4	67.6	8.6
1005	Maize (corn).	14	1.9	13	66.6	4.1	47.6	11.8
0806	Grapes, fresh or dried.	13	1.8	10	60.9	3.7	56.4	11.7
1205	Rape or colza seeds, whether or not	15.4	2.1	13.6	50.8	3.1	46.2	8.9

Source: Wits database and authors' calculations

BRIDGING MIGRATION AND RURAL REGENERATION: RETHINKING LINGUISTIC INTEGRATION FOR DEMOGRAPHIC SUSTAINABILITY

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SUMMARY

This study examines how language learning contributes to demographic resilience in rural Southern Italy, with Pietradefusi as a case study. It addresses a significant knowledge gap by exploring the intersection of migration, linguistic integration, and rural sustainability. Findings reveal that migrant settlement is sustained by a hybrid ecosystem that combines formal instruction, informal community hubs, and digital tools. These practices foster social cohesion, encourage long-term settlement, and position language acquisition as a strategic demographic resource rather than solely a cultural one, strengthening the demographic sustainability of depopulated regions. Policy implications highlight the need for municipalities to recognise non-institutional hubs as grassroots integration centres and to complement them with AI-enabled language platforms that support certification requirements. Such hybrid strategies can enhance accessibility through flexible scheduling, transport provision, and multilingual resources. Ethical design, human oversight, and attention to digital literacy and privacy are essential to ensure that technological innovation strengthens rather than replaces human connection. Although the study's small sample size limits generalisation, it opens pathways for further research across rural contexts and for testing operational models that embed inclusive language practices into demographic policy. Ultimately, the findings highlight how inclusive language strategies can transform integration into a driver of rural resilience. Although the study's small sample size limits generalisation, it opens pathways for further research across rural contexts and for testing operational models that embed inclusive language practices into demographic policy. Ultimately, the findings highlight how inclusive language strategies can transform integration into a driver of rural resilience.

Keywords: *AI education, demographic resilience, Italy, language, L2, inclusion, multilingual education, refugees*

INTRODUCTION

Across Europe, rural territories face persistent demographic challenges marked by ageing populations, declining birth rates, and youth outmigration. Southern Italy, in particular, reflects this crisis, with regions such as Calabria, Campania, and Sicily experiencing steep population declines and structural economic fragility (OECD, 2025). In response, several small municipalities have adopted refugee resettlement strategies as a countermeasure to demographic decay. Research has increasingly recognised migration as a potential catalyst for rural revitalisation (Zanfrini & Pasini, 2025; Pasetti & Cancellieri, 2024), yet the alignment between asylum governance and local development policy remains tenuous.

The existing literature emphasises the importance of migrant labour, housing access, and community support, but our study focuses on the pivotal role of linguistic integration—particularly for migrants settled in rural areas. This perspective is informed by two previous studies: one examining the empowerment of unaccompanied minors in rural Italy through linguistic integration (Santorelli et al., 2024), and another analysing the broader framework, policies, and outcomes of linguistic integration in Italy (Santorelli et al., 2023). Together, these studies highlight how language acquisition shapes social inclusion, autonomy, and long-term integration outcomes, providing a foundation for the present analysis. Bourdieu's (1991) concept of linguistic capital is crucial to understanding how language proficiency influences educational access, performance, and future opportunities.

Furthermore, this study aims to highlight how EU-driven language certification programs and local linguistic initiatives shape integration outcomes and demographic renewal in Southern Italy. Through fieldwork, interviews, and policy analysis, it examines the role of language proficiency in promoting access to asylum, employment, and social cohesion. In addition to institutional efforts, the integration process can be further enhanced by incorporating emerging AI-supported language tools into non-institutional learning environments. These technologies—ranging from mobile translation apps to adaptive language learning platforms—offer flexible, accessible, and personalised support for language acquisition and mediation. Crucially, they can facilitate linguistic integration even in non-standard or informal settings, empowering migrants to navigate everyday interactions, access services, and build social connections beyond formal education systems.

THEORETICAL FRAMEWORK

This study draws upon a multi-layered theoretical foundation that combines migration systems theory, rural sociology, linguistic integration models, and identity-focused frameworks from multilingual education. Together, these perspectives offer a nuanced lens for analysing how language acquisition contributes to the demographic and social revitalisation of depopulated rural areas in Southern Italy. In addition, the concepts of demographic resilience and linguistic capital are introduced to deepen the analysis of how language intersects with population sustainability and social power in rural contexts.

Migration Systems Theory (Mabogunje, 1970) highlights the reciprocal linkages between sending and receiving regions. In Southern Italy, small municipalities are embedded within dynamic migration systems where

international flows can either reinforce existing social structures or reshape them. Within this context, linguistic integration serves as a feedback mechanism: language proficiency opens access to legal residency, education, and employment, which, in turn, influences migrants' decisions to settle and integrate over the long term.

These processes unfold within a broader landscape of rural restructuring. As Woods (2011) argues, rural territories are increasingly transformed by global and national pressures, often resulting in peripheralization. Southern Italy exemplifies this trend, facing demographic decline and economic marginalisation. This study challenges dominant narratives of rural decline by positioning migrants as agents of change. Language programs are reframed not simply as tools for integration but as instruments of territorial revalorization, enabling migrants to contribute meaningfully to local revitalisation.

Language learning is central to this transformation, not only as a communicative practice but also as a site of identity formation and power negotiation (Zschomler, 2019). Drawing on language socialisation theory (Duff, 2010; Norton, 2013), the study emphasises how multilingual contexts allow migrants to navigate belonging, agency, and visibility. Informal learning environments—such as community hubs—play a vital role in fostering social inclusion and shaping migrant identities within the host society.

The relationship between language and identity is further illuminated through Social Identity Theory (Tajfel & Turner, 1979) and Bourdieu's (1991) concept of linguistic capital. Linguistic capital refers to the value of language skills as a form of cultural capital that grants access to institutional recognition, employment, and social legitimacy. Migrants who acquire dominant or prestigious languages gain access to social capital and legal rights, while those speaking marginalised languages often face exclusion. In rural educational and social settings, these linguistic hierarchies significantly influence integration outcomes and settlement decisions.

The notion of demographic resilience adds another analytical layer. Defined as the capacity of populations to withstand and adapt to demographic challenges such as depopulation, ageing, and migration imbalances (De Souza, 2015; OECD, 2025), demographic resilience in rural Italy depends on the successful integration and retention of migrants. Language proficiency is a critical determinant: it enables migrants to meet residency requirements, access labour markets, and participate in civic life, thereby stabilising population dynamics and contributing to rural sustainability.

Finally, Pierson's (1993) policy feedback theory offers a framework for understanding how language certification policies shape local governance. EU-driven linguistic initiatives create incentive structures that influence municipal asylum practices. When adapted to local contexts, these policies enhance rural towns' capacity to retain population and foster demographic resilience, positioning language learning as a strategic tool for both integration and territorial sustainability.

RESEARCH METHODOLOGY

This study adopts a qualitative research design to explore how linguistic integration strategies contribute to demographic resilience in rural Southern Italy. The methodology combines fieldwork, document analysis, and case study expansion to provide a comprehensive understanding of the intersection between migration, language policy, and rural revitalisation. The approach is grounded in the need to capture migrants' lived experiences and the social dynamics of small municipalities, where quantitative indicators alone cannot fully explain integration processes.

A central focus is the hybrid integration model that emerges from the interplay of formal instruction, informal community-based learning, and digital tools. This model demonstrates how diverse pathways of language acquisition collectively sustain social cohesion and demographic stability in depopulated rural areas.

Fieldwork analysis was conducted in the municipality of Pietradefusi (Avellino, Campania) between January and September 2025. The site was selected for its engagement in migrant reception and non-institutional integration initiatives. Pietradefusi has experienced marked depopulation over the past decade, driven by a persistently negative natural balance and sustained outmigration. However, the arrival of foreign nationals—though numerically limited—has contributed to a modest but consistent positive migration balance in certain years. The study included informal observations, interviews, and the collection of digital surveys.

A total of 25 individuals participated: 15 migrant residents (ages 18-45, originating from Bangladesh, Ghana, Mali, Côte d'Ivoire, and Gambia), 2 educators involved in language instruction, 6 long-term local residents, and 2 representatives from NGOs active in integration efforts. All participants provided informed consent.

Data were collected through a combination of informal conversations, field notes, and digital surveys.

Informal interviews were conducted in English or Italian, with translation provided via a translator app or AI tools (e.g., Google Translate, ChatGPT) as needed. Notes were taken manually during or immediately after each interaction.

Digital surveys were distributed via Google Forms, targeting migrant residents.

To facilitate survey participation, a printed note was displayed inside Bar Mario, a local bar, featuring a QR code that provided easy access to the questionnaire. Moreover, the bar owner, through informal personal

contacts with members of the migrant community, directly shared the survey link, thereby encouraging their participation. The questions aimed to elicit reports of integration experiences and perceptions.

The survey is structured in two main sections. The first section collects profile information (Table 1), including gender, age, level of education, languages spoken, and possession of an Italian language certificate.

Table 1.

Demographic profile of the respondents

VARIABLE	DISTRIBUTION
Age range	18–45 years
Gender	13 male, 2 female
Nationalities	Bangladesh (7), Ghana (2), Mali (2), Côte d'Ivoire (1), Gambia (3)
Length of stay	<2 years (6), 2–5 years (5), >5 years (4)
Employment status	Agricultural work (10), service sector (3), unemployed (2)
Italian Language Certification	3

Source: Author's own elaboration

The second section focuses on the linguistic and social integration of migrants in rural areas. It is divided into thematic sub-sections, and for each statement, participants were asked to respond to statements using a five-point Likert scale: Very much – Quite a bit – A little – Not at all – I don't know / Not applicable.

The survey investigates how non-institutional hubs—such as bars, social centres, and local associations—when combined with digital tools, translation apps, and AI-powered educational technologies, contribute to linguistic integration.

The purpose of this survey is to assess the impact of non-institutional hubs on migrants' integration in rural areas.

In particular, the structured questionnaire is designed to collect data on the following dimensions:

- Use of digital tools and artificial intelligence
- Access to public services
- Role of non-institutional hubs
- Linguistic and social integration
- Repopulation of rural areas.

The questions are formulated to help construct a behavioural grid that demonstrates:

- The role of language proficiency in accessing rights and employment
- The effectiveness of digital and AI tools in supporting integration
- The contribution of non-institutional hubs to social cohesion

The impact on demographic balance and rural development.

The survey combined the closed-ended Likert-scale questions (Table 2) with open-ended questions to capture both measurable trends and personal narratives.

While the structured items provided quantifiable data on confidence, frequency, and perceived importance, the open-ended questions allowed respondents to elaborate on their experiences in their own words.

Table 2.

Closed-ended Likert-scale question domains

Domain	Topic
Language Learning & Proficiency:	Confidence in everyday Italian, barriers to attending courses, and frequency of informal practice.
Digital Tools & AI:	frequency of translation app use, perceived effectiveness of AI-powered tools.
Non-Institutional Hubs:	importance of bars and shops, trust in community figures versus municipal officials.
Integration & Rural Development:	perceptions of welcome, contribution of migration to rural revitalisation, and long-term settlement intentions.
Five-point Likert scale: Very much – Quite a bit – A little – Not at all – I don't know / Not applicable.	

Source: Author's own elaboration

To complement the structured scales, participants were invited to respond to narrative prompts such as:

- Can you describe a situation in which you learned Italian through everyday interaction (e.g., at a bar, shop, or workplace)?
- What challenges have you faced in attending formal Italian language courses, and how have you tried to overcome them?
- How have places like local bars, grocery stores, or social centres helped you feel part of the community?
- Which digital or AI-powered tools have been most useful for you in learning Italian or accessing services, and why?
- Who do you turn to when you need help with language or local information, and what makes them trustworthy?
- How do you see your life in Pietradefusi in the next five years? Do you plan to stay, move, or pursue new opportunities?

This dual design enabled the construction of a behavioural grid linking language proficiency, digital tool use, and informal hubs to broader outcomes, including access to rights, employment, and rural demographic resilience. The closed-ended items ensured comparability across respondents, while the open-ended narratives added depth, nuance, and authentic voices that captured the lived realities of integration. To strengthen validity, themes emerging from interviews were systematically cross-checked against survey responses through triangulation, confirming consistency across different data sources.

Document Analysis To support the fieldwork findings and situate Pietradefusi's experience within broader national and international frameworks, a document analysis was conducted using thematic keywords such as linguistic integration, rural settlement, demographic resilience, and policy innovation. This analysis revealed that Pietradefusi reflects a broader trend across Southern Italy, in which small municipalities increasingly leverage migration and language policies to counter depopulation and foster local revitalisation.

Statistical data from ISTAT, accessed via the Campania regional portal, provided detailed insights into demographic shifts and migration flows specific to Pietradefusi, reinforcing its relevance as a case study. The 30th Italian Report on Migrations (Zanfrini & Pasini, 2025) further contextualised these findings by highlighting successful initiatives in regions such as Calabria (Sarlo et al., 2016) and Sicily, where targeted programs in language learning, cultural mediation, and community engagement reversed depopulation trends and contributed to economic renewal and social cohesion (European Parliament, 2020).

These national examples align with broader European strategies (Curtale et al., 2025). The EU Action Plan on Integration and Inclusion 2021–2027 (European Commission, 2025) outlines a multi-level approach that encourages collaboration among national, regional, and local actors, civil society, and migrant communities to develop tailored integration policies (European Commission, n.d.). Central to this strategy is the Asylum, Migration and Integration Fund (AMIF), which provides financial support for language training programs aligned with the Common European Framework of Reference for Languages (CEFR). These programs are particularly vital in rural areas, where formal resources are limited and language proficiency is essential for accessing employment, education, and civic life.

Projects such as UNITES (2022–2024), coordinated by Eurocities and funded through AMIF (European Commission, 2025), exemplify participatory governance by involving migrants and local stakeholders in co-designing integration policies. Similarly, the SIRA Project (2021–2023) piloted grassroots approaches in several EU countries, strengthening local capacity and improving access to funding mechanisms. Both initiatives align with the Action Plan's strategic goals and underscore the importance of inclusive, locally adapted integration models.

Despite these efforts, language barriers remain a persistent challenge. The European Parliament's study "New approaches to labour market integration of migrants and refugees" (Fasani, 2024). notes that limited proficiency in the host country's language continues to restrict migrants' access to essential services, especially in rural areas. Many language programs lack territorial sensitivity and standardised certification, making it difficult for migrants to demonstrate their skills and integrate effectively. The study calls for more inclusive and flexible language policies that address the needs of vulnerable groups and promote lifelong learning.

These insights reinforce the importance of contextualised language strategies observed in Pietradefusi. Informal language acquisition and community-driven practices have proven effective in encouraging long-term inclusion, supporting the idea that migration and linguistic integration can serve as strategic tools for rural renewal within both national and European policy frameworks.

MAIN RESULTS

The case study of Pietradefusi offers a compelling example of how small towns in Southern Italy are being reshaped by demographic decline and the gradual rise of migrant communities.

Pietradefusi is a small municipality in Avellino, Campania, nestled in the Irpinia hills of Southern Italy. Its economy is primarily based on agriculture, with vineyards and olive groves playing a central role in local production. The town hosts an Istituto Comprensivo

that includes a preschool (scuola dell'infanzia), primary school, and lower secondary school (first-grade secondary education). Additionally, there is a second-grade secondary school—a Liceo Classico—which operates with a limited number of enrolled students. For broader educational and economic opportunities, residents often rely on nearby towns such as Avellino and Benevento.

According to the ISTAT (Istituto Nazionale di Statistica, 2025), between 2000 and 2023, Pietradefusi experienced a steady decline in its resident population, dropping from over 2,500 inhabitants to 1,918 by the end of 2023.

This demographic contraction reflects broader trends of rural depopulation in Southern Italy, driven by a persistently negative natural balance and sustained outmigration. In 2023, foreign residents accounted for approximately 6.4% of the population, indicating a modest but stable migrant presence. By January 1, 2024, this proportion had risen to 8.8%, following a net increase of 46 foreign residents (+37.4%). Notably, the leading nationality shifted from Romania (28 residents in 2023) to Bangladesh (23 residents in 2024), marking a significant change in the migrant community's composition. Regional trends further highlight this transformation: Asian nationals grew from 15 (12.2%) to 50 (29.6%), with Bangladesh and Pakistan showing the strongest growth; African nationals increased from 44 (35.8%) to 64 (37.9%), with Nigeria remaining prominent and new arrivals from Mali and Gambia; meanwhile, European nationals saw a relative decline from 50.4% to 31.4%, as Romanian and Bulgarian communities remained stable but proportionally less dominant. These shifts underscore the evolving role of migration in shaping Pietradefusi's demographic landscape.

In Pietradefusi, informal commercial spaces, such as the local bar, grocery store, and tobacco shop, continue to serve as everyday social anchors for both longtime residents and newcomers. In the main square of Dentecane—home to the municipal offices—establishments like Alimentari Michele and Bar Mario emerged as informal hubs of social interaction and information exchange. These venues offered spontaneous access to practical knowledge about transportation, job opportunities, and local networks, underscoring the strategic role of non-institutional settings in fostering social cohesion and facilitating integration.

Empirical data from interviews revealed that most migrants acquired everyday Italian through informal interactions rather than institutional instruction. While the majority had attended CPIA language courses, only a few had obtained formal certification. Irregular work schedules and limited transportation were cited as significant barriers to consistent attendance. Yet formal language certification is not merely symbolic: it is a legal requirement for obtaining long-term residency in Italy. This underscores the urgency of providing hybrid solutions in rural areas—combining formal instruction with flexible, community-based learning—to ensure migrants can meet legal thresholds while adapting to local constraints.

Several interviewees described how informal learning occurred through daily exchanges in community spaces. One migrant recounted that, to request a traditional meal at the bar-trattoria, they had to explain the recipe in detail, including the ingredients, cooking procedures, and utensils. This interaction not only expanded their vocabulary but also became a moment of cultural exchange. The bar owner, intrigued by the dish, added it to the menu, and it soon attracted interest from local residents, who began requesting it. Through this shared culinary experience, migrants and locals engaged in mutual learning, fostering a sense of belonging and respect.

Migrants consistently emphasized the role of community spaces in their linguistic and social integration: "At first I only came for coffee... I didn't speak much. But here, nobody minds if you fumble a word. They just smile and help you say it better" (Adam, 28, olive worker from Mali); "Bar Mario is where I learned the Italian I actually use. Not from books—from talking with old men about football and pasta" (Rahim, 33, labourer from Bangladesh); and "At Bar Mario I learned more Italian than in class, because I had to order food, ask questions, and talk with locals every day" (Hasan, 32, labourer from Bangladesh). These everyday exchanges often became moments of cultural exchange, as one participant explained: "Explaining my recipe was like teaching Italian to myself. The bar owner listened carefully, and I felt respected." Similarly, Fatima, a caregiver from Mali, noted: "You see the same people every morning. Over time, they start asking how your kids are doing or if you've found work yet. That's where I feel I became part of the town." Local residents also recognised this transformation, with Enrico, a 61-year-old pensioner, observing: "We used to think migrants were just passing through. However, they are now part of our community. You hear Arabic and Napoletano mixed like it's normal."

Taken together, these findings show that in rural contexts where institutional resources are limited, integration unfolds through a hybrid ecosystem of informal hubs, trusted community figures, and digital technologies, demonstrating that language learning is most effective when treated not only as a classroom subject but as a lived, community-based practice that fosters belonging and strengthens demographic resilience.

Beyond these spontaneous interactions, the bar actively supported migrants' language acquisition and integration. It provided teaching materials, including a printed Italian dictionary and a tablet equipped with translation and learning apps. These resources were available to anyone who needed them and were frequently used to mediate conversations with locals. It is particularly noteworthy that many migrants described the bar owner as a trusted figure—someone they could rely on more than local officials, who were

often perceived as impersonal or difficult to approach. "When I don't understand something, I go to the bar and ask Mario or Irene about it. They use the tablet with translation apps and explain everything. They even call on my behalf when I can't go through some bureaucratic procedures" (Moussa, 35, labourer from Mali). The bar thus became not only a social hub but also a grassroots integration centre, where language learning, community support, and emotional reassurance converged.

Technology and educational AI emerged as essential tools during the initial phase of settlement, when language barriers were most acute. Many participants reported feeling overwhelmed when attempting to access municipal services, often unsure where to go or whom to contact. In these moments, digital tools became indispensable: automatic translation apps, voice recognition engines, and CEFR-aligned language platforms enabled migrants to interpret instructions, formulate questions, and engage with unfamiliar systems. "Without the translation app, I could not ask for help at the municipal office. It gave me the words I needed" (Oumar, 29, labourer from Gambia. It is paramount to understand and monitor how social and linguistic environments are changing, as well as to consider the ethical implications of implementing such technologies in sensitive situations (Alwi, et al., 2025). Beyond immediate communication needs, these tools supported high-quality, flexible language learning. Migrants described using pronunciation apps, vocabulary trainers, and multilingual interfaces to practice Italian in real time, often in response to specific daily challenges. This form of situational, self-paced learning allowed them to build linguistic competence in ways that formal instruction could not always accommodate. Importantly, these technologies also facilitated peer-to-peer learning among migrants from different linguistic backgrounds, creating shared spaces of understanding and support.

In rural contexts such as Pietradefusi, where institutional resources are limited, the combination of informal social environments and digital technologies has formed a hybrid ecosystem of learning and inclusion. These findings suggest that migrant integration is most effective when language is treated not only as a classroom subject but as a lived, community-based practice. By embracing flexible, context-sensitive strategies—grounded in everyday interaction and supported by technological innovation—rural municipalities can foster sustainable settlement and strengthen demographic resilience. Given the structural barriers to formal education, integrating digital tools and AI-powered language education represents a promising solution. Technologies offering flexible scheduling, adaptive feedback, and multilingual accessibility can replicate core components of classroom instruction while enabling self-paced, situational learning.

DISCUSSION

The findings from Pietradefusi reveal a significant shift in how language policies and integration practices are understood within the broader landscape of migration studies. Traditionally framed as cultural tools to facilitate communication and social inclusion, language policies in this study emerge as strategic instruments of demographic stabilisation. This reframing is particularly relevant in rural contexts facing depopulation, where migrants' ability to settle long-term is closely tied to their access to language instruction and to certification requirements legally linked to residency status in Italy. The hybrid model observed in Pietradefusi also reflects the strategic goals of EU-funded initiatives such as UNITES and SIRA, which advocate participatory governance and territorial sensitivity in integration policy.

Document analysis reinforces this perspective, particularly when compared with the cases of Sicily and Calabria (Besliu, 2023). What distinguishes Pietradefusi, however, is the innovative role played by non-institutional learning environments.

Educational AI and digital tools further enhanced this informal infrastructure. Indeed, community hubs and digital channels together allow learners to acquire usable linguistic capital in authentic contexts—whether through app-based conversation challenges or voice-enabled guides for navigating public services.

It is important to note that current practice often involves migrants using freely available apps, such as translation tools or voice-recognition engines (e.g., Siri or Google Assistant), in an ad-hoc manner, or vocabulary-building applications such as Memrise (free version) or Quizlet. These tools rely on flashcards and spaced repetition to help memorise essential words, but they are typically accessed casually and without pedagogical validation. Indeed, while these applications provide immediate support for everyday communication, their educational outcomes are not systematically measured, and they cannot guarantee progression aligned with recognised proficiency frameworks. In contrast, structured digital materials—such as CEFR-aligned adaptive platforms, validated online courses, and AI-driven pronunciation trainers—represent emerging innovations that have been tested for pedagogical validity. These tools are designed to replicate core components of classroom instruction, offering measurable progress, adaptive feedback, and alignment with certification requirements.

Highlighting this distinction emphasises that, although casual app use can help overcome immediate barriers, it markedly differs from structured digital learning environments that are effective and can reliably support migrants in meeting legal and educational standards (Table 3).

Table 3.
Apps vs. Structured Digital Materials in AI-Supported Language Learning

DIMENSION	FREELY AVAILABLE APPS (CURRENT PRACTICE)	STRUCTURED DIGITAL MATERIALS (EMERGING INNOVATION)
Purpose	Immediate communication support; adhoc translation and vocabulary help.	Systematic language acquisition aligned with CEFR or other validated frameworks.
Strengths	Accessible, low cost, easy to use; useful for overcoming daily barriers.	Pedagogically tested; measurable outcomes; adaptive feedback; supports certification requirements.
Limitations	Outcomes not systematically measured; risk of fossilised errors; limited progression.	Requires infrastructure (e.g., internet access and devices); higher digital literacy; less spontaneous than informal exchanges.
Examples	Google Translate, voice recognition apps, and basic vocabulary trainers (Siri, Memorise, Quizlet, Drosp).	CEFR-aligned adaptive platforms, AI-driven pronunciation feedback, and validated online courses (Talkpal, Giulia, PingoAI).
Role in Integration	Helps migrants "get by" in everyday interactions.	Enables migrants to achieve formal proficiency and meet legal residency thresholds.

Source: Author's own elaboration.

Recognising this gap is crucial for policy design: municipalities should encourage the transition from reliance on unstructured apps to validated digital learning pathways, while also addressing barriers related to digital literacy, internet access, and the need for human guidance. Educational AI should be understood as a catalyst rather than a substitute for human connection. When combined with community-based learning and institutional support, AI can amplify integration processes, transforming language from a classroom subject into a lived tool of everyday life and contributing to the demographic resilience of rural regions.

In sum, this study contributes to a growing body of research that repositions language policy as a demographic tool and highlights the transformative potential of informal learning environments. By embedding language acquisition in everyday life and leveraging local networks, rural municipalities such as Pietradefusi can foster sustainable integration and demographic resilience, offering a replicable model for other regions facing similar challenges.

CONCLUSIONS

This study extends the traditional scope of migration research by reframing language policies not merely as cultural instruments but as strategic demographic tools. In the context of rural Italy, and specifically Pietradefusi, language acquisition emerges as a decisive factor in population stabilisation. By enabling migrants to meet legal residency requirements and participate fully in local life, language proficiency directly shapes their decision to settle long-term—thereby contributing to the demographic resilience of depopulated regions.

An innovative empirical contribution lies in the positioning of non-institutional learning environments—such as cafés, bars, and social hubs—as vital complements to formal language instruction. These spaces foster spontaneous, situated learning and social bonding, often filling gaps left by limited institutional infrastructure. The active roles of community figures, the availability of digital tools, and the emergence of informal support networks illustrate how integration unfolds beyond classrooms and is embedded in everyday life.

Key Empirical Findings. The study shows that migrant integration in Pietradefusi is shaped by a hybrid ecosystem of informal hubs, trusted community figures, and digital tools. Most migrants acquire everyday Italian through informal exchanges, while structural barriers limit access to formal courses. Informal spaces such as bars and shops foster both linguistic practice and cultural exchange, while digital technologies provide flexible, situational learning. Together, these mechanisms strengthen social cohesion and contribute to rural demographic sustainability.

Policy Implications Findings suggest that rural municipalities should invest in hybrid integration strategies that combine formal instruction with community-based learning and digital support. Non-institutional hubs can be recognised as grassroots integration centres, while AI-powered language tools can help migrants meet legal certification requirements. Policies that support transport access, flexible scheduling, and multilingual resources would further enhance integration outcomes.

Limitations of the Study. The relatively small sample size and reliance on snowball sampling limit the generalizability of results. Self-reported data may also introduce bias.

Directions for Future Research Future studies should integrate longitudinal quantitative data on migrant population dynamics, labour market participation, and language proficiency to complement qualitative insights. Comparative research across multiple rural municipalities would clarify whether Pietradefusi's hybrid integration model is replicable elsewhere. Exploring the role of digital and AI tools in formal certification processes also represents a promising avenue. Moving forward, an operational framework for hybrid integration should be imagined and tested, providing municipalities with concrete strategies to embed inclusive language practices, digital innovation, and community partnerships into sustainable demographic policy.

Final Reflections This research highlights the intersection of migration, linguistic integration, and rural demographic resilience, offering a reflection that points toward further research and operational testing. Ethical design, human oversight, and attention to digital literacy and privacy are essential in deploying technological solutions. To support demographic resilience, rural municipalities should prioritise mobile-first language access, human-guided digital supports, and cross-sector coordination. Ultimately, AI is not a substitute for human connection—it is a catalyst that amplifies it, transforming language from a classroom subject into a living tool of community life. The convergence of inclusive language strategies, digital innovation, and cross-sector partnerships represents a transformative pathway for integration—one that empowers individuals, strengthens communities, and redefines rural resilience across Europe.

REFERENCES

Alwi, S., Mohd Saleh, M. N., & Md Mansor, M. N. (2025). AI and Dialect Recognition: Challenges and Opportunities in Linguistic Diversity. *Forum for Linguistic Studies*, *7*(2), 1052-1062. https://doi.org/10.30564/fls.v7i2.7894

Besliu, R. (2023). *Southern Italy's small-town revival fueled by migration*. The Parliament Magazine.https://www.theparliamentmagazine.eu/news/article/southern-italys-smalltown-revival-fuelled-by-migration

Bourdieu, P. (1991). *Language and symbolic power*. (J. B. Thompson, Ed., G. Raymond, & M. Adamson, Trans.). Cambridge: Polity Press. https://monoskop.org/images/4/43/Bourdieu_Pierre_Language_and_Symbolic_Power_1991.pdf

Curtale, R., Stut, M., Alessandrini, A., Deuster, C., Batista e Silva, F., Natale, F., & Dijkstra, L. (2025*). Outlook and demographic perspectives for EU's rural regions: A modelling-based exercise*. JRC Working Papers on Territorial Modelling and Analysis 01. Ispra: European Commission. https://publications.jrc.ec.europa.eu/repository/handle/JRC140514

De Souza, R. (2015). Demographic Resilience: Linking Population Dynamics, the Environment, and Security. *SAIS Review of International Affairs*, *35*(1), 17-27. https://doi.org/10.1353/sais.2015.0017

Duff, P. A. (2010). Language socialization into academic discourse communities. *Annual Review of Applied Linguistics*, *30,* 169-192. https://doi.org/10.1017/S0267190510000048

European Commission. (n.d.) *Building inclusive territories: Refugee and migrant integration in rural areas*. European Website on Integration. https://migrant-integration.ec.europa.eu/library-document/building-inclusive-territories-refugee-and-migrant-integration-rural_en

European Commission. (2025). *Action plan 2021-2027 tracker: Building strong partnerships*. Directorate-General for Migration and Home Affairs. https://home-affairs.ec.europa.eu/policies/migration-and-asylum/migrant-integration/migrant-integration-hub/progress-tracker-action-plan-integration-and-inclusion-2021-2027/action-plan-2021-2027-tracker-building-strong-partnerships_en

European Commission. (2025) *Asylum, Migration and Integration Fund* (2021-2027). Directorate-General for Migration and Home Affairs. https://home-affairs.ec.europa.eu/funding/asylum-migration-and-integration-funds/asylum-migration-and-integration-fund-2021-2027_en

European Parliament. (2020). *Integration of migrants in middle and small-sized cities and in rural areas in Europe*. https://op.europa.eu/en/publication-detail/-/publication/d28ace91-85d2-11ea-bf12-01aa75ed71a1

Fasani, F. (2024). *New approaches to labour market integration of migrants and refugees*. Study PE 754.232. Policy Department for Economic, Scientific and Quality of Life Policies, Directorate-General for Internal Policies, European Parliament. Requested by the EMPL Committee. Luxembourg. https://www.europarl.europa.eu/RegData/etudes/STUD/2024/754232/IPOL_STU(2024)754232_EN.pdf

Istituto Nazionale di Statistica (ISTAT). (2025). *Population Projection Tool*. https://www.istat.it

Mabogunje, A. L. (1970). Systems approach to a theory of rural-urban migration. *Geographical Analysis*, *2*(1), 1-18. https://doi.org/10.1111/j.1538-4632.1970.tb00140.x

Norton, B. (2013). *Identity and language learning: Extending the conversation* (2nd ed.). Bristol, England: Multilingual Matters.

Organisation for Economic Co-operation and Development (OECD). (2025). *Reinforcing Rural Resilience*. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/05/reinforcing-rural-resilience_e4f58e08/7cd485e3-en.pdf

Organisation for Economic Co-operation and Development (OECD). (2025). *Employment Outlook 2025: Demographic change and economic growth*. OECD Publishing.

Pasetti, F., & Cancellieri, A. (2024). *Explaining integration policies and processes of post-2014 migrants in small localities in Europe: A whole-of-community approach*. Whole-COMM Project. Working Paper 2. https://whole-comm.eu/deliverables/working-papers/integration-policies-and-processes-whole-of-community-approach

Pierson, P. (1993). When effect becomes cause: Policy feedback and political change. *World Politics*, *45*(4), 595-628. https://doi.org/10.2307/2950710

Santorelli, M., & Palladino, M. (2024, October 10-11). Empowering unaccompanied minors in rural Italy: The role of linguistic integration. In: *Economic growth in the face of global challenges. Consolidation of national economies and reduction of social inequalities*: conference proceedings: international scientific-practical conference (18th edition, Vol. 3, pp. 155-166). Chisinau: INCE, ASEM. https://doi.org/10.36004/nier.cecg.II.2024.18.15

Santorelli, M., & Simone, A. (2023, October 12-13). Linguistic integration in Italy: Framework, policies and outcomes. In: *Economic growth in the conditions of globalization*: conference proceedings: international scientific-practical conference (17th edition, Vol. 2, pp. 446-457). Chisinau: ASEM. https://doi.org/10.36004/nier.cecg.iv.2023.17.28

Sarlo, A., & Martinelli, F. (2016). *Housing and the social inclusion of immigrants in Calabria: The case of Riace and the "Dorsal of Hospitality"*. Working paper 13. Case Studies Series COST Action IS1102. Reggio Calabria: Università Mediterranea.

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In: W. G. Austin & S. Worchel (Eds.), *The social psychology of intergroup relations* (pp. 33-47). Monterey, CA: Brooks/Cole.

Woods, M. (2011). *Rural*. Routledge. https://www.routledge.com/Rural/Woods/p/book/9780415442404

Zanfrini, L., & Pasini, L. (Eds.). (2025). *30 Rapporto sulle migrazioni 2024*. Fondazione ISMU ETS. Milano: Fondazione ISMU. https://www.ismu.org/wp-content/uploads/2025/02/30-Rapporto-ISMU-ETS_2024.pdf

Zschomler, S. (2019). Language Is Your Dignity: Migration, Linguistic Capital, and the Experience of Re/De-Valuation. *Languages, 4*(3), 64. https://doi.org/10.3390/languages4030064

CHANGING FERTILITY INTENTIONS IN MOLDOVA

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SUMMARY

This article examines the realisation of short-term fertility intentions in the Republic of Moldova using longitudinal data from the Generations and Gender Survey (GGS) Waves 1 (2020) and 2 (2023). Moldova faces persistent below-replacement fertility and high emigration rates, yet survey evidence indicates that individuals' desired number of children exceeds the actual number of births. By tracking approximately 650 respondents who intended to have a child within three years in 2020, we assess the extent to which these intentions were realised and identify the factors that facilitated or hindered their realisation. Descriptive and multivariate analyses reveal that only about one-third of intended births occurred within the observation period, reflecting significant unmet reproductive intentions. Partnership status, age, parity, and subjective well-being emerge as key determinants of successful realisation, while economic insecurity, unstable relationships, and migration contribute to unmet plans. The analysis also contextualises these outcomes within Moldova's recent social and economic shocks as well as major family policy reforms adopted in 2022, which aim to strengthen parental leave, childcare availability, and financial protection around childbirth. The findings highlight substantial structural barriers that limit individuals' ability to achieve their reproductive goals and underscore the need for sustained policies that enhance family support, gender equality, and economic stability, helping align fertility outcomes with citizens' aspirations.

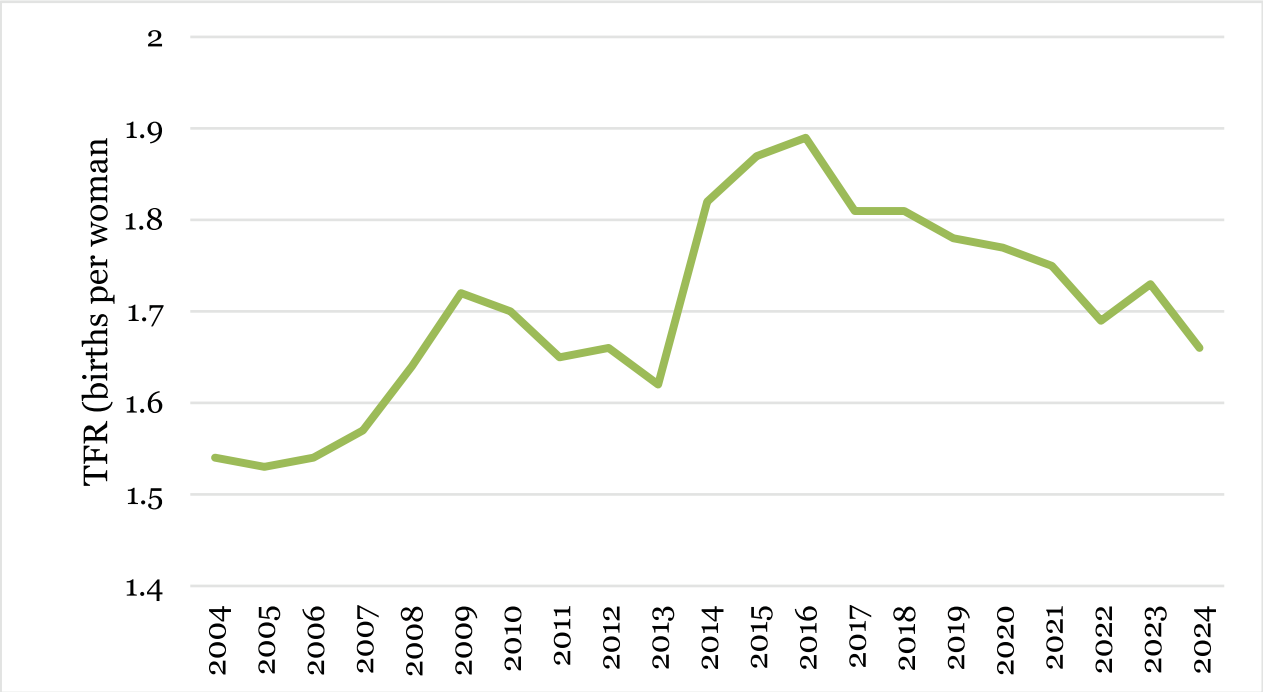
Keywords: *fertility intentions, Generations and Gender Survey*

INTRODUCTION

Moldova is experiencing sustained low fertility and population decline, driven by both declining birth rates and high emigration rates. The total fertility rate (TFR) has fluctuated around low levels in recent decades. Figure 1 shows that after a modest rise to nearly 1.8–1.9 in the mid-2010s, the TFR has fallen back to about 1.6 in 2023, well below the replacement level of 2.1. This persistent below-replacement fertility, coupled with significant out-migration of young adults, has led to a natural population decline and rapid population ageing (Gagauz et al., 2024).

In contrast, survey data indicate that desired fertility in Moldova remains higher than what is achieved. Many individuals, especially young people, express intentions to have children, despite actual birth rates remaining low. This gap between aspirations and outcomes is a central concern for policymakers and human rights advocates alike, and is something observed in many countries around the world (Badolato, 2025). It suggests that Moldovans may be having fewer children than they would like due to various constraints.

Figure 1.
Total Fertility Rate in Moldova, 2004–2024



Source: *UN Population Division*

In this context, the Generations and Gender Survey (GGS) provides crucial longitudinal data to examine fertility intentions (i.e. the plans or desires to have a child) and their realisation (actual childbearing). This report analyses GGS Wave 1 (2020) and Wave 2 (2023) data for the Republic of Moldova to assess the extent to which individuals who intended to have a child within three years in 2020 had a birth by 2023. The analysis is grounded in a formal, evidence-based approach suitable for UNFPA and policy stakeholders. We identify key demographic, economic, and social factors influencing the realisation of fertility intentions, and we discuss recent policy measures that may affect these outcomes. The goal is to inform policies that enable people to achieve their reproductive intentions in line with their rights and aspirations, thus bridging the gap between intended and actual fertility.

THEORETICAL FRAMEWORK

Fertility decision-making is a complex process shaped by individual desires, partnership dynamics, and broader structural conditions. An expressed fertility intention (such as planning to have a child in the next three years) reflects a respondent's current aspirations given their life situation (Ajzen & Klobas, 2013). However, not all intentions are realised, due to factors that can either facilitate or impede the move from intention to birth. Prior research in Europe has demonstrated that age, parity, marital/partnership status, and socioeconomic resources are key determinants of whether fertility goals are achieved (Spéder & Bálint, 2024). These factors operate within a life-course and human-rights framework, embodied in the Sustainable Development Goals.

Individual and Couple Factors

Age is fundamental – there is a biologically limited window for childbearing and strong age norms regarding the timing of parenthood. Very young adults may intend children but postpone until completing education or establishing careers (Neels et al., 2017) whereas older individuals nearing the end of reproductive age may face declining fecundity or health barriers (Shreffler et al, 2016). Number of children also influences realization of fertility intentions: those who are childless or have fewer children might be more strongly motivated to have a child, whereas those who already have two or more children might be more likely to abandon further childbearing plans (Kocourková & Šťastná, 2021). The stability and quality of a partnership is another key factor – having a co-resident partner or spouse greatly increases the likelihood of a planned birth (Rutigliano & Esping-Andersen, 2018). Conversely, being single or experiencing a breakup in a union can derail previously stated intentions, as having a child outside a stable partnership is less common or more challenging (Thomson et al., 2012). Moreover, the gender dynamics within couples matter: if the division of childcare and housework is perceived as fair and supportive (i.e., a more egalitarian sharing of responsibilities), couples may be more likely to follow through on their childbearing plans (Riederer et al., 2019).

Socio-Economic Factors

Economic conditions often act as either enablers or obstacles to having children. Sufficient income, stable employment, and housing security can give individuals the confidence to proceed with childbearing, whereas economic insecurity or job instability may lead to postponement of intended births (Matera et al., 2023). Access to supportive services—such as childcare, healthcare, and parental leave—also plays a critical role. If affordable childcare is available, the perceived opportunity costs of having a child are lower, making it more feasible to act on fertility intentions. In Moldova, reliance on informal support, such as family networks, for childcare has traditionally been high (Buciuceanu-Vrabie & Grigoraș, 2023); lacking such support or having only expensive formal childcare can hinder the realization of intended children. Broader contextual factors, including cultural norms and the policy environment, also influence these decisions.

Macro-Context

Moldova's social and economic context between 2020 and 2023 was significantly impacted by the COVID-19 pandemic and, in 2022, the spillover effects of the war in neighbouring Ukraine, both of which caused economic uncertainty and stress that could affect family plans. Importantly, Moldova has been addressing demographic challenges through new policies (see section 6) aimed at creating a more favourable environment for family formation. High levels of emigration among reproductive-aged adults represent a critical contextual factor as many young Moldovans leave the country for work or better living conditions, which can delay or prevent local childbearing. A recent analysis revealed that a substantial proportion of those planning to emigrate are young individuals who wish to have children (Ivan & Tabac, 2022). This "brain and cradle drain" means that even strong fertility intentions might not translate into births within the country if people move abroad.

DATA AND METHODS

This analysis uses data from the Generations and Gender Survey (GGS) in the Republic of Moldova, a nationally representative longitudinal survey on family dynamics and population processes. Wave 1 was conducted in 2020 (with 10,074 respondents), and Wave 2 in 2023, providing a three-year follow-up. The focus of this report is on respondents of reproductive age who, at Wave 1, indicated an intention to have a child within the next three years. In Wave 1, respondents were asked, "Do you intend to have a child in the next three years?" with response options ranging from definitely not to definitely yes. We define as "intenders" those who answered affirmatively (either "probably yes" or "definitely yes") to that question in 2020. There were roughly 650 individuals in this category at Wave 1. We then track these same individuals in Wave 2 (2023) to determine whether they realised their fertility intention, i.e., had a live birth in the interim period. Births were recorded, along with their dates and other outcomes, during the interview at wave 2.

For the analytical strategy, we combine descriptive statistics (cross-tabulations and figures) with multivariate analysis. We first present descriptive findings on fertility intentions and their realisation rates by various characteristics (gender, age, parity, employment status, etc.). Then, to assess the determinants while controlling for other factors, we estimate a logistic regression model predicting the odds of having had a child by Wave 2 among those who intended to have one at Wave 1. The regression includes key independent variables measured at Wave 1 (e.g., age, gender, partnership status, number of children, socio-economic indicators) and some time-varying factors. We report both logistic coefficients and average marginal effects (AMEs) to aid interpretation. All analysis is conducted in a longitudinal (panel) framework, meaning we explicitly examine changes between 2020 and 2023 for the same individuals.

It should be noted that attrition between waves (e.g., due to migration or non-response) can affect the sample. Most Wave 1 respondents (10,074) were re-interviewed in Wave 2 (5,599, 55.6%), but those who could not be followed (including some who may have left the country) are not represented in the realised outcomes. This could lead to a slight underestimation of realisation rates if, for instance, some intenders moved abroad and had children there (unrecorded by the survey) or an overestimation if those who dropped out were less likely to have children. We proceed with the assumption that attrition bias is minimal, while acknowledging this limitation. The data have been weighted to adjust for sampling design and non-response where appropriate.

Finally, to contextualise the findings, we incorporate information on relevant policy changes and conditions in Moldova between 2020 and 2023. In particular, three major family policy reforms (Laws No. 195, 367, and 353 of 2022) were enacted after Wave 1. While the full impact of these laws might not yet be observable in Wave 2, given the short interval, our analysis considers their potential influence on the environment for the realisation of fertility intentions.

DESCRIPTIVE FINDINGS

We now turn to the core question: to what extent were the intentions expressed in 2020 actually realised by 2023, and which groups were more successful in this regard? Overall, the data reveal a significant gap between intentions and outcomes. Of the ~650 individuals who intended to have a child within 3 years, only about one-third had a child by the time of the Wave 2 survey. In other words, roughly 35% of the short-term fertility intentions were realised, while the remaining ~65% were unrealised within the three-year window. This headline finding confirms that many intended births did not occur as planned, reflecting a considerable unmet realisation of fertility intentions.

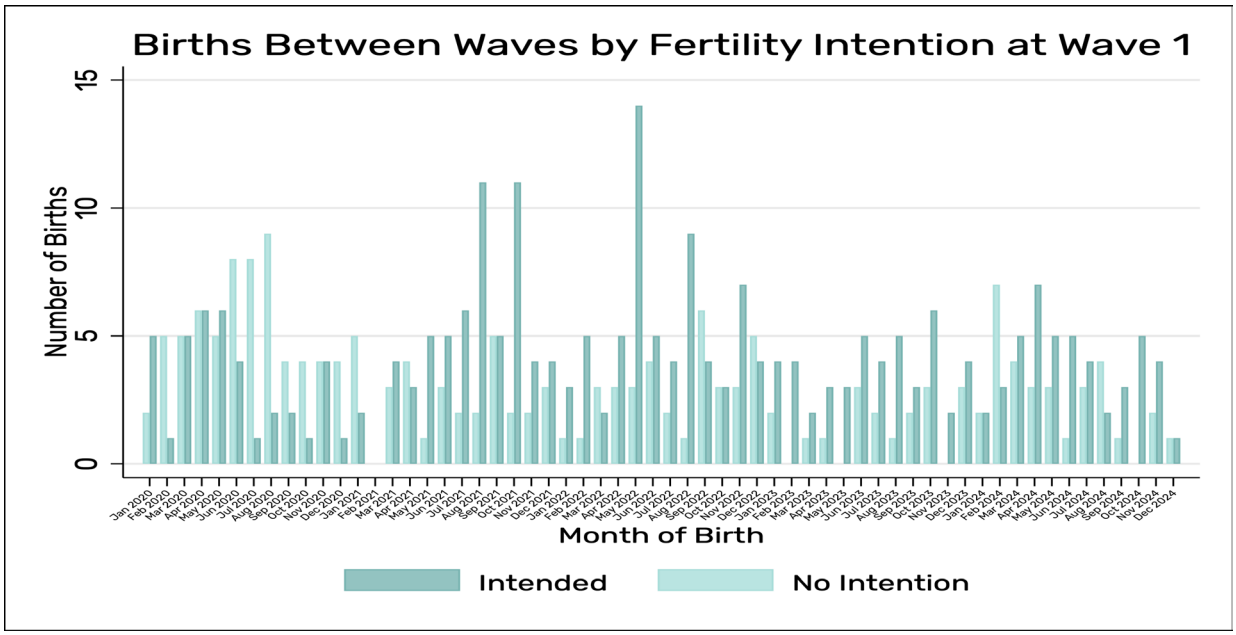
It is also informative to look at all births that occurred in the period and see what fraction of them were to those who had intended versus those who had not intended to have a child. Figure 2 - 'Births between Wave 1 and Wave 2, by prior intention status' illustrates the timing and composition of births from 2020 to 2023. Each month's births are separated into two groups: births to respondents who had reported an intention at Wave 1 ("intended births"), and births to those who had said they were not planning a child in that period ("unintended or unplanned births" from the perspective of Wave 1 intentions).

We observe that intended births (dark segments) accounted for the majority of new children born to the panel respondents; however, a substantial share of births occurred to those who initially did not intend to have a child or at least not within the specified time period. This indicates that fertility behaviour is dynamic: some people who did not plan a child ended up having one (perhaps due to changed circumstances or unplanned pregnancies), contributing to the overall birth count. There is a noticeable peak in births around mid-2022, which could reflect timing preferences (as some plans materialise after the pandemic peaked) or policy effects (since new family policies were introduced in 2022, potentially encouraging births). Nonetheless, the consistent presence of "unintended" births highlights that not all fertility is premeditated within a three-year span – life events and surprises also play a role.

The number of unintended births peaks in the period immediately following the survey. This is primarily due to the structure of the question on intentions, which is only asked to those who are not knowingly pregnant. If a respondent was three months pregnant at the time of the wave 1 interview and didn't know it, you are much more likely not to have intended to have a child. Otherwise, intended births generally outnumbered unintended births in any month.

Figure 2.

Births between Waves 1 and 2 by prior intention status



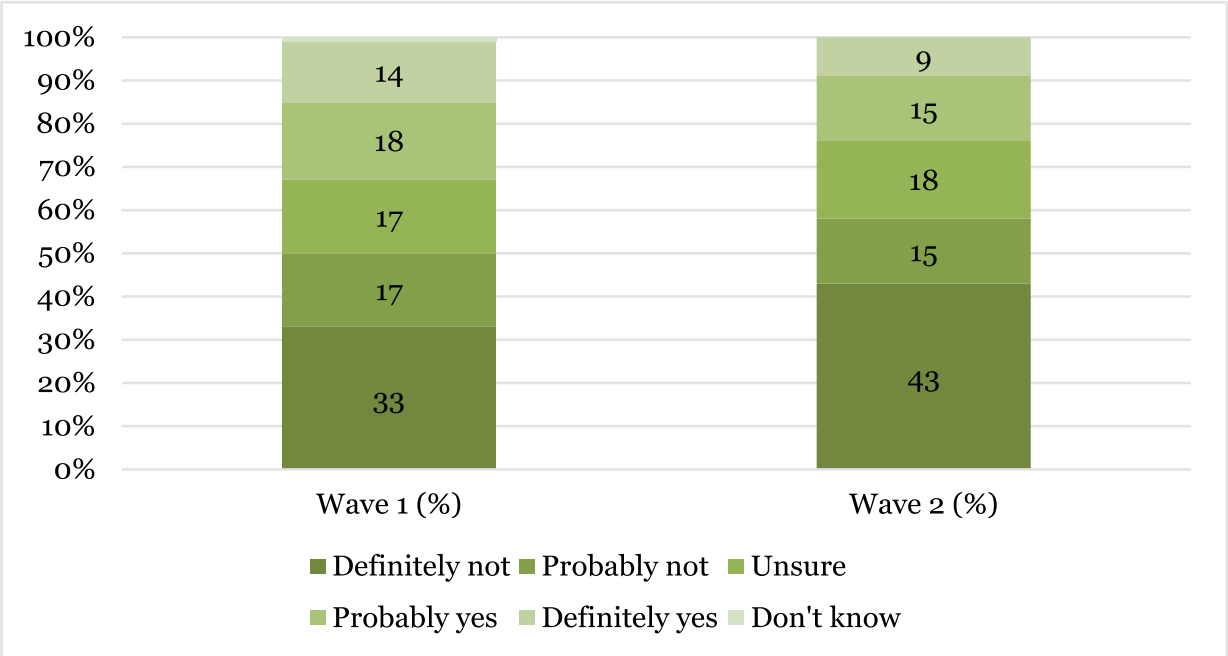
Source: *GGSII - Wave 2 Moldova*

Note: *Each bar represents the number of births in a given month from 2020 to 2023 among the panel. Darkly shaded portions are births to those who intended a child at Wave 1, while light portions are births to those who did not intend one.*

Figure 3. Fertility intentions at Wave 1 (2020) and Wave 2 (2023) show the distribution of responses to the question about intending to have a child within 3 years for those who were asked the question at two time points. This figure does not accurately reflect the fertility intentions of the population as a whole. It excludes those who are pregnant, infertile, or over the age of 50 for women. At Wave 1, a considerable share of respondents who were asked reported positive short-term fertility intentions: approximately 32% said they "definitely" or "probably" intended to have a child within three years (14% definitely, 18% probably). Around 33% of those asked the intention question replied "definitely not," with others responding as "probably not" or being unsure. This confirms that fertility intentions were relatively high, consistent with the notion that many Moldovan adults desire children (eventually, most want two children over their lifetime, on average).

Figure 3.

Fertility intentions at Wave 1 (2020) vs. Wave 2 (2023)



Source: *GGSII - Wave 2 Moldova*

By Wave 2 in 2023, the distribution of intentions had shifted. Those who had, in the meantime, become parents (realising their intention) were no longer "in the market" for an immediate new birth, and some others who did not have a child had grown more pessimistic about near-term childbearing. The proportion saying "definitely not" intending to have a child in the next three years rose to 43% (up from 33%). Conversely, the combined share saying "definitely yes" or "probably yes" dropped to about 25%. In fact, only 10% of respondents in 2023 still said "definitely yes" to having a child in the next three years – a decline from the 14% in 2020. This suggests that within three years, many of those who initially planned a child either fulfilled their plan or changed their mind (often not to plan one soon). The increase in definite negations could include individuals who have achieved their desired family size with a birth between waves and thus do not intend to have another soon, as well as those whose circumstances have worsened or who have aged into a stage where they no longer plan to have children.

The overall one-third realisation rate masks considerable heterogeneity across individual characteristics. We examine realisation rates (% of intenders who had a child) across key demographic and socio-economic groups.

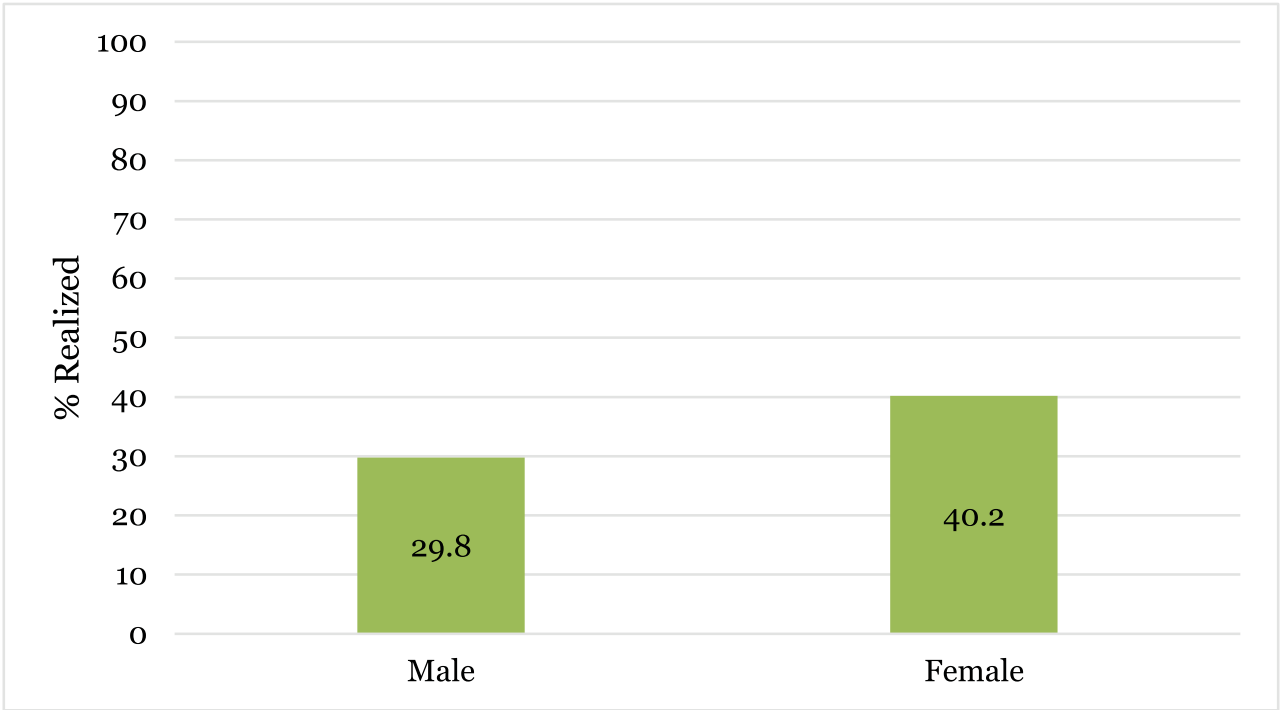
Gender

There is a notable gender difference in outcomes. Figure 4. 'Fertility intention realisation by gender' shows that female respondents were more likely to have realised their intention than male respondents. About 40% of women who intended to have a child succeeded in doing so within three years, compared to roughly 30% of men. This gap (40% vs. 30%) suggests that women's short-term fertility plans were more often actualised than those of men.

One possible reason could be that women have more direct biological urgency and reproductive agency; another factor is that a man's intention can only be realised if he finds a partner willing and able to conceive – if an intended father was not in a stable partnership, his plan may have fallen through. Meanwhile, many women who intended to have a child were able to follow through, possibly because they secured the necessary conditions or because, in a couple, the woman's intention often drives the decision to actually become pregnant.

Figure 4.

Realisation of fertility intentions by gender



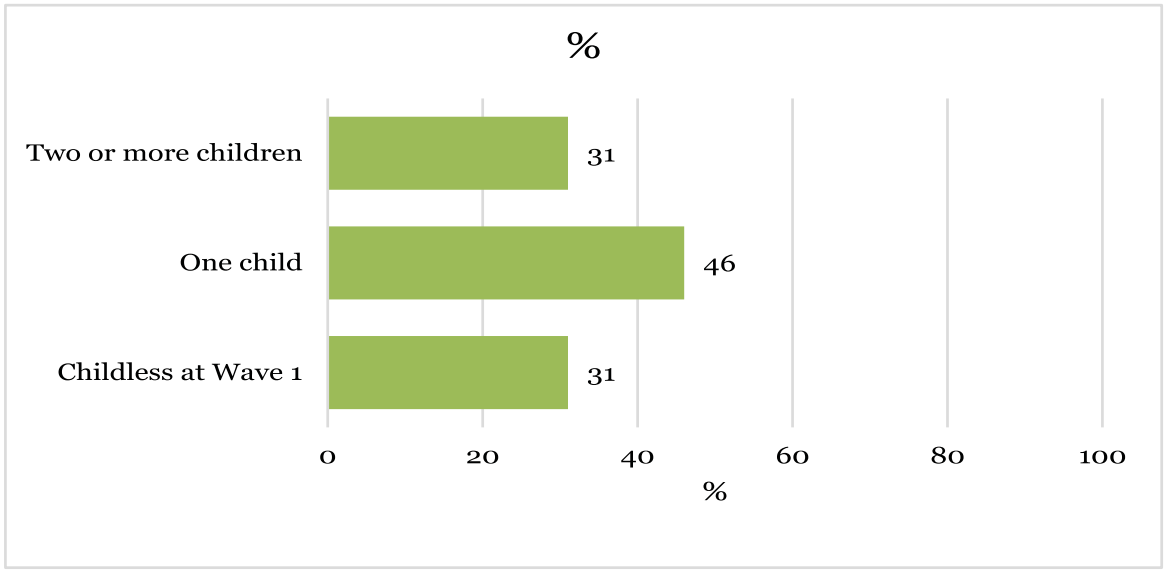
Source: GGSII - Wave 2 Moldova

Parity

The likelihood of realising an intention varied non-linearly with how many children a person already had. Figure 5. Fertility intention realisation by parity shows that respondents who had one child at baseline were the most likely to fulfil their intention for another child: nearly 46% of intenders with one child had a new baby by 2023. In contrast, those who were childless in 2020 had a lower realisation rate, about 31%, and those who already had two or more children also realised about 31% of their intentions. This pattern suggests that intending to have a second child was, in this timeframe, more likely to result in a birth than intending to have a first or a third child. A possible explanation for this outcome could be that individuals with one child may have a strong motivation to have a sibling for their child and also possess the experience of parenthood that helps them navigate caring for another child. Many likely timed their second birth soon after the first, which is a common spacing strategy. By contrast, childless intenders include many young people who may have faced obstacles (finding a partner, establishing careers) or ended up delaying their first birth beyond the three-year window. Those with multiple children might have intended another but perhaps found that realities (financial or time constraints) prevented adding to an already large family. However, the descriptive data underline that the jump from parity 0 to 1 is a critical hurdle—one that a minority of intenders clear in a short period—whereas parity 1 to 2 seems, for many, quite attainable in three years (likely reflecting many second-birth plans).

Figure 5.

Realisation of fertility intentions by number of children at Wave 1



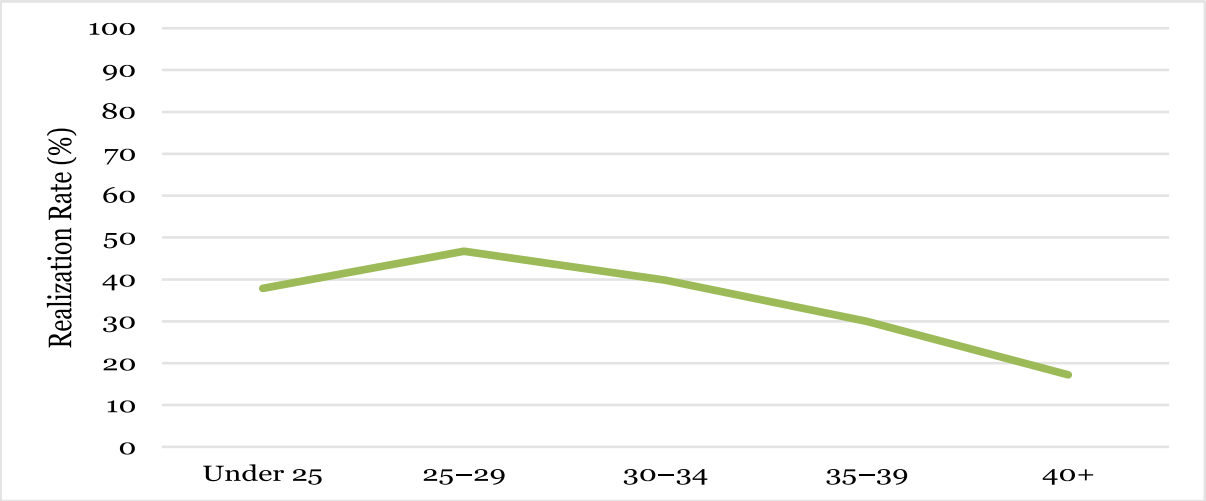
Source: *GGSII - Wave 2 Moldova*

Age

Age is a pivotal factor for fertility timing. Figure 6 indicates an inverted U-shaped relationship between age and realisation chances. Generally, young adults in their late teens or early twenties had relatively low realisation rates—many in this group intended to have a child but did not actually have one by their mid-twenties, possibly due to continuing education or a lack of economic readiness. Mid-career adults in their mid-to-late 20s to early 30s showed higher realisation rates, as this age is often optimal for childbearing (in terms of biology and typical life course timing). Older individuals (mid-30s and above) who stated an intention to have a child in the next three years were somewhat less likely to realise their intentions by 2023. This aligns with biological reality: the youngest intenders might "overshoot" and delay, whereas the oldest intenders may have overestimated their ability to have a child still. For example, a 40-year-old intending to have a child might have only a small chance to achieve it in three years due to reduced fertility. Alternatively, this age category is likely to contain a higher share of parents with two or more children, which was found to be associated with a lower likelihood of fertility intention realisation (see Figure 5).

Figure 6.

Realisation of fertility intention by age group



Source: GGSII - Wave 2 Moldova

Economic Status

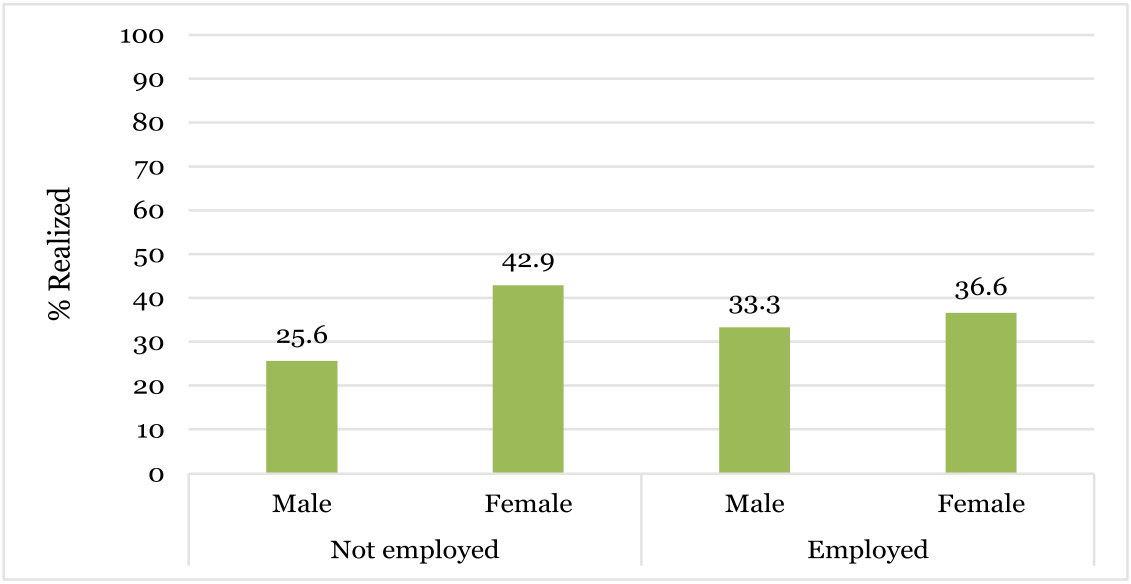
Economic activity can influence the feasibility of childbearing. Somewhat surprisingly, our data do not show a strong advantage in realisation for those who were employed. In fact, Figure 7. Fertility intention realisation by employment status at Wave 1 reveals a slightly higher realisation rate among those who were not employed at baseline (approximately 32%) compared to those who were employed (28%). This difference is modest and not statistically significant, but its direction is notable.

One might expect that having a job (and thus income security) would facilitate having a child. However, the result may reflect that those not employed include individuals who were intentionally out of the labour force to focus on family (e.g., homemakers or students who planned to start families soon). For example, some women who were not working might have been doing so in preparation for pregnancy or due to being on extended leave; thus, they were in a position to realise their fertility plans. To examine this, we also provide the results by gender, and the difference between genders is indeed larger for the non-employed than employed.

It's possible that many unemployed female intenders had partners with income or other support, enabling them to proceed with childbearing. In any case, being employed at Wave 1 did not confer a clear advantage in achieving a birth by Wave 2. This finding underscores that job conditions and leave policies (or the lack thereof) can complicate the translation of intentions into reality. It also resonates with the regression outcome where "employed status" had no significant effect on realization (odds ratio not distinguishable from 1).

Figure 7.

Fertility intention realisation by employment status at Wave 1



Source: GGSII - Wave 2 Moldova

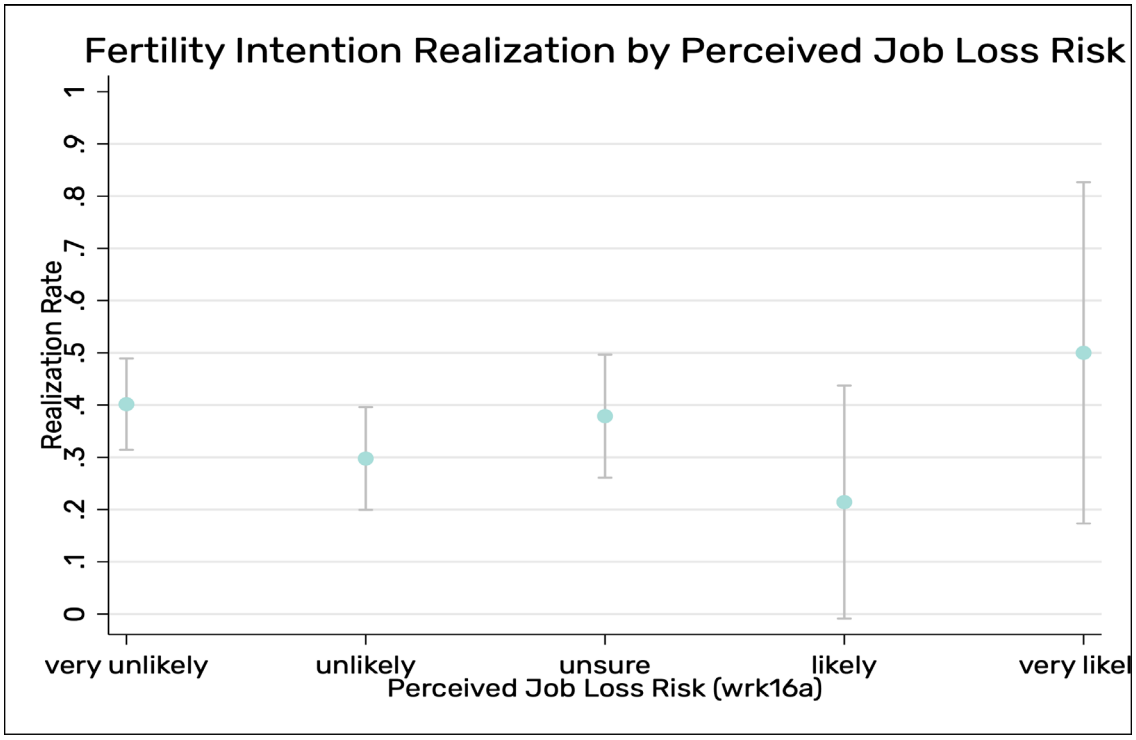
Digging deeper into economic security, the GGS asked employed respondents about their perceived risk of losing their job (job loss risk). Figure 8. The realisation of fertility intentions in response to perceived job-loss risk (job stability) exhibits a striking non-linear pattern. Respondents who felt very secure in their jobs ("very unlikely" to lose a job) realised about 40% of their intended births, which is relatively high. Those who said job loss was "unlikely" had a lower realisation rate (around 30%). Interestingly, those who were uncertain about their job stability ("unsure" if they might lose it) actually had a fairly high realisation (~45%).

On the other hand, people who perceived a likely risk of job loss had a very low realisation rate (only ~15–20%), suggesting that moderate insecurity strongly deterred or prevented them from fulfilling their fertility plans. However, those who said it was "very likely" they would lose their job showed the highest realisation rate of all (exceeding 50%, though based on a small sample, with wide confidence intervals). This U-shaped relationship implies that both high security and very high insecurity were associated with higher chances of having the intended child, while moderate insecurity was associated with the lowest chances.

One possible interpretation is that individuals with very secure jobs felt confident enough to proceed with childbearing (no fear of losing income), whereas those with very insecure jobs may have pre-emptively decided to have a child perhaps because they expected to exit the workforce anyway or wanted to take advantage of existing job protection (for example, a woman who suspects she'll be laid off might choose to become pregnant and secure maternity benefits before that happens). Meanwhile, those with mild to moderate concerns about job stability may have opted to postpone having a child, waiting for a more stable moment that perhaps did not arrive in time. These results highlight the nuanced ways in which economic uncertainty can influence reproductive behaviour. In essence, clear certainty or clear uncertainty might spur action, while in-between uncertainty breeds caution. It also highlights that policies that ensure job security and protection during childbearing (e.g., protection from dismissal and good maternity leave benefits even in unstable jobs) could help those who are undecided.

Figure 8.

Fertility intention realisation by perceived job loss risk (Wave 1)



Source: *GGSII - Wave 2 Moldova*

Note: *Error bars indicate 95% confidence intervals, highlighting statistical uncertainty especially in smaller groups.*

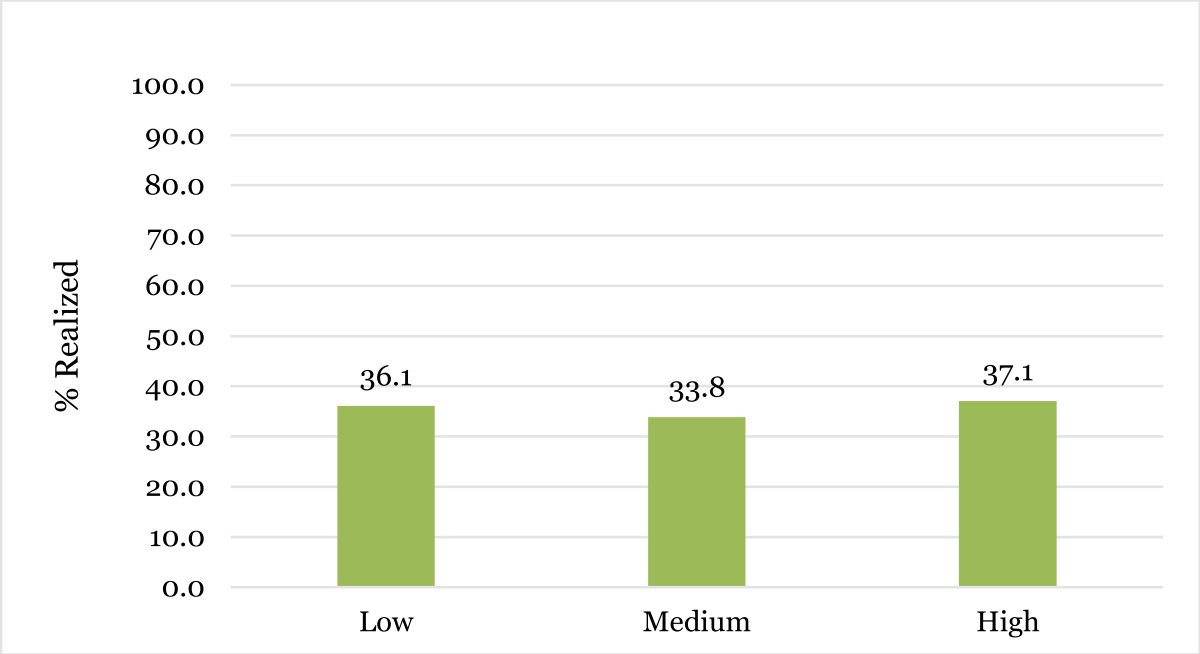
Education Level

Figure 9 examines whether education (e.g., secondary vs higher education) affected realisation. After controlling for age and other factors, education level did not show a significant independent effect on the likelihood of having a child. This suggests that once we account for age (which correlates with education) and employment, differences between, say, those with university degrees and those with lower education in fulfilling fertility plans are minimal.

There might be offsetting influences: higher-educated individuals often delay childbearing (which could lower short-term realisation), but they also tend to have more resources and knowledge to plan births (which could increase realisation if they intend). In our data, these forces appear to balance out. Thus, we did not find a strong direct education gradient in intention realisation. The implication is that policies should address structural factors (such as income, job support) that cut across educational groups rather than assuming that, for example, less-educated people simply follow through more or vice versa.

Figure 9.

Fertility intention realisation by Education Level (Wave 1)



Source: GGSII - Wave 2 Moldova

Wave 2 Intentions

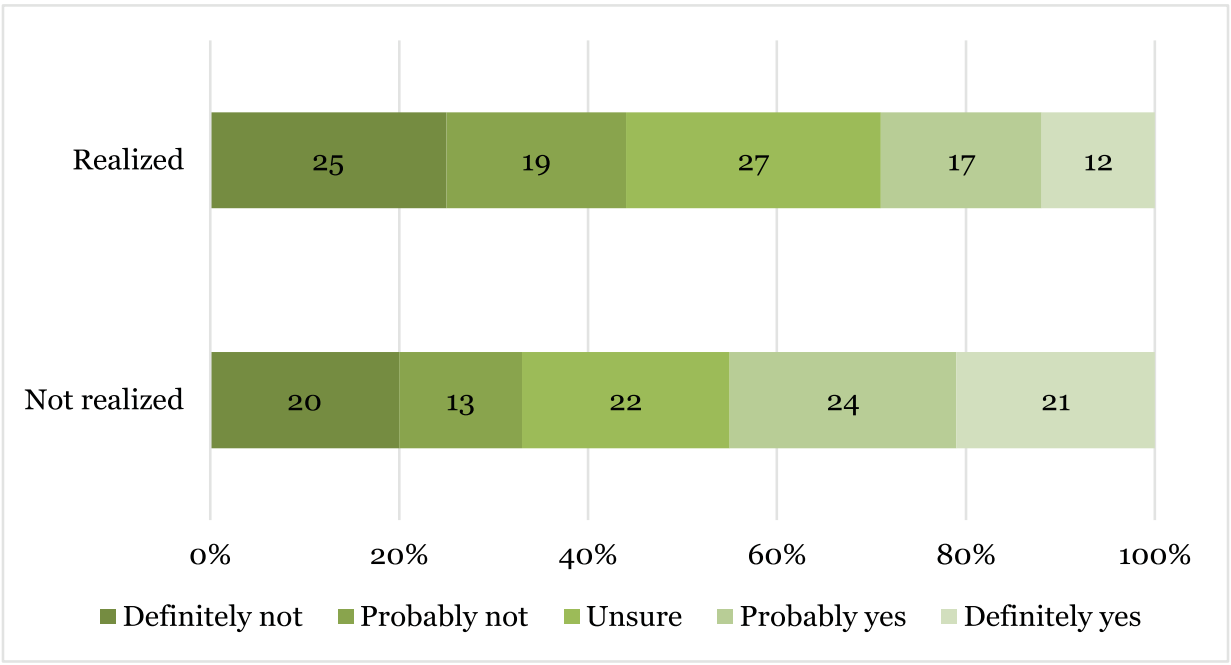
In summary, the realisation of fertility intentions in Moldova from 2020 to 2023 was limited (approximately one-third overall) and uneven across different groups. Women, those in their late 20s, and those with one prior child had comparatively higher success rates in achieving a birth, whereas men, those very young or older, and those with no prior children or with multiple children had lower success rates. Socio-economic stability played a role: having a secure partnership was crucial (as we will see quantitatively in the next section), and job security had a complex influence.

Many who failed to realise their plans by 2023 still expressed intentions for the future, as evidenced by the fact that among those who did not have the child they intended, a significant share in Wave 2 said they still intend to have a child eventually (while others resigned to "definitely not"). Figure 10. Wave 2 fertility intentions by whether Wave 1 intention was realised illustrate this point. Those who realized their Wave 1 intention (they had a child) mostly did not plan another child in the immediate future – over 40% of them now say "definitely not" to a new child in the next 3 years (having just had one), and only a small minority (perhaps around 12%) say they definitely or probably intend another soon. In contrast, among those who did not realize their initial intention, many remain oriented toward trying in the near future: nearly half express some positive intention (about 21% definitely yes, 25% probably yes), and only one-third say "definitely not" (20%) or "probably not" (13%) for the next 3 years (the rest ~22% are unsure).

This indicates a pattern of postponement rather than abandonment for many; they still want a child, just not accomplished yet. However, some have likely become discouraged or faced new obstacles, which has led to a rise in definite "no" responses in that group as well. Overall, the descriptive findings highlight key barriers and facilitators that we will explore in a more rigorous, multivariate manner next.

Figure 10.

Wave 2 fertility intentions by realization of Wave 1 intention



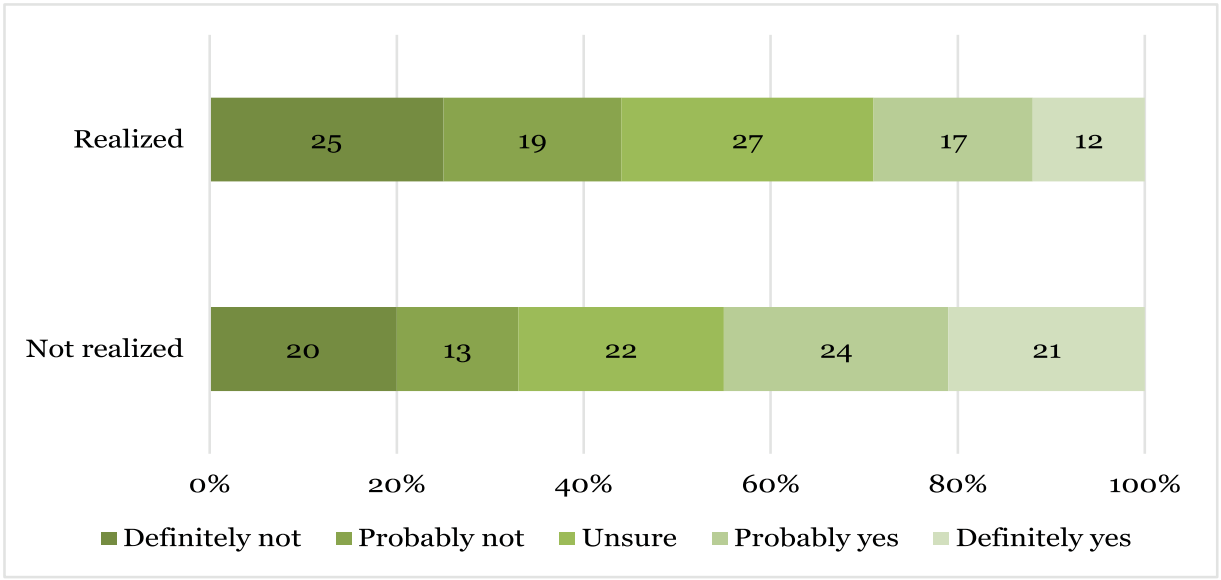
Source: GGSII - Wave 2 Moldova

REGRESSION ANALYSIS

To quantify the influence of various factors on the likelihood of realising a fertility intention, we estimated logistic regression models. Table 1 presents the detailed results of three models; here, we discuss the key findings from the most comprehensive specification. In addition, Figure 11. The following visualises the average marginal effects of selected predictors on the probability of having had a child (realising the intention) by Wave 2. These results help identify which conditions significantly increase or decrease the chances of fulfilling a fertility plan, holding other factors constant.

Figure 11.

Average marginal effects on the probability of realizing a fertility intention (logistic regression results, 95% confidence intervals)



Source: GGSII - Wave 2 Moldova

The regression confirmed many patterns noted descriptively, while controlling for interrelated factors:

Partnership Status

The most decisive factor was having a partner at Wave 1. Being married or cohabiting in 2020 dramatically raised the odds of realising the intention by 2023. The logistic coefficient for being partnered was 1.18 (Model 2), corresponding to roughly 3.2 times higher odds of having a child compared to being single, while holding other factors equal. In terms of marginal effects, this translates to about a +20-percentage point higher probability of realisation for those who had a partner at baseline (Figure 10).

Parity

Consistent with the parity-specific rates, having more children at Wave 1 significantly reduced the likelihood of another birth. Each additional child one already had was associated with a lower chance of realising an intention for an additional child (coef = -0.29 in Model 2, $p<.01$). For example, a person with two children in 2020 was much less likely to have their intended third child than a person with no children was to have their intended first. This effect likely reflects both declining desire for very large families and greater practical constraints (time, financial, housing) with each additional child. It is noteworthy, however, that the descriptive analysis showed the highest realization at parity 1; the linear parity effect in the regression captures the overall downward trend but may understate the unique challenge of going from 0 to 1 child.

Age

Age is represented in the model as both a linear and a quadratic term, indicating a significant non-linear relationship. The positive coefficient on age and negative on age² indicate increasing odds of realisation up to a certain age, then decreasing at older ages (in line with the earlier discussion). The estimated turning point is around the late 20s. For example, going from age 20 to 30 (holding other factors constant) substantially increases the probability of realising the intention (peaking around 28–30), but beyond the early 30s, further ageing starts to reduce the probability. In Model 2, age had a strong positive effect (coef ~0.30 per year, $p<.001$) and age² had a small negative effect. By Model 3 (with partner-only sample), age effects became statistically insignificant (perhaps due to a narrower age range or collinearity), but the qualitative pattern remains. In sum, mid-reproductive ages (late 20s to early 30s) are the most favourable for intention fulfilment, whereas being very young or older reduces the chances, all else being equal.

Gender

Interestingly, once controlling for partnership and other factors, the gender effect diminished and lost significance. In Model 2 (full sample controlling for partnership), the coefficient for being female (relative to male) was a negligible -0.05 (not significant). This suggests that the raw gender gap we observed (women's higher success) can be explained by other variables; for instance, women intenders were more likely to be in a partnership or to have different age profiles than male intenders. When restricted to partnered individuals (Model 3), the coefficient for women became significantly negative (-0.45, $p < .05$), suggesting that, among those in a union, women may have been slightly less likely than their male counterparts to experience the intended birth. This could be due to health or biological issues (some women may have had difficulty conceiving even with intent), or perhaps because some partnered women changed their minds or faced career constraints, whereas if the man was intent and in partnership, the couple proceeded (this is speculative). The main conclusion is that gender, in itself, is not a robust predictor once circumstances are taken into account.

Economic Factors

We included multiple measures of the economic and housing situation. Employment status at Wave 1 had a negative coefficient (indicating that employed people were less likely to realise than non-employed individuals), but it was not statistically significant, echoing the descriptive finding of little difference. Home ownership and housing space (in terms of the number of rooms) were also not significant predictors. These might serve as proxies for economic stability; their null effects suggest that, within this relatively short period, those factors did not directly constrain the decision to have a child, or it could be that nearly all intenders had adequate housing, such that variation in housing was not a critical factor. Housing satisfaction was similarly insignificant.

One economic indicator that did show significance was overall life satisfaction (a 1–10 scale of subjective well-being). Higher life satisfaction at Wave 1 was associated with a slightly higher probability of realising the fertility intention (coef ~0.13 per point, $p<.01$ in Model 2). This implies that individuals who felt happier and more content with their lives were more likely to follow through on their plans to have a child. Life satisfaction can capture optimism, stress levels, and perhaps unobserved advantages; those who are generally satisfied may have more substantial social support or personal efficacy that help achieve life goals, including childbearing. The marginal effect is modest (on the order of a few percentage points per additional point of life satisfaction), but it is meaningful: for example, someone who rated their life satisfaction 9/10 had a higher chance of fulfilling their intention than someone who rated it 5/10, controlling for objective factors. This finding aligns with a broader concept that emotional well-being and confidence are essential for assuming the responsibility of a child.

Migration & Mobility

We attempted to capture major life changes through a variable for "moved between waves" (indicating a change of residence, possibly abroad or to another location). This variable had no significant effect. Its coefficient was positive in Model 2 but very imprecise, and in Model 3 (partnered sample), it was almost zero. The lack of significance is likely because moving is a highly heterogeneous category – some moves may be for better housing (which could encourage childbearing), while others may be due to emigration or disruptive moves (which could inhibit childbearing). Given the available data, we cannot definitively determine how migration influenced the realisation. However, since some potential parents undoubtedly migrated and did not have a child in Moldova (and thus counted as "not realised" in our data), one could infer that out-migration contributed to some of the unrealised intentions. Broader evidence confirms that the departure of many potential parents from the country results in a loss of births domestically.

Relationship Quality and Gender Attitudes

In Model 3, limited to those who had a partner at baseline, we added relationship satisfaction and an index of household task egalitarianism. Higher relationship satisfaction had a positive effect on realisation (coef = 0.22, p<.05). This means that among couples, those who reported being more satisfied with their partner relationship were more likely to follow through with having a child. A supportive, harmonious relationship likely fosters the mutual decision and readiness to have a baby. This is important from a gender and rights perspective: it's not just being partnered, but the quality of that partnership that matters for jointly undertaking parenthood. On the other hand, the egalitarian division of housework index (where a higher value presumably means a more equal sharing of domestic duties) did not show a significant impact (coef = -0.03, n.s.). The negative sign is counterintuitive.

Table 1.

Multivariate Regression Results for Predicting Realized Fertility Intentions

*Significance levels: *p<0.05; **p<0.01; ***p<0.001 (gender reference category is male)*

Variables	(1)	(2)	(3)
Age	0.388*** (0.103)	0.305*** (0.112)	0.228 (0.168)
Age squared	-0.007*** (0.002)	-0.005*** (0.002)	-0.004* (0.003)
Gender	0.284 (0.178)	0.104 (0.197)	-0.236 (0.256)
Employed at wave 1	-0.169 (0.200)	-0.259 (0.248)	
Partnered at wave 1		1.030*** (0.257)	0.000 (.)
Number of biological children at Wave 1	-0.130 (0.124)	-0.372** (0.150)	
Owns their own home at wave 1	-0.075 (0.220)	-0.225 (0.279)	
Number of rooms in the house	0.034 (0.075)	-0.033 (0.094)	
Satisfied with housing	0.015 (0.054)	-0.039 (0.069)	
Life satisfaction (1–10)	0.126** (0.059)	0.112 (0.078)	
Moved between waves	0.149 (0.718)	-0.298 (1.069)	
Relationship satisfaction (1–10)			0.217* (0.124)
Household Task Egalitarianism Index			-0.120 (0.244)
Constant	-6.195*** (1.577)	-6.650*** (1.936)	-3.843 (3.265)
Observations	632	631	390

Source: GGSII - Wave 2 Moldova

POLICY IMPLICATIONS

Realisation of fertility intentions does not occur in a vacuum; it is embedded in Moldova's broader socio-economic and policy context. The period between GGS Wave 1 (2020) and Wave 2 (2023) saw significant upheavals and also major policy responses aimed at supporting families. In this section, we outline the key contextual challenges and the policy measures in place or recently implemented, examining how they relate to the determinants identified above.

Economic and Social Challenges

Moldova faced persistent economic insecurity in the early 2020s. Many young people grapple with low incomes, job instability, and limited opportunities, which in turn affect decisions about starting or expanding a family. The COVID-19 pandemic (2020–2021) exacerbated uncertainty – some couples may have delayed childbearing due to health concerns or economic setbacks during the lockdowns. In 2022, the war in Ukraine led to an influx of refugees and economic ripple effects (energy price spikes, inflation) in Moldova, further straining household budgets. These crises likely contributed to some fertility plans being postponed. The GGS data indeed suggest that those with concerns about job security had lower realisation, and more people became pessimistic by 2023 about near-term childbearing.

Migration

As noted, youth emigration is a critical factor. Moldova has one of the highest emigration rates in Europe, with many working-age individuals (including would-be parents) moving abroad (Tabac, 2021). Moreover, it is often the more educated and economically active young families – precisely those who might intend children- who are more likely to emigrate. This represents a loss of "reproductive potential" for the country. If an intending couple migrates, they may either delay having children until they are settled abroad or have children outside Moldova (which would not be counted as realised in our data). Thus, out-migration may be one of the structural reasons that account for some of the gap between intentions and local realisations. Tackling the root causes of migration (improving jobs, governance, services) is beyond the scope of family or reconciliation policy per se, but it is central to demographic resilience. Indeed, experts emphasise that improving the quality of life and opportunities in Moldova would encourage young people to "stay and create families in the Republic of Moldova," thereby bolstering fertility.

Unstable Partnerships

The rise in divorce and later marriage ages means some people do not have a stable partner when they initially intend a child, leading to non-realisation. The GGS showed that partnership status was paramount. Encouraging and supporting family formation could involve policies such as housing support for newlyweds, relationship education, or facilitating access to reproductive technologies for singles who wish to have children (although this is not currently common in Moldova). Culturally, non-marital childbearing is not rare in Moldova, but usually a cohabiting or married partnership is still the norm for childbearing. Hence, interventions that support couples or reduce financial barriers to maintaining a relationship could indirectly increase fertility realisation.

Inadequate Support Services

Historically, access to affordable childcare and flexible work arrangements has been limited in Moldova. Formal daycare for children under the age of 3 is scarce, prompting parents to rely on grandparents or private babysitters. Maternity and parental leave have been generous in length (up to the child's 3rd birthday), but this can also lead to long career breaks for mothers and to employers' hesitancy to hire women of childbearing age. Even though women can work whilst also receiving parental leave benefits since 2023, the insufficient number of childcare services for children under 3 years of age is likely to still represent a barrier to maternal employment. There were also gaps in engaging fathers in caregiving, and policies did not strongly incentivise paternal leave uptake. These issues create a context in which having a child can impose high costs on a family, potentially deterring those who intend to have one but are unsure if they can manage.

Policy Reforms

Recognising these challenges, the Moldovan government, with support from UNFPA and others, introduced several family-friendly policy reforms in 2022. Notably, three laws were passed to support fertility intention realisation:

Law No. 195/2022. This law reformed the parental leave system and allowed parents to share childcare leave, meaning fathers can take part of their parental leave entitlement (encouraging a more equitable division of child-rearing responsibilities). It also introduced a shorter-term, higher-income childcare allowance option. In practice, this gives families flexibility: they can choose a shorter parental leave period with higher monthly payments rather than a longer one with lower pay. The idea is to minimise career sacrifices while compensating with an adequate income. This policy particularly helps those who might have been hesitant to step out of work for multiple years; with a better-paid, shorter leave, more families might proceed with childbearing, knowing they won't face undue financial hardship or career stagnation. However, even after returning to work, such individuals still face a childcare gap (Saraceno, 2011). It also signals support for fathers to be caregivers, promoting gender equality.

Law No. 367/2022. This law established alternative childcare services for children under age 3. It provides a regulatory framework for employers or authorised individuals to offer childcare at or near the workplace, or in home-based settings, as an alternative to public crèches (which are lacking). Essentially, it encourages the creation of workplace crèches or childminder services that meet certain standards. If implemented effectively, the law should facilitate a smoother transition back to work and reduce the opportunity cost of having a child. Our findings regarding employment status and gender suggest that a lack of childcare support can hinder intentions; thus, Law 367 is a direct policy response to enable those intentions to be realised by providing the necessary support services. It shifts some childcare solutions into the formal sphere, with quality oversight by the Ministry of Labour and Social Protection. Over

time, such services could particularly help mothers with insecure jobs and could encourage employers to be more family-friendly.

Law No. 353/2022. This law amended the provisions for maternity leave and benefits. It ensures that women on maternity leave can continue to receive an income and that the maternity allowance is calculated based on the higher of the two parents' salaries. In other words, if the father earns more than the mother, the maternity benefit (which is a percentage of earnings) can be based on his salary, thus increasing the benefit amount. It also appears to guarantee that a woman can work or earn a certain amount, even while on leave (perhaps part-time), without losing the benefit, allowing for some continuity of career or income. By increasing the income replacement during maternity leave and allowing flexibility, Law 353 enhances the financial attractiveness of having a child. Financial strain during maternity was likely a deterrent for some intenders (especially if the mother had to live on a small stipend). Now, with potentially higher benefits, the period around childbirth is better cushioned. This policy especially supports families where women are high earners (they won't be penalised by a low cap, since it uses the higher of the two incomes) and encourages couples to have children, knowing they will not suffer a significant drop in total household income during leave. It promotes the principle that having a child should not mean financial ruin or a loss of salary for the mother; she can effectively benefit from the family's highest income level.

Together, these three laws (195, 367, 353) represent a considerable pro-family policy package designed to create a more supportive environment for young couples to have children and better combine parenthood with paid work. They address some of the precise barriers our analysis identified: e.g., job insecurity (Law 195 gives flexibility and encourages sharing leave, which could reduce employer discrimination and mothers' career costs), childcare access (Law 367 helps after the baby is born), and financial concerns (Law 353 bolsters maternity pay). These reforms came into effect primarily in late 2022 and 2023, meaning that by the time of GGS Wave 2, their effects might just be starting to take hold.

CONCLUSION

The Generations and Gender Survey data from Moldova convey a clear message: while many Moldovans desire to have children, a range of obstacles – including economic uncertainties, a lack of a partner, insufficient support systems, and broader societal challenges – often prevent those intentions from becoming a reality within the expected timeframe. Between 2020 and 2023, only about one in three intended births actually occurred among those who said they planned to have a child. This highlights a significant unmet need for support in reproductive decision-making. Women in stable, satisfying partnerships and in their late 20s were most likely to succeed in having the child they intended, whereas those lacking a partner or facing insecurity often had to defer their plans.

The policy implications are profound. To close the gap between desired and realised fertility, Moldova is taking steps in the right direction by implementing progressive family policies that promote work-family balance, gender equality, and financial support for childbearing. These measures, along with broader improvements in living standards and opportunities for youth, will be crucial in creating an environment where individuals can exercise their reproductive choices freely and confidently. It's not about encouraging people to have more children than they want, but about empowering them to have the children they do want.

In closing, aligning Moldova's fertility outcomes with its citizens' intentions is an important component of the country's demographic resilience and human development strategy. It requires sustaining momentum on policy reforms, investing in youth and families, and continuously engaging with data and research (such as the GGS) to evaluate progress. If successful, Moldova can ensure that no one is forced to relinquish their dream of parenthood due to remediable barriers, and in doing so, the country can gently raise its fertility level in line with the genuine aspirations of its people. This will help mitigate population decline while upholding the rights and welfare of individuals and families. The path forward is one of enabling choices: a Moldova where individuals who plan to have a child can welcome that child into the world with the support of their community and the state.

Declaration of Interests

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REFERENCES

Ajzen, I., & Klobas, J. (2013). Fertility intentions: An approach based on the theory of planned behavior. *Demographic research, 29,* 8, 203-232. https://doi.org/10.4054/DemRes.2013.29.8

Badolato, L. (2025). The fertility desires-intentions gap in the United States. *Population Studies*, 1-19. https://doi.org/10.1080/00324728.2025.2501315

Buciuceanu-Vrabie, M., & Grigoraș, E. (2023) Intergenerational care Support Transfer: Insights from the Generations and Gender Survey. *Economy and Sociology*, 1, 53-64. https://doi.org/10.36004/nier.es.2023.1-05

Gagauz et al. (2024). *The population of the Republic of Moldova at the Horizon of 2040*. edition coordinator: Olga Gagauz ; authors: Olga Gagauz, Irina Pahomii, Maxim Slav [et al.] Chişinău. https://doi.org/10.36004/nier.2024.go.105.en

Ivan, C., Tabac,T. (2022). *Intenţii de emigrare şi fertilitate: factorI explicativi şi implicaţii demografice*. Ministerul Muncii și Protecției Sociale al Republicii Moldova (MMPS). Chișinău. https://moldova.unfpa.org/sites/default/files/pub-pdf/intentii_de_emigrare_si_fertilitate._factori_explicativi_si_implicatii_demografice_15.09.22_2.pdf

Kocourková, J., & Šťastná, A. (2021). The realization of fertility intentions in the context of childbearing postponement: comparison of transitional and post-transitional populations. *Journal of Biosocial Science*, *53*(1), 82-97. https://doi.org/10.1017/S002193202000005X

Matera, C., Dommermuth, L., Bacci, S., Bertaccini, B., Minello, A., & Vignoli, D. (2023). Perceived economic uncertainty and fertility intentions in couples: A dyadic extension of the theory of planned behaviour. *Journal of Family and Economic Issues*, *44*, 790-806. https://doi.org/10.1007/s10834-022-09872-x

Neels, K., Murphy, M., Bhrolcháin, M. N., & Beaujouan, É. (2017). Rising educational participation and the trend to later childbearing. *Population and Development Review*, *43*(4), 667-693. https://doi.org/10.1111/padr.12112

Riederer, B., Buber-Ennser, I., & Brzozowska, Z. (2019). Fertility intentions and their realization in couples: How the division of household chores matters. *Journal of Family Issues*, *40*(13), 1860-1882. https://doi.org/10.1177/0192513X19848794

Rutigliano, R., & Esping-Andersen, G. (2018). Partnership choice and childbearing in Norway and Spain. *European Journal of Population*, *34*(3), 367-386. https://doi.org/10.1007/s10680-017-9432-6

Saraceno, C. (2011). Childcare needs and childcare policies: A multidimensional issue. *Current Sociology*, *59*(1), 78-96. https://doi.org/10.1177/0011392110385971

Shreffler, K. M., Tiemeyer, S., Dorius, C., Spierling, T., Greil, A. L., & McQuillan, J. (2016). Infertility and fertility intentions, desires, and outcomes among US women. *Demographic Research*, *35*, 39, 1149-1168. https://doi.org/10.4054/DemRes.2016.35.39

Spéder, Z., & Bálint, L. (2024). Realization of Short-Term Fertility Intentions in a Comparative Perspective: Which Macro-Level Conditions Matter? *Population Research and Policy Review*, *43*, 72. https://doi.org/10.1007/s11113-024-09913-3

Tabac, T. (2021). International migration and population changes in Moldova. Economy and Sociology, (2), 94–102. https://doi.org/10.36004/nier.es.2021.2-08

Thomson, E., Winkler-Dworak, M., Spielauer, M., & Prskawetz, A. (2012). Union instability as an engine of fertility? A microsimulation model for France. *Demography*, *49*(1), 175-195. https://doi.org/10.1007/s13524-011-0085-5

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SOCIAL ACCEPTANCE OF ASSISTED REPRODUCTIVE TECHNOLOGIES IN MOLDOVA: A SOCIALLY DIFFERENTIATED PERSPECTIVE

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SUMMARY

Assisted reproductive technologies (ART) offer an important medical intervention for couples experiencing difficulties conceiving. This study examines the level of social acceptance of ART in Moldova and identifies key socio-demographic, economic, and cultural factors shaping public attitudes toward its use. The analysis is based on data from a quantitative exploratory study conducted between August and September 2025, using a self-administered online questionnaire completed by 375 respondents aged 20 to 50. Acceptance of ART is analysed across three contexts: personal use, use in cases of partner infertility, and willingness to encourage others to access such technologies. The findings indicate that acceptance is generally high but socially differentiated. Education, income, and place of residence are the strongest correlates of acceptance, whereas age, religiosity, and parental status exert more moderate effects. These disparities point to persistent social inequalities in attitudes toward ART and underscore the need for public policies to reduce barriers to access. At the same time, the results suggest that ART are perceived not only as medical interventions but also as instruments of broader reproductive modernisation.

Keywords: *ART, social acceptance, social attitudes, fertility, reproductive health*

INTRODUCTION

Infertility represents a globally recognised public health issue, affecting 17.5% of the population over their lifetime (WHO, 2023). Other studies indicate that approximately 12% of couples face infertility, with this proportion gradually increasing (Aderaldo et al., 2023). In Moldova, the Generations and Gender Study (2020) reported that 12% of respondents aged 15–49 experienced difficulties conceiving a child in the past 12 months, and 9% reported that they could not or could no longer have children (Rosenberg et al., 2022). Fertility problems can arise at any age; however, delaying childbearing increases the risk of age-related infertility and, consequently, the need for medical assistance to conceive.

Infertility poses psychosocial challenges, affecting individual well-being and family relationships. Some analyses indicate that persistent infertility leads to long-term deterioration in mental health. Women experiencing infertility face a high incidence of anxiety and depression, associated with factors such as treatment costs, age, and the duration of infertility (Hu et al., 2025). Estimates also indicate that couples who remain infertile are more likely to divorce. Moreover, persistent infertility does not confer a "protective" long-term effect on women's earnings. One interpretation is that, although childbirth reduces women's earnings, the long-term burden of involuntary childlessness on women's mental well-being may have a compensatory (negative) impact on their income (Bögl et al., 2024).

In this context, assisted reproductive technologies (ART) have become important solutions for couples facing difficulties conceiving naturally. International evidence shows that the public largely perceives infertility as a treatable medical condition and expresses strong support for universal access to ART, including willingness to contribute financially to publicly funded fertility treatment programmes (Skedgel et al., 2021). However, access to and acceptance of assisted reproductive medical technologies are not determined solely by medical need; they are influenced by socioeconomic, educational, and cultural factors, as well as the structure of public policies on funding infertility treatments.

Thus, despite major advances in fertility treatment that offer many the hope of achieving pregnancy, significant social, economic, and geographic barriers persist in many countries regarding who can access and benefit from these technologies (Imrie et al., 2023). Studies addressing this issue have identified more than one barrier to access to assisted reproductive medical technologies, with the patient's geographic location being the most frequently reported; others were grouped thematically as psychological, financial, minority group membership, educational level, and age (Mackay et al., 2023). The acceptance and use of ART are not determined solely by medical or biological factors but are profoundly shaped by social determinants—the contextual factors that structure opportunities and constraints for individuals and groups. Understanding these aspects is important, given that assisted reproductive medical technologies have the potential to support fertility recovery in the context of delayed childbearing (Kocourková et al., 2023). Additionally, it is important to know who has access to ART, as this helps identify potential social inequities in their use (Goisis et al., 2020).

The aim of this study is to analyse the level of ART acceptance among the adult population in Moldova and to explore the socio-demographic, cultural, and economic factors associated with this acceptance. By examining acceptance at both the individual level (personal and partner-related use) and the social-normative level (willingness to encourage others), the study seeks to identify socially differentiated patterns of attitudes toward ART and to provide a basis for policy-relevant discussion.

THEORETICAL FRAMEWORK

The literature indicates that the use and dissemination of ART in Europe are not determined exclusively by economic development, demographic structure, or the religious composition of the population, but are significantly influenced by the cultural and normative acceptability of these technologies (Präg & Mills, 2017). Access varies widely internationally due to religious, cultural, and political factors that affect the moral status of the embryo (Adamson, 2009). Studies show that societies in which assisted reproductive medical technologies are perceived as morally and socially legitimate exhibit higher utilisation rates, regardless of differences in GDP or total fertility. Identifying the factors that shape public attitudes towards assisted reproductive medical technologies is a crucial starting point for developing strategies to increase public acceptance (Fortin & Abele, 2016).

Delayed childbearing is recognised as one of the main factors contributing to the rising demand for assisted reproductive medical technologies in contemporary societies. At the same time, the increased availability and effectiveness of these technologies may reinforce the tendency to postpone motherhood, creating a bidirectional relationship between reproductive behaviour and the utilisation of assisted reproductive medical technologies (Kocourkova et al., 2014). This dynamic is closely linked to broader transformations in the late demographic transition, characterised by declining fertility, diversification of family forms, and the reconfiguration of life-course trajectories.

Numerous studies indicate that the use of assisted reproductive medical technologies is socially stratified, with children conceived via these technologies more likely to be born to mothers of higher socioeconomic status than those conceived naturally. Women with higher levels of education and income are more likely to access ART, both because of greater financial capacity and because of delayed childbearing, a phenomenon often associated with extended educational and professional trajectories (Imrie et al., 2023; Goisis et al., 2020). Moreover, mothers with university-level education are more likely to give birth after using assisted reproductive medical technologies than those with lower educational attainment (Goisis et al., 2024).

A frequently debated aspect in the literature is that public funding of assisted reproductive medical technologies is associated with higher utilisation rates and more favourable clinical outcomes, including higher clinical pregnancy rates in in vitro fertilisation (IVF). Health systems that include assisted reproductive medical technologies in publicly funded service packages reduce financial barriers and contribute to a more equitable distribution of access (Chambers et al., 2013; Issanov et al., 2022). The literature suggests that countries with mandatory IVF coverage have better perinatal outcomes, attributable to greater use of best IVF practices, such as single-embryo transfers (Fotovati et al., 2024).

Conversely, higher out-of-pocket costs for patients lead to a significant reduction in the use of assisted reproductive medical technologies across all population groups, suggesting that funding policies affect all social categories. Norway provides a relevant example, in which ART are largely accessible through the public healthcare system. Nevertheless, longitudinal studies show that parents conceiving through assisted reproductive medical technologies are predominantly socioeconomically advantaged: older, with higher levels of education and income, and, in most cases, married. Even in a generous system, individuals from lower socioeconomic groups may face financial barriers when seeking additional treatments in the private sector beyond the three cycles covered by the public system (Goisis et al., 2020). These findings underscore that the formal universalism of policies does not entirely eliminate social inequalities in ART use.

ART may have demographic relevance when women utilise them at an earlier age. Moreover, it has been suggested that using these technologies at a younger age increases women's chances of achieving their reproductive goals and reduces the risk of age-related infertility and assisted reproductive medical technologies failure (Kocourkova et al., 2014). While these technologies are costly from the patient's perspective, they are not necessarily so from a societal standpoint. Funding mechanisms should aim to maximise efficiency and equity of access while minimising the potential risks associated with multiple births (Chambers et al., 2009).

Existing literature clearly shows that access to and acceptance of ART are shaped by a complex interplay of socioeconomic, cultural, and political factors. Although there is a general understanding of the role of costs, funding systems, and cultural norms at the European level, there remains a clear need for context-specific studies.

In Moldova, both the literature and systematic empirical evidence on public attitudes toward ART remain limited. Against this background, this article provides one of the first empirical analyses of social acceptance of ART in Moldova and introduces a multidimensional approach to acceptance by distinguishing between personal, partner-related, and normative forms of support for assisted reproduction.

METHODOLOGY

The study adopts an exploratory research design, which is particularly appropriate given the limited availability of systematic empirical evidence on public attitudes toward ART in Moldova. Rather than testing causal relationships, the research aims to map patterns of acceptance and to identify key social dimensions along which these attitudes vary.

Empirical data were collected through the survey "Public Perceptions of ART", conducted between August and September 2025 using a self-administered online questionnaire. Participation was voluntary, and respondents self-selected into the study. The questionnaire was administered to individuals aged 20 to 50 years, yielding a final sample of 375 respondents. All participants provided informed consent, and the study complied with ethical standards in reproductive health research.

Given the non-probability nature of the sample, the analysis relies on descriptive and comparative statistics rather than multivariate regression techniques. This analytical strategy is consistent with the exploratory nature of the study and enables the identification of socially structured patterns of acceptance without implying statistical representativeness or causal inference.

Several limitations should be considered when interpreting the findings of this study. The data derive from a self-administered online survey with voluntary participation, which limits the sample's representativeness and may underrepresent older, less-educated, and rural populations. The exploratory, cross-sectional design precludes causal inference, and the analysis relies on self-reported attitudes and intentions rather than observed behaviour. In addition, key explanatory mechanisms, such as medical knowledge, perceived risks, stigma, and trust in healthcare institutions, were not directly measured. Finally, the study does not differentiate among specific ART types, which may be subject to varying levels of social acceptance.

MAIN RESULTS

Table 1 (Annexe) presents the proportions of respondents willing (a) to use assisted reproductive medical technologies in the event of their own infertility, (b) to use these technologies if infertility concerns their partner, and (c) to encourage a person or couple in their close social network to access assisted reproductive medical technologies. Together, these three indicators capture distinct yet related dimensions of attitudes towards ART and are examined across key socio-demographic characteristics.

Overall, the results indicate relatively high levels of acceptance. A total of 76.8% of respondents report willingness to use ART in a personal infertility scenario, 75.3% in the case of partner infertility, and 80.5% express readiness to encourage others to seek such medical solutions. The remaining respondents express uncertainty or indecision, suggesting either ambivalence towards these technologies or limited information. Acceptance is slightly higher in the normative scenario of encouraging others than in self-referential situations, a pattern commonly associated with perceptions of personal risk, stigma, or financial and emotional costs. At the same time, the high level of acceptance in the partner-related scenario points to strong conjugal solidarity. Taken together, these patterns suggest a broad social consensus regarding the legitimacy of ART as a medical response to infertility.

Gender differences are evident across all three dimensions of acceptance. Women report higher acceptance than men, with the largest gap in the indicator measuring willingness to encourage others (83.5% among women versus 70.2% among men). This difference may reflect women's greater exposure to reproductive health information and services, as well as more frequent personal or social experiences of infertility, which can foster empathy for medical reproductive solutions. Men's lower levels of acceptance—particularly in the normative scenario—may be linked to lower engagement with reproductive health issues, gendered norms surrounding masculinity, or greater caution towards medical interventions in reproduction. Overall, women's greater openness to ART may be understood in the context of the gendered distribution of reproductive responsibility, whereby women more often bear the social and practical burden of managing infertility, even when its causes are male or shared.

A clear social gradient in ART acceptance is evident by place of residence. The predominantly urban municipality of Chisinau shows the highest levels of firm acceptance across all three scenarios—personal use, partner-related use, and encouraging others (83% / 88.5% / 88.8%). This pattern aligns with greater exposure to modern medical practices, higher average levels of education and income, and more liberal social norms prevalent in the capital. Urban areas outside Chisinau show slightly lower acceptance than the capital but remain more favourable than rural areas (79.7% / 78.3% / 82.6%).

By contrast, respondents in rural areas report substantially lower acceptance (65.3% / 61.9% / 66.1%) and higher shares of uncertainty and opposition. These differences point to persistent inequalities in access to specialised medical services and reproductive health information, as well as to lower levels of informational

and medical capital. They also reflect the continued influence of more traditional norms surrounding reproduction and medical intervention in family life, including perceptions of ART as an "external" or intrusive intervention in the private sphere of the couple.

Education is among the strongest and most consistent determinants of ART acceptance. The data show a clear, progressive rise in willingness to use or support these technologies with higher educational attainment. Acceptance is lowest among respondents with lower secondary or general education (63.5% / 64.9% / 66.2%), increases among those with vocational or specialised secondary education (75.9% / 74.7% / 78.5%), and peaks among respondents with tertiary education (81.5% / 79.7% / 86.0%). Lower levels of education are thus associated with greater ambivalence and stronger opposition across all scenarios.

These patterns suggest that education plays a central role in shaping attitudes towards ART by enhancing medical literacy, trust in scientific knowledge, and the ability to frame infertility as a medical condition rather than a matter of fate or moral order. Educational attainment is also closely linked to broader forms of cultural capital and higher income, which together reduce both symbolic and practical barriers to the acceptance of biomedical reproductive solutions. Differences by education are particularly pronounced in the normative scenario of encouraging others, where acceptance ranges from 66.2% among respondents with lower education to 86.0% among those with tertiary education. This indicates that education influences not only personal decision-making but also broader normative orientations towards legitimising ART for others. From a sociological perspective, education can thus be understood as a key mechanism in the rationalisation and social legitimation of biomedical intervention in reproduction.

Age is also a relevant dimension shaping attitudes toward ART. Acceptance is highest among younger, reproductively active age groups—those aged 20–29 years (79.4% for personal use; 76.5% for partner-related use; 82.4% for encouraging others) and 30–39 years (80.2%; 79.4%; 82.6%). By contrast, respondents aged 40–50 years report lower levels of acceptance across all scenarios, with the most pronounced decline in the partner-related scenario (72.1%; 62.1%; 77.6%). The sharp drop to 62.1% in this indicator indicates a pronounced age gradient in attitudes toward assisted reproduction.

These patterns indicate that ART acceptance tends to decline with age. Younger respondents may be more exposed to contemporary medical information, more pragmatically oriented toward technological solutions, and more likely to be in life-course phases in which fertility and family planning remain salient. Older cohorts may express greater caution towards reproductive medical interventions, stronger attachment to traditional norms, and heightened concern about age-related medical risks. In addition, ART may be perceived as less relevant to personal family trajectories among respondents aged 40–50, which could contribute to lower acceptance, particularly in partner-related scenarios. The pronounced age difference in the partner-related indicator may also reflect cohort-specific gender norms or differences in perceptions of medical responsibility within couples.

Household monthly income is clearly and consistently associated with acceptance of ART. Willingness to use or support these technologies increases with income, underscoring the role of economic resources in shaping reproductive attitudes. Among respondents with monthly household incomes below 10,000 MDL, acceptance remains relatively low (63.4% for personal use; 63.3% for partner-related use; 69.0% for encouraging others). Acceptance rises substantially in the middle-income categories (10,001–20,000 MDL and 20,001–30,000 MDL), reaching its highest levels among respondents with incomes above 30,001 MDL (approximately 88–89% across all three scenarios).

These findings suggest that ART are perceived not only as a medical intervention but also as an economically conditioned resource, with real or anticipated costs playing a decisive role in shaping acceptance. Income is closely intertwined with other structural factors—such as education, access to medical services, and cultural capital—that may further mediate trust in assisted reproductive medicine and access to reliable information. The strong income gradient observed in the data highlights the persistence of financial barriers and suggests that policy measures, such as subsidies or the inclusion of ART in health insurance schemes, may be important for reducing inequalities in access.

Participation in religious services is associated with meaningful variation in attitudes towards assisted reproductive medical technologies. Acceptance levels differ across categories of religious participation: respondents who attend services once a month or more report lower acceptance (69.5% for personal use; 69.2% for partner-related use; 78.0% for encouraging others), while those who attend only on major religious holidays show moderately higher levels (75.7%; 74.2%; 78.8%). The highest acceptance is observed among respondents who participate occasionally in religious services (81.7%; 80.6%; 83.5%). Individuals who report no participation in religious services occupy an intermediate position (72.8%; 72.8%; 75.7%).

These results indicate that the relationship between religiosity and ART acceptance is nonlinear. Occasional participation in religious practices is associated with the most favourable attitudes, whereas frequent religious practice is linked to greater reticence towards medical intervention in reproduction. This pattern suggests that the intensity of religious participation may reflect the degree of internalisation of traditional religious norms regarding reproduction and biomedical intervention. Frequent attendance likely reflects a more conservative normative orientation, whereas occasional participation may combine cultural or symbolic religious affiliation with more pragmatic or modern attitudes towards

medical solutions. Across all categories of religious participation, acceptance is consistently higher in the normative scenario of encouraging others than in self-referential situations, indicating that religious norms appear to constrain personal decision-making more strongly than social endorsement.

By contrast, parental status is associated with only modest differences in attitudes towards ART. Respondents with children report acceptance of 76.3% for personal use, 75.2% for partner-related use, and 81.4% for encouraging others, while respondents without children report comparable levels (78.2%; 77.3%; and 78.3%, respectively). These small differences do not indicate a strong effect of parental status on ART acceptance.

Nevertheless, subtle variations in the response pattern can be observed. Respondents without children are slightly more willing to consider ART for themselves or their partner, possibly reflecting unmet reproductive aspirations or future-oriented family plans. In contrast, respondents with children show somewhat higher levels of willingness to encourage others, which may reflect greater empathy toward infertile couples or an appreciation of the social and personal value of parenthood. Overall, these findings suggest that acceptance of ART functions primarily as a general normative attitude rather than as a response driven by personal parental experience. Parental status thus appears to be a secondary factor, relative to structural resources and cultural norms, in shaping attitudes toward ART.

Intentions to give birth or conceive in the future are also associated with attitudes toward assisted reproductive medical technologies. Respondents who report an intention to conceive ("definitely/probably yes") express relatively high levels of acceptance across all three scenarios: 77.8% for personal use, 79.0% for partner-related use, and 83.9% for encouraging others. The highest levels of acceptance, however, are observed among respondents who are undecided about future childbearing ("I am not sure"), with 85.8% indicating willingness to use ART themselves, 82.8% in the partner-related scenario, and 85.7% when encouraging others.

Respondents who state that they do not or will no longer wish to have children ("probably no/definitely no") display acceptance levels similar to those who intend to conceive (77.2%; 76.1%; 83.5%), while those who find it difficult to answer report the lowest levels of acceptance across all scenarios (66.7%; 66.7%; 75.0%). This pattern suggests that firm reproductive intentions—whether positive or negative—are associated with relatively stable and moderate levels of acceptance, whereas uncertainty plays a more decisive role in shaping openness to ART.

Higher acceptance among undecided respondents may reflect a perception of ART as a means of preserving or extending future reproductive options. Individuals who intend to conceive appear to adopt a pragmatic approach to medical interventions that facilitate family planning. At the same time, respondents who do not plan to have children often continue to express normative support for ART, as reflected in their willingness to encourage others, indicating a separation between personal reproductive preferences and broader social acceptance of medical intervention in reproduction. By contrast, difficulty in articulating future reproductive intentions may signal limited information, moral ambivalence, or anxiety regarding potential consequences, which in turn translates into lower acceptance of ART.

DISCUSSIONS AND CONCLUSIONS

This study demonstrates that ART are widely socially accepted in Moldova, and reveals a clear social structure underlying this acceptance. Education, place of residence, income, gender, and religiosity emerge as key factors shaping attitudes towards ART. Overall, the findings support the interpretation that acceptance of these technologies reflects broader processes of the modernisation of reproductive values rather than merely individual reactions to infertility.

The results indicate that factors linked to human capital and modernisation, particularly higher educational attainment, urban residence, and greater economic resources, are positively associated with openness to ART. These associations likely operate through greater medical literacy, trust in scientific knowledge, and improved access to healthcare services. By contrast, more traditional normative contexts, such as rural settings and frequent religious practice, are associated with greater reticence toward biomedical interventions in reproduction, reflecting enduring cultural understandings of the "naturalness" of reproduction and the moral boundaries of medical involvement in family life. Gender differences further highlight the role of social structure in shaping attitudes: women tend to be more favourable toward ART than men, possibly due to greater exposure to reproductive healthcare and a disproportionate responsibility for managing infertility within couples.

A consistent finding across the analysis is the distinction between normative support for ART and personal willingness to use it. Acceptance is systematically higher in scenarios involving others' encouragement than in self-referential situations, suggesting that perceptions of financial cost, medical risk, and social stigma continue to shape individual decision-making. This pattern indicates a form of generalised normative acceptance accompanied by individual caution, consistent with sociological perspectives that emphasise that moral approval of a technology often precedes its widespread personal adoption.

These findings align with international research showing generally favourable public attitudes toward ART, alongside persistent inequalities in access related to socioeconomic status and cultural context (Fauser et al., 2019; Passet-Wittig et al., 2025). As in other countries, higher-income groups in Moldova display more positive attitudes, underscoring the continued importance of financial resources in shaping both acceptance and potential use. At the same time, international evidence highlights that awareness gaps, financial barriers, and cultural considerations remain significant obstacles to equitable access, even in contexts where public support for assisted reproduction is high (Adamson et al., 2025).

Importantly, the results suggest that positive attitudes toward ART coexist with limited or uneven knowledge about their procedures, costs, and risks. Previous studies indicate that individuals often overestimate their understanding of assisted reproductive medicine, while lacking accurate information about success rates, age limits, and potential health risks (Szalma & Bitó, 2021). The present findings, particularly regarding the roles of religiosity and uncertainty, indicate a similar pattern in Moldova and underscore the importance of targeted public education.

Taken together, the study shows that assisted reproductive medical technologies are perceived as legitimate and effective responses to infertility, but that acceptance is unevenly distributed across social groups. Structural inequalities related to education, income, and place of residence continue to shape how these technologies are valued and understood, indicating that processes of medical modernisation are not uniformly diffused across society.

From a policy perspective, these results highlight the need for a dual approach that combines efforts to improve equitable access to ART with initiatives to increase public knowledge and support informed decision-making. Expanding financial support mechanisms, improving access to specialised services outside major urban centres, and developing evidence-based information programs could help reduce social disparities and strengthen reproductive health outcomes in Moldova.

REFERENCES

Adamson, G. D. (2009). Global cultural and socioeconomic factors that influence access to ART. *Women's Health*, *5*(4), 351-358. https://doi.org/10.2217/whe.09.28

Adamson, G. D., Armstrong, H., Cheong, Y., Damato, E., Fatemi, H., Ferriani, R., Griesinger, G., Ledger, W. L., Pistollato, M., Pellicer, A., Petrova, A., Rombauts, L., Wilsdon, T., & Ziebe, S. (2025). Policy solutions to improve access to fertility treatment and optimise patient care: consensus from an expert forum. *Frontiers in Reproductive Health*, *7*, 1605480. https://doi.org/10.3389/frph.2025.1605480

Aderaldo, J. F., Rodrigues de Albuquerque, B. H. D., Câmara de Oliveira, M. T. F., de Medeiros Garcia Torres, M., & Lanza, D. C. F. (2023). Main topics in assisted reproductive market: A scoping review. *PloS One*, *18*(8), e0284099. https://doi.org/10.1371/journal.pone.0284099

Bögl, S., Moshfegh, J., Persson, P., & Polyakova, M. (2024). *The economics of infertility: Evidence from reproductive medicine*. Working Paper 32445. National Bureau of Economic Research. https://doi.org/10.3386/w32445

Chambers, G. M., Sullivan, E. A., Ishihara, O., Chapman, M. G., & Adamson, G. D. (2009). The economic impact of assisted reproductive technology: a review of selected developed countries. *Fertility Sterility*, *91*(6), 2281-2294. https://doi.org/10.1016/j.fertnstert.2009.04.029

Chambers, G. M., Hoang, V. P., & Illingworth, P. J. (2013). Socioeconomic disparities in access to ART treatment and the differential impact of a policy that increased consumer costs. *Human Reproduction*, *28*(11), 3111-3117. https://doi.org/10.1093/humrep/det302

Fauser, B. C. J. M., Boivin, J., Barri, P. N., Tarlatzis, B. C., Schmidt, L., & Levy-Toledano, R. (2019). Beliefs, attitudes and funding of assisted reproductive technology: Public perception of over 6,000 respondents from 6 European countries. *PloS One*, *14*(1), e0211150. https://doi.org/10.1371/journal.pone.0211150

Fortin, C., & Abele, S. (2016). Increased Length of Awareness of ART Fosters Positive Attitudes and Acceptance among Women. *International Journal of Fertility & Sterility*, *9*(4), 452-464. https://doi.org/10.22074/ijfs.2015.4603

Fotovati, M., Badeghiesh, A. M., Baghlaf, H. A., & Dahan, M. H. (2024). The relationship between socioeconomic status and perinatal outcomes in in vitro fertilization conceptions. *AJOG global reports*, *4*(2), 100329. https://doi.org/10.1016/j.xagr.2024.100329

Goisis, A., Håberg, S. E., Hanevik, H. I, Magnus, M. C., Kravdal, Ø. (2020) The demographics of assisted reproductive technology births in a Nordic country. *Human Reproduction*, *35*(6), 1441-1450. https://doi.org/10.1093/humrep/deaa055

Goisis, A., Fallesen, P., Seiz, M., Salazar, L., Eremenko, T., & Cozzani, M. (2024). Educational gradients in the prevalence of medically assisted reproduction births in a comparative perspective. *Fertility Sterility*, *122*(4), 648-657. https://doi.org/10.1016/j.fertnstert.2024.05.149

Hu, L., Yuan, Y., Li, Y., Cai, M., Yin, J., & Zhu, L. (2025). Prevalence and risk factors of negative emotions in infertile women: a systematic review and meta-analysis. *Frontiers in Public Health*, *13*, 1701381. https://doi.org/10.3389/fpubh.2025.1701381

Imrie, R., Ghosh, S., Narvekar, N., Vigneswaran, K., Wang, Y., & Savvas, M. (2023). Socioeconomic status and fertility treatment outcomes in high-income countries: a review of the current literature. *Human Fertility*, *26*(1), 27-37. https://doi.org/10.1080/14647273.2021.1957503

Issanov, A., Aimagambetova, G., Terzic, S., Bapayeva, G., Ukybassova, T., Baikoshkarova, S., Utepova, G., Daribay, Z., Bekbossinova, G., Balykov, A., Aldiyarova, A., & Terzic, M. (2022). Impact of governmental support to the IVF clinical pregnancy rates: differences between public and private clinical settings in Kazakhstan-a prospective cohort study. *BMJ open*, *12*(2), e049388. https://doi.org/10.1136/bmjopen-2021-049388

Kocourkova, J., Burcin, B., & Kucera, T. (2014). Demographic relevancy of increased use of assisted reproduction in European countries. *Reproductive Health*, *11*(1), 37. https://doi.org/10.1186/1742-4755-11-37

Kocourková, J., Šťastná, A., & Burcin, B. (2023). The influence of the increasing use of assisted reproduction technologies on the recent growth in fertility in Czechia. *Scientific Reports*, *13*(1), 10854. https://doi.org/10.1038/s41598-023-37071-7

Mackay, A., Taylor, S., & Glass, B. (2023). Inequity of Access: Scoping the Barriers to ART. *Pharmacy*, *11*(1), 17. https://doi.org/10.3390/pharmacy11010017

Passet-Wittig, J., Greil, A. L., McQuillan, J., & Bujard, M. (2025). Social Disparities Across Different Stages of Medical Help-Seeking to Have a Child in Germany. *Social Inclusion,* 13, 10420. https://doi.org/10.17645/si.10420

Präg, P., & Mills, M. C. (2017). Cultural determinants influence assisted reproduction usage in Europe more than economic and demographic factors. *Human Reproduction*, *32*(11), 2305-2314. https://doi.org/10.1093/humrep/dex298

Rosenberg, R., Bietsch, K., Sonneveldt, E. (2022). Infertility in Moldova: evidence from the generations and gender survey. *Economy and Sociology*, 2, 34-51. https://doi.org/10.36004/nier.es.2022.2-03

Skedgel, C., Ralphs, E., Finn, E., Whitty, J. A., Markert, M., & Samuelsen, C. (2021). Is the public supportive and willing to pay for a national assistive reproductive therapies programme? Results from a multicountry survey. *BMJ open*, *11*(3), e044986. https://doi.org/10.1136/bmjopen-2020-044986

Szalma, I., & Bitó, T. (2021). Knowledge and attitudes about assisted reproductive technology: Findings from a Hungarian online survey. *Reproductive BioMedicine & Society Online*, *13*, 75-84. https://doi.org/10.1016/j.rbms.2021.06.005

World Health Organization. (2023). *Infertility prevalence estimates, 1990-2021*. Geneva: World Health Organization. https://iris.who.int/server/api/core/bitstreams/a22ced65-46b1-4482-bf85-058719fec649/content

ANNEXE

Table 1.

Attitudes toward ART use, total positive responses (% "definitely yes" / "probably yes")

		If your health condition would prevent you from having children by natural conception, would you be willing to resort to ART?	If your spouse's or partner's health condition would prevent the conception of a child by natural means, would you be willing to resort to ART?	If a person or couple in your close circle were to face infertility, would you encourage them to access ART?
Total		76.8	75.3	80.5
Sex	Female	78	77.3	83.5
	Male	72.6	70.3	70.2
Place of residence	Chisinau Municipality	83	88.5	88.8
	Other cities	79.7	78.3	82.6
	Rural areas	65.3	61.9	66.1

Education level	Lower secondary / General	63.5	64.9	66.2
	Vocational / Specialised secondary	75.9	74.7	78.5
	Higher education	81.5	79.7	86
Age	20-29 years	79.4	76.5	82.4
	30-39 years	80.2	79.4	82.6
	40-50 years	72.1	62.1	77.6
Monthly family income	< 10.000 MDL	63.4	63.3	69.0
	10.001 - 20.000 MDL	79.8	79.9	82.4
	20.001 - 30.000 MDL	76.2	73.8	79.7
	≥ 30.001 MDL	89.4	87.9	89.4
Religious participation	Once a month or more	69.5	69.2	78
	Only on major holidays	75.7	74.2	78.8
	Occasionally. family events or holidays	81.7	80.6	83.5
	Never	72.8	72.8	75.7
Parental status	Yes	76.3	75.2	81.4
	No	78.2	77.3	78.3
Intention to (further) have/ conceive a child in the future?	Definitely yes / Probably yes	77.8	79.0	83.9
	Not sure	85.8	82.8	85.7
	Probably no / Definitely no	77.2	76.1	83.5
	Difficult to answer	66.7	66.7	75.0

Source: Survey "Public Perceptions of ART" (2025)

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SOCIAL AND ECONOMIC PREDICTORS OF DEMOCRATIC CONSOLIDATION. A QUANTITATIVE ASSESSMENT

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SUMMARY

This paper examines democratic consolidation as a dynamic and non-linear process shaped by structural socio-economic conditions and institutional capacity, rather than as a fixed or irreversible political outcome. Building on classic and contemporary theories of democracy and consolidation. The study advances a quantitative and comparative analysis of European Union member states over the period 2006–2022. Democratic consolidation is operationalised through the Democracy Index developed by The Economist Intelligence Unit, while explanatory variables capture economic development, social welfare, inequality, poverty, state fragility and education, using data from Eurostat, the World Happiness Report and the Fragile States Index. Methodologically, the research combines descriptive analysis (box-plots and cartographic representations), Pearson correlation analysis and multivariate linear regression. The results indicate systematic associations between the level of democracy and socio-economic performance. The regression model explains a substantial share of cross-national variation in democratic outcomes within the EU, though notable residuals highlight the limits of purely socio-economic explanations and point to the role of additional institutional and political factors. The findings reveal persistent structural divides between Western Europe and Central and Eastern Europe and confirm the phenomenon of democratic erosion in several post-communist states. Overall, the study underscores that democratic consolidation depends not only on formal electoral institutions, but also on inclusive economic development, social protection and institutional resilience. These results have important implications for both comparative democratic theory and EU-level public policy aimed at safeguarding democratic quality and preventing democratic backsliding.

Keywords: *democracy, democratization, democratic consolidation, social, economic, predictors*

INTRODUCTION

In theory, democracy is a form of government in which citizens with the right to vote participate at regular intervals (elections) to appoint the few (the ruling elites) to govern (Schumpeter, 1942). This is the empirical or minimalist definition of democracy (Sartori, 1999), which emphasises its concrete, practical and procedural aspects, inspired by the supply and demand relationship that governs the free market in capitalist societies. Citizens with the right to vote represent demand (solutions to the problems they face), while political leaders represent supply (public policy proposals).

According to the Schumpeterian approach, democracy is no longer the rule of the people, as it was in the classical view, but the rule of leaders validated by the people. Starting from an empirical approach to democracy, G. Sartori adds to the definition a series of normative aspects that derive from the functioning of a democratic regime: a pluralistic, liberal and competitive political regime, in which power is obtained through elections and exercised on the basis of clear and predictable procedures, but limited and controlled by constitutional institutions (Sartori, 1999).

A comprehensive definition of democracy is provided by Robert A. Dahl (2000) in his work *Polyarchies. Participation and Opposition*: 1) elected officials; 2) free and fair elections; 3) inclusive suffrage; 4) the right to run for public office; 5) freedom of expression; 6) the existence of alternative sources of information; 7) associative autonomy. Guillermo O'Donnell adds two more attributes to these characteristics of polyarchy (democracy); 8) elected officials (and some appointed officials) should not be prevented from completing their term of office; 9) elected authorities should not be subject to constraints from unelected actors, such as the military or secret services. Despite the criticism it has received over time, democracy is the most justified form of government because it ensures participation, political equality and legitimate control over power (Dahl, 2002; 2003).

Democracy is a political regime in which protracted conflicts between elites are resolved through the adoption of democratic rules as a mechanism for compromise and stabilisation (Rustow, 1970). Democratic institutions and procedures ensure political participation, electoral competition and accountability of rulers, without necessarily guaranteeing economic performance, stability or social welfare (Schmitter and Karl, 1991). Democracy and the market economy are compatible, but do not automatically converge. Economic reforms can generate social costs which, in the absence of protection and mediation mechanisms, can undermine democratic consolidation. (Przeworski, 1996).

Democracy can be achieved through revolution, popular uprising, coup d'état, special military operation, or "round-table negotiations", as was the case in the year of the collapse of communism in Central and Eastern Europe (1989). Democracy is not a state that is won once and for all (Schedler, 1998). Just as dictatorial regimes can collapse in certain historical circumstances, so too can consolidated democracies undergo phases of "democratic erosion", eventually being reclassified as hybrid regimes (illiberal democracies, partially consolidated democracies, competitive authoritarianisms). Competitive authoritarianism describes regimes in which electoral competition exists but is systematically distorted by abuse of power, resulting in a stable type of regime situated between democracy and authoritarianism (Levitsky and Way, 2010).

According to Jean Grugel, democracy is a political system that translates citizens' preferences (validly cast votes) into public policies, with effective institutions that protect and deepen individual rights and freedoms, supported by a civil society that highly values participation, opposition and contestation. In a consolidated democracy, alternatives to power are possible, but anti-democratic actors are limited in their destructive actions (Grugel, 2008).

This paper analyses the process of democratic consolidation, understood as the transition from a totalitarian or authoritarian regime to liberal democracy, in which democracy as a system of government becomes stable and broadly accepted by political and social actors. In a consolidated democracy, a return to the previous regime is unlikely. In the classic formulation of Juan Linz and Alfred Stepan, a democracy is consolidated when anti-democratic alternatives are excluded (*democracy is the only game in town*), democratic rules are enforced, and democratic norms and values are shared by social actors (Linz and Stepan, 1996).

THEORETICAL FRAMEWORK

Since the second half of the 20th century, the study of democratic consolidation has been one of the major areas of research in political science, approached from various institutional, socio-economic and cultural perspectives. Previous studies show that democracy is not limited to the organisation of free elections, but also requires the stability and internalisation of democratic norms, the effective functioning of institutions and the capacity of the political system to deliver economic development, welfare and social inclusion (Huntington, 1991; 1996).

In this paper, democratic consolidation is conceptualised as a continuous process of institutionalisation and internalisation of democratic norms, values and practices. Consequently, democracy cannot be treated as a perfect or irreversible state, as no society fully meets the criteria of a fully consolidated democracy. In my opinion, a perfectly consolidated democracy is an ideal or a" concept on paper" (Iftimoaei, 2013, 2015). A comparative-historical analysis of political systems highlights the non-linear path of transition, democratisation and democratic consolidation. This path is marked by episodes of progress and institutional stabilisation, but also by periods of regression or even democratic collapse (Schedler, 1997).

Democratisation is the process of transition from an undemocratic (totalitarian or authoritarian) regime to a democratic regime, which involves going through a series of normative, institutional and procedural stages: political liberalisation, the adoption of a democratic constitution, and the organisation of competitive elections. The democratisation process is marked by uncertainty induced by the behaviour of political actors, the power relations between them, and the international context. This process does not always lead to a liberal or consolidated democracy. History is full of examples of countries that remain stuck in intermediate or hybrid forms of government. Transitions from authoritarianism are processes characterised by uncertainty in which the strategies, negotiations and consensus of the elites play a decisive role (O'Donnell et al., 1986).

Democratic consolidation begins after the establishment and functioning of electoral democracy and involves a process of strengthening formal democratic institutions, citizens animated by a participatory "civic culture" (Almond and Verba, 1996), with reactions to sanction illiberal behaviour, mechanisms to prevent democratic regression, and good governance. Many years after the collapse of communism, global democratisation is characterised by stagnation and fragmentation, with a high proportion of hybrid regimes and major difficulties in democratic consolidation, despite the expansion of competitive elections (Diamond, 1999; 2002a; 2002b; Diamond et al., 2004). There are many political regimes (e.g. "delegative democracies") in which electoral legitimacy coexists with a severe weakening of institutional control and accountability mechanisms, which inhibits the transformation of electoral democracy into a consolidated democracy. Delegative democracies are not consolidated (institutionalised) democracies, but they can be sustainable (O'Donnell, 1994).

Andreas Schedler proposes three scenarios for analysing democratic consolidation: 1) consolidation as the avoidance of democratic breakdown (prevention of coups, suspension of elections, authoritarianism); 2) consolidation as a process of deepening democracy (functioning of the rule of law, increased representation and good governance); 3) consolidation as neutralisation of authoritarian alternatives (combating and sanctioning illiberal discourse) (Schedler, 1997; 1998).

The democratic path is mainly determined by structural socio-economic factors (e.g. income and education), while the impact of democracy on economic performance is limited and indirect. (Barro, 1999). Economic prosperity and poverty reduction increase the likelihood of democratic stability by expanding the middle class, reducing economic dependence, and increasing the state's capacity to produce welfare. Investments in human capital, particularly in education and health, are considered central mechanisms through which economic development translates into democratic consolidation (Lipset, 1959; 1994).

Table 1.

Theoretical contributions to the study of the impact of socio-economic predictors on democratic consolidation

Contributor	Reference work	Theoretical mechanism of consolidation	Socio-economic predictors (operationalisation)
Linz & Stepan	*Problems of Democratic Transition and Consolidation* (1996)	Institutionalisation of democratic rules; functional rule of law	Public expenditure on education (% GDP); public expenditure on health (% GDP)
Lipset	*Some Social Requisites of Democracy* (1959)	Modernisation, education, human capital	Real GDP per capita; participation rate in education
Przeworski et al.	*Democracy and Development* (1996, 2000)	Democracy and economic prosperity	GDP per capita; Gini coefficient
Dahl	*Polyarchy* (2000, 2002, 2003)	Political inclusion and effective participation	AROPE; subjective poverty
Putnam	*Making Democracy Work* (2001)	Social capital, trust, civic cohesion	World Happiness Report; subjective poverty
O'Donnell	*Delegative Democracy* (1994)	Rule of law; Institutional accountability	Fragile State Index
Acemoglu & Robinson	*Why Nations Fail* (2012)	Inclusive economic institutions vs. capture	Gini coefficient; risk of poverty
Inglehart & Welzel	*Modernisation, Cultural Change, and Democracy* (2005)	Emancipatory values and self-expression	Education; subjective well-being

Source: developed by the author

High levels of income inequality, persistent poverty and social exclusion are associated with declining trust in institutions, civic apathy and receptivity to populist or authoritarian rhetoric. Indicators such as the Gini coefficient, AROPE or subjective poverty are frequently used to capture these structural mechanisms that undermine democratic functioning. Economic development favours cultural changes towards values that support the emergence and consolidation of democracy (Inglehart and Welzel, 2005).

Levels of happiness, life satisfaction and perceptions of quality of life are associated with consolidated democracy ("advanced democracy" or ("liberal democracy"). Democracies that succeed in providing their citizens with a high level of well-being enjoy stronger public support and greater resilience in the face of political crises. Major differences in democratic development and performance between nations are explained by the nature of political and economic institutions; inclusive institutions support growth and democracy (Acemoglu and Robinson, 2008; 2014; 2024).

Democratic consolidation in Central and Eastern Europe is the result of complex interactions between institutions, elites, socio-economic structures, political culture and external influences, which requires the use of multiple and complementary analytical models (Grecu, 2012). The assessment of democratisation in post-communist Romania must go beyond the institutional-electoral dimension and include social indicators of well-being, inclusion and quality of life, which condition the legitimacy and sustainability of democracy (Mărginean, 1997). Referring to Romania, Claudiu Crăciun (2017) considers that our country is undergoing a second democratic transition, in which the stake is no longer the construction of democratic institutions, but the defence and consolidation of their effective functioning in the face of illiberal tendencies and state capture. In post-communist economies, the consolidation of democracy is decisively conditioned by socio-economic performance and the equitable distribution of the benefits of development, not just by the formal functioning of democratic institutions (Mádr, 2022).

DATA AND METHODS

The study consists of a quantitative and comparative approach based on data provided by the Democracy Index developed by *The Economist Intelligence Unit* (EIU), data from *Eurostat, The Fund for Peace – Fragile States Index, World Happiness Report – Word Happiness Index*. The choice of the EIU Democracy Index was justified by its synthetic nature, its extensive geographical coverage, and its sensitivity to institutional, social, and cultural variations relevant to the process of democratic consolidation.

The Democracy Index is a composite indicator that measures the quality of political regimes based on a set of 60 items, grouped into five analytical dimensions: (1) electoral process and pluralism, (2) functioning of government, (3) political participation, (4) democratic political culture, and (5) civil liberties. The data used by the EIU comes from international statistical sources, standardised assessments and opinion poll results. The scores for each dimension are normalised on a scale from 0 to 10. The aggregate score of the Democracy Index is calculated as the arithmetic mean of the five components. Based on the final score, countries are classified into four types of political regime: full democracy, flawed democracy, hybrid regime, and authoritarian regime. In this paper, the Democracy Index is available for European Union member countries for the period 2006-2022.

The empirical research is based on descriptive analysis methods (box-plot analysis and cartographic analysis), correlation analysis to identify bivariate relationships between democracy and explanatory variables, and regression analysis to test the influence of socio-economic factors on the level of democracy.

Box-plot analysis was used as an exploratory statistical tool to examine the distribution of the democracy index among European Union member states (2006–2022). This technique serves to illustrate internal variation, identify central values and dispersion, and highlight extreme cases that can guide the interpretation of the phenomenon of democratic consolidation. The box plot provides a standardised representation of the distribution through essential statistical elements such as the median, quartiles (Q1 and Q3), interquartile range (IQR) and extremes. The median indicates the 'typical' level of democracy within the European Union, while the quartiles delimit the area where the central half of the values are concentrated. The width of the interquartile range reflects the degree of heterogeneity in democratic consolidation between states.

As part of the research methodology, cartographic analysis was used to highlight the spatial distribution of the Democracy Index at European Union level and to capture significant territorial variations in its evolution between 2006 and 2022. The thematic maps were generated using Philcarto software, a cartographic tool dedicated to exploratory geographical analysis, which allows coherent representations of socio-political phenomena through statistical classifications and appropriate colour schemes. The use of Philcarto is part of a mixed methodological approach, which combines box-plot analysis with territorial visualisation, facilitating the interpretation of spatial and structural differences between states.

Pearson's correlation was used to investigate the association (intensity and direction of linear relationships) between the democracy index and the socio-economic variables considered relevant for substantiating the democratic consolidation model. This statistical technique allowed for the empirical consistency of the theoretical hypotheses to be assessed, providing a solid basis for the selection of predictors subsequently included in the regression model. Pearson coefficients were calculated for all available variables, covering economic indicators (GDP per capita, education and health expenditure), social indicators (infant mortality, school participation, relative poverty), risk indicators (state fragility index) and subjective well-being variables (*WHR*).

Multivariate linear regression analysis allows for the assessment of the ability of socio-economic variables to explain the variation in the democracy index at the level of European Union states. The regression model was constructed using the average Democracy Index for the period 2006-2022 as the dependent variable and a set of ten indicators (economic and social) as independent variables. Economic predictors (GDP per capita, spending on education and health) suggest that economic development and investment in human capital facilitate the consolidation of democratic institutions. Social predictors (participation in education, level of happiness, reduction in infant mortality) explain democratic variations, indicating that democracy is favoured by well-being, equal access to public services and high social performance. On the other hand, the state fragility index and poverty indicators are negative predictors, showing that institutional instability and social exclusion undermine democratic processes. The multivariate regression model provides a structural understanding of the mechanisms that facilitate or hinder democratic consolidation.

Research Questions (RQ):

RQ1. To what extent do socio-economic variables explain the variation in the level of democratic consolidation in European Union member states between 2006 and 2022?

RQ2. What are the socioeconomic predictors with the greatest explanatory power over the democracy index in the European Union?

RQ3. Are there significant structural differences between Western European and Central and Eastern European countries in terms of the relationship between socio-economic development and th al level of democracy?

RQ4. To what extent do social welfare indicators (education, health, happiness, infant mortality) contribute to democratic consolidation, compared to risk and vulnerability indicators (poverty, inequality, state fragility)?

RQ5. In what types of states (from a democratic and geographical point of view) does the multivariate regression model best explain the level of democracy, and where do significant deviations (positive or negative residuals) occur?

RESULTS AND DISCUSSIONS

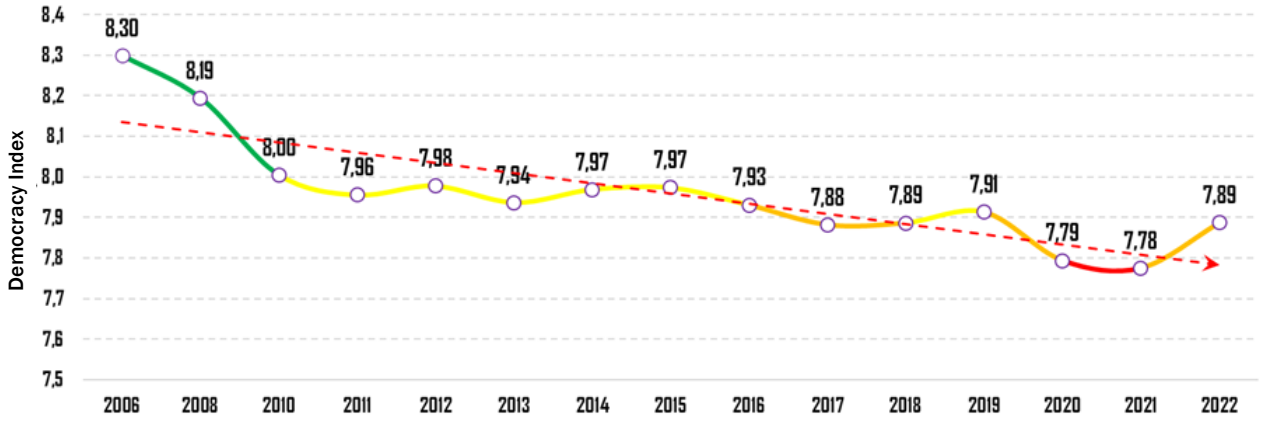
European states are among the oldest and most stable democracies in the world, scoring 8 and above on the Democracy Index scale. The European Union (EU) is the region with the most consolidated democracies in the world. Even though the continental context is very optimistic compared to the rest of the world, where the situation is worrying from the perspective of the predominance of authoritarian and totalitarian states, there are some differences between EU member states. For the period 2006-2022, Western Europe, which includes 21 states, has an average democracy score of 8.41, and Central and Eastern Europe (7 states) has a score of 5.50, indicating the presence of flawed democracies in the region, plus a few authoritarian states (Belarus and the Russian Federation).

Within the European Union, differences between East and West remain, although the range of values is much smaller. At the European Union level, there are no member states with authoritarian forms of government or hybrid regimes. Instead, there are 17 flawed democracies, representing 60.7% of the states that make up the European bloc. Most often, corruption, authoritarian temptations, hate speech, discrimination, marginalization and social exclusion contributes to the flawed nature of these democracies.

The average democracy index (2006-2022) for the European Union is 7.96, and the median for the constituent states is 7.88 (Figure 3). The evolution of democracy within the European bloc has been one of erosion over the 17 years studied, from a score of 8.30, indicating harmonious cohesion in the democratic development of its members, presenting the European Union as a true democracy, to a multi-speed union in terms of democratic processes. The accession of Romania and Bulgaria has led to a considerable decline in this indicator. Although the values have become increasingly lower from year to year, following economic, social and political problems in all constituent states, 2022 shows a slight recovery trend (see Figure 1).

Figure 1.

The evolution of the Democracy Index at the level of the European Union states (EU-28)



Source: own processing based on EIU data – Democracy Index (2006-2022).

At the level of the European Union states, the highest values are recorded by the states in the Scandinavian region, which are also considered the most democratic states in the world. At the same time, these countries are considered the benchmark for measuring the level of democratic consolidation, consistently occupying the top positions in the annual ranking compiled by the EIU. Sweden has the highest value on the democracy index scale within the European bloc. More moderate values are recorded by the countries in the historical core of the European Union (the Netherlands - 9.02, Luxembourg - 8.86 and Germany - 8.60). The lowest values are recorded by countries that were part of the communist bloc before 1989, where democratic processes are still

problematic. The lowest average values are recorded by countries such as Romania (6.59), Croatia (6.76), Bulgaria (6.88) and Hungary (6.88).

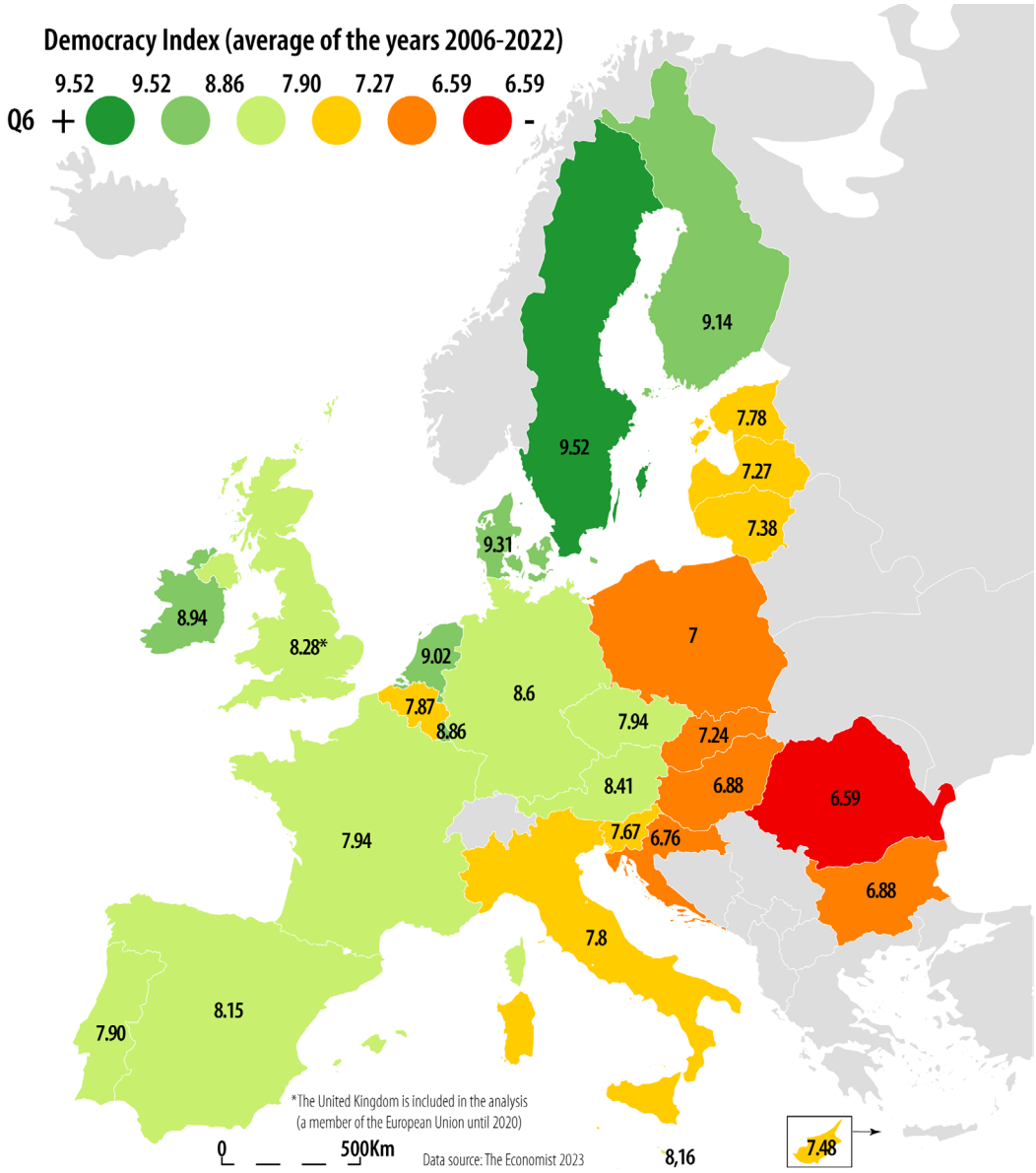
Romania is the most vulnerable country in terms of democratic erosion, barely maintaining a score above 6, where a score below 6 would place Romania among the states with hybrid forms of government (a symbiosis between democratic and authoritarian processes). The Baltic states, Estonia (7.78), Latvia (7.27) and Lithuania (7.38), which were directly part of the Soviet bloc, gain higher than the former communist states on the Eastern border of the European Union, which were independent during the existence of the "Iron Curtain".

Among the European bloc countries that did not experience communism, the most worrying values regarding the erosion of democracy are the average scores recorded by Belgium and Italy. Since 2013, Belgium has gone from being a fully democratic country to one with a flawed democracy, and the situation is deteriorating year by year, with the 2021 recording a minimum value of 7.51. The average democracy index for Belgium for the period 2006-2022 is 7.87, an average score driven by high values prior to 2013.

The democracy index values place Italy in the category of flawed democracies, and since the democracy index was launched by *The Economist Intelligence Unit* in 2006, the values have fluctuated between 7.98 (2008) and 7.52 (2019). Italy's political problems are well known throughout the world: governmental instability and short-lived governments. Even though the cartographic representation of the average democracy index (Figure 2) places France among the flawed democracies, it has consolidated democratically, returning to the category of full democracies in 2022. France has experienced considerable variations in the stability of its democracy over time.

Figure 2.

Average democracy index for the period 2006-2022

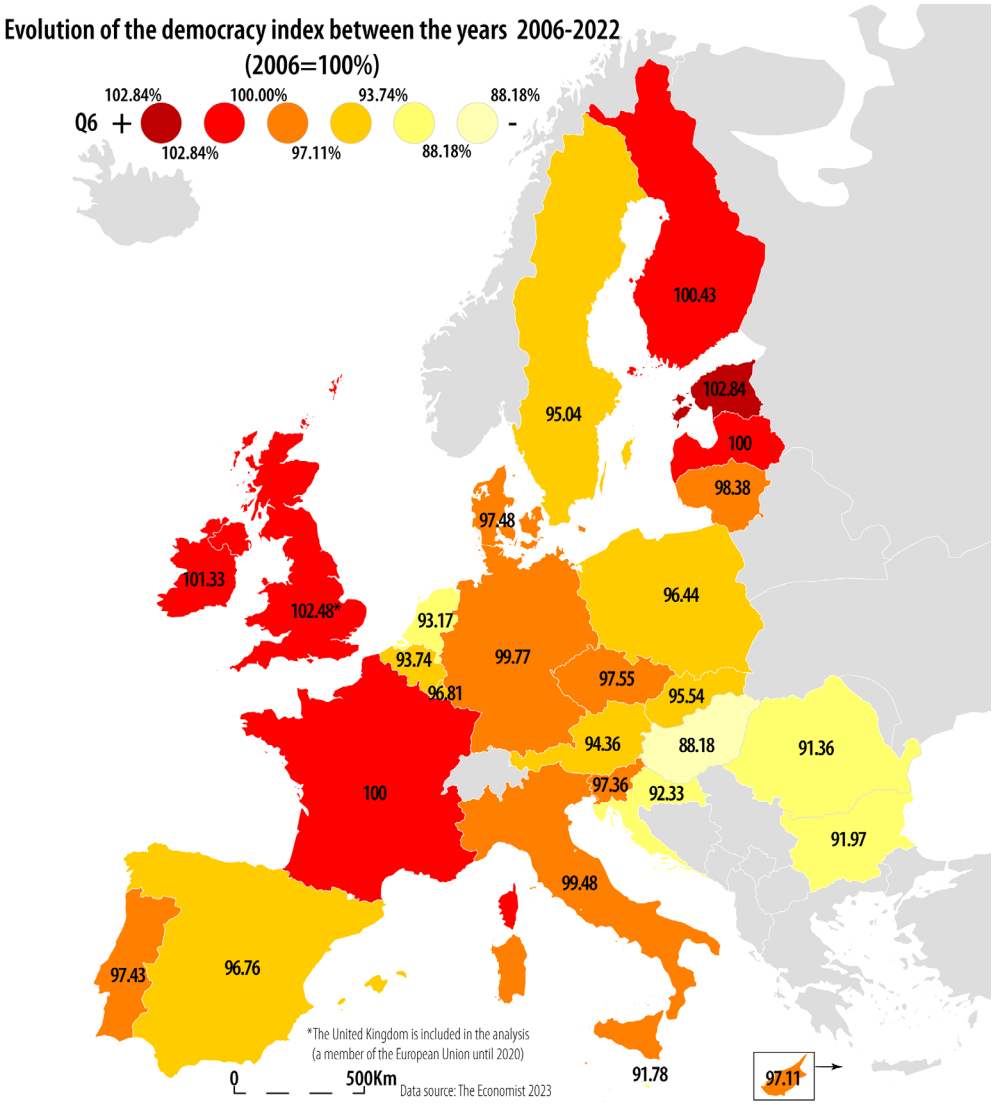


Source: own processing with Philcarto based on EIU data – Democratic Index

Figure 3 shows the evolution of the Democracy Index for the period 2006–2022, relative to the values for 2006 (2006 = 100%). This representation allows us to observe the direction of democratic evolution within the European Union and highlights several major trends of interest for the analysis of the democratic consolidation process.

Figure 3.

Evolution of the Democracy Index (2006 compared with 2022; 2006 = 100%)



Source: own processing with Philcarto based on EIU data – Democratic Index

The evolution of the level of democracy within the European Union states, compared to 2006, shows that few states have made significant progress. The most positive developments were recorded by countries such as Estonia (+2.84%), the United Kingdom of Great Britain and Northern Ireland (+2.48%), Ireland (+1.33%) and Finland (+0.43%). The Nordic countries are the only ones to record values above 100%, indicating long-term democratic consolidation. This reflects institutional stability, advanced civic culture and the resilience of democratic mechanisms .

Western European countries (Germany, the Netherlands, Belgium, France, Spain) have experienced stagnation or moderate declines. Probable causes include political polarisation, institutional crises, populist pressure, authoritarian temptations and post-crisis socio-economic transformations.

All other countries have experienced a process of "democratic erosion". The most severe democratic erosion is in Central and Eastern Europe: Hungary (-11.82%), Romania (-8.64%), Bulgaria (-8.03%), Croatia (-7.67%). These developments confirm the phenomenon of democratic backsliding, characterised by the politicisation of institutions, pressure on the judiciary, the erosion of press freedom and the weakening of democratic control.

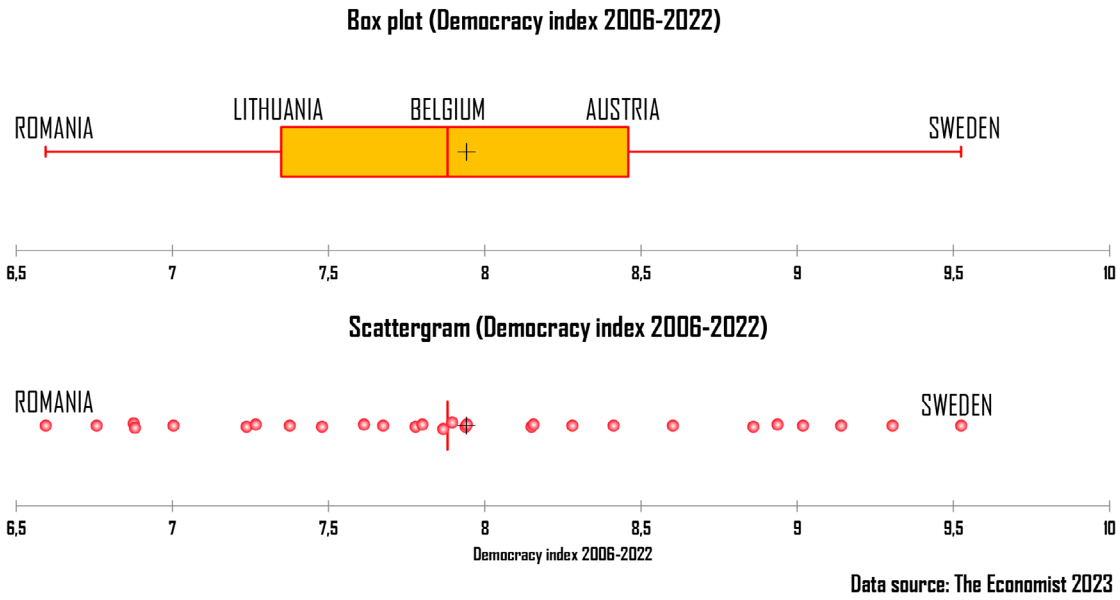
Romania stands out with a marked negative trend, barely maintaining a score above 6 in the absolute index, a situation that places it in the category of flawed democracies. The 8.64% decline compared to 2006 explains institutional vulnerability, political instability and recurrent pressure on the rule of law.

Although the European Union remains a stable democratic space at the international level, there are strong regional differences and a trend of errosion, especially among the astern states. The phenomenon of democratic erosion confirms that the process of democratic consolidation is not irreversible and that institutions can regress in the absence of robust mechanisms for democratic protection.

An analysis of the statistical distributions of the Democracy Index (Figure 4) provides an essential insight into the internal variations in democratic quality within the European Union. The box-plot representation allows us to examine the structure and dispersion of values, identify centres of democratic gravity, and delineate the statistical extremes that mark the lowest and highest performances. In this context, the distribution of the Democracy Index for the period 2006–2022 is an important analytical tool for understanding the degree of democratic cohesion at European level, but also the emerging gaps between Member States.

Figure 4.

Box plot analysis of the Democracy Index



Source: own processing with XLSTAT based on EIU data – Democratic Index

The box plot indicates a relatively wide distribution of values, with significant differences between the upper pole – represented by Sweden – and the lower pole – represented by Romania. The quartiles describe an internal structure of the distribution in which the central half of the values (Q1–Q3) lies between the level reached by Lithuania and that of Austria, delimiting the range in which most Member States fall. The median, positioned at Belgium, suggests that the "typical" level of European democracy in recent years corresponds to the category of flawed democracy, as reflected in the annual rankings of *The Economist Intelligence Unit*.

Romania's position at the bottom of the distribution highlights the persistent vulnerabilities of its internal institutional framework, placing it in the category of fragile democracies, prone to periods of political regression and instability. On the other hand, Sweden's position at the upper end of the distribution confirms its status as a continental and global benchmark for democratic governance, reflecting institutional stability, a mature civic culture and the robust functioning of *checks and balances*.

The box plot clearly shows that, although the European Union remains a robust democratic ecosystem at the global level, internal cohesion is affected by significant differences between Member States. The distribution indicates the emergence of a heterogeneous democratic landscape, dominated by flawed democracies and affected by phenomena of stagnation and regression. The marked dispersion and asymmetry of the distribution, visible in the box plot, support the need to use the multivariate regression and correlation analysis included in this study. The box plot not only introduces a descriptive perspective on the data, but also underpins the choice of inferential techniques, justifying the analysis of the relationships between the level of democracy and the explanatory socio-economic variables.

Table 2.

Correlation analysis

Correlation matrix (Pearson):

Variables	Var.1	Var.2	Var.3	Var.4	Var.5	Var.6	Var.7	Var.8	Var.9	Var.10	Var.11
Var.1	**1**	**0.5905**	**0.6215**	**-0.8689**	**0.8658**	-0.3078	**-0.4515**	**-0.4438**	**-0.5970**	**0.6873**	**0.7994**
Var.2	**0.5905**	**1**	**0.4962**	**-0.4902**	**0.5723**	**-0.3973**	**-0.4916**	**-0.4241**	**-0.4810**	**0.5153**	0.3144
Var.3	**0.6215**	**0.4962**	**1**	**-0.6501**	**0.5433**	-0.2259	-0.3563	-0.2733	-0.2881	**0.4758**	0.3605
Var.4	**-0.8689**	**-0.4902**	**-0.6501**	**1**	**-0.8345**	**0.3964**	**0.5081**	0.3701	**0.6846**	**-0.6094**	**-0.7420**
Var.5	**0.8658**	**0.5723**	**0.5433**	**-0.8345**	**1**	**-0.5479**	**-0.5698**	-0.3017	**-0.7559**	**0.6798**	**0.7425**
Var.6	-0.3078	**-0.3973**	-0.2259	**0.3964**	**-0.5479**	**1**	**0.6994**	0.0813	**0.4515**	**-0.4155**	-0.1819
Var.7	**-0.4515**	**-0.4916**	-0.3563	**0.5081**	**-0.5698**	**0.6994**	**1**	**0.4170**	**0.5755**	**-0.5480**	-0.3363
Var.8	**-0.4438**	**-0.4241**	-0.2733	0.3701	-0.3017	0.0813	**0.4170**	**1**	0.3613	**-0.3840**	-0.1835
Var.9	**-0.5970**	**-0.4810**	-0.2881	**0.6846**	**-0.7559**	**0.4515**	**0.5755**	0.3613	**1**	**-0.6694**	**-0.4696**
Var.10	**0.6873**	**0.5153**	**0.4758**	**-0.6094**	**0.6798**	**-0.4155**	**-0.5480**	**-0.3840**	**-0.6694**	**1**	**0.5158**
Var.11	**0.7994**	0.3144	0.3605	**-0.7420**	**0.7425**	-0.1819	-0.3363	-0.1835	**-0.4696**	**0.5158**	**1**

Values in bold are different from 0 with a significance level alpha=0,05

Source:developed by the author

Note:

Var 1. Democracy index 2006-2022
Var 2. GDP (%) expenditure on education
Var 3. GDP (%) current health expenditure
Var. 4 Fragile state index
Var. 5 World Happiness Report
Var. 6 Income inequality Gini coefficient
Var. 7 AROPE
Var. 8 Infant mortality rate
Var. 9 Subjective poverty
Var. 10 Participation rate in education
Var. 11 Real GDP per capita

The results of the Pearson correlation (Figure 5) highlight the existence of consistent linear relationships between the democracy index and the main socio-economic indicators included in the model. These relationships confirm the theoretical hypothesis that democratic consolidation is closely linked to the level of economic development, social welfare and institutional capacity of the state. The strongest association is observed in relation to the World Happiness Report (r = 0.8658), suggesting that democracy consolidates in social contexts characterised by high life satisfaction, social cohesion and institutional trust. Similarly, positive correlations with real GDP per capita (r = 0.7994), education participation rates (r = 0.6873) and public spending on health and education indicate that more robust democracies are associated with sustained investment in human capital and superior economic performance.

The democracy index is negatively correlated with indicators reflecting state fragility and social exclusion. The very strong negative correlation with the Fragile States Index (r = -0.8689) highlights the inverse relationship between the institutional capacity of the state and the quality of the democratic regime. This relationship suggests that states with weak institutions, poor governance and political vulnerability are more prone to democratic erosion. The negative correlations with subjective poverty (r = -0.5970), AROPE (r = -0.4515) and infant mortality (r = -0.4438) indicate that inequality, poverty and social protection deficits are structural factors that limit the consolidation of democracy.

An important element of the analysis is the consistency of the relationships between the explanatory variables. Economic development and welfare indicators are positively correlated with each other and negatively correlated with poverty and fragility indicators, outlining two distinct structural dimensions: a pole of democratic development and stability and a pole of social and institutional vulnerability. This empirical structure suggests that democracy is not an isolated phenomenon, but the result of the interaction between economic, social and institutional factors.

Overall, Pearson's correlation analysis confirms the multidimensional nature of democratic consolidation and provides an empirical basis for the multivariate regression model. The relationships identified indicate that democracy tends to consolidate in prosperous, inclusive and institutionally stable societies, while poverty, inequality and state fragility are risk factors for democratic regression.

Table 3.

Regression analysis

Summary Output

Regression Statistics	
Multiple R	**0,9576**
R Square	**0,9171**
Adjusted R Square	**0,8652**
Standard Error	**0,3022**
Observations	*27*

Anova

	df	***SS***	***MS***	***F***	***Significance F***
Regression	10	16,15758307	1,615758	17,69292	8,15762E -07
Residual	16	1,461157016	0,091322		
Total	26	17,61874008			

	Coefficients	Standard Error	t Stat	P - value	Lower 95%	Upper 95%
Intercept	3,1393	1,9943	1,5742	0,1350	-1,0884	7,3670
Var 1.	0,1039	0,0808	1,2855	0,2169	-0,0674	0,2753
Var 2.	-0,0011	0,0595	-0,0185	0,9855	-0,1273	0,1251
Var. 3.	-0,0233	0,0121	-1,9274	0,0719	-0,0490	0,0023
Var. 4.	0,5383	0,2299	2,3412	0,0325	0,0509	1,0258
Var. 5.	2,8336	3,2735	0,8656	0,3995	-4,1059	9,7731
Var. 6.	0,0092	0,0189	0,4848	0,6344	-0,0309	0,0493
Var. 7.	-0,1050	0,0739	-1,4202	0,1748	-0,2617	0,0517
Var. 8.	0,0135	0,0088	1,5287	0,1459	-0,0052	0,0323
Var. 9.	0,0108	0,0072	1,4984	0,1535	-0,0045	0,0261
Var. 10.	0,0000	0,0000	1,1356	0,2728	0,0000	0,0000

Multicolinearity statistics:

Variables	**Var.1.**	**Var. 2.**	**Var. 3.**	**Var. 4.**	**Var. 5.**	**Var. 6.**	**Var. 7.**	**Var. 8.**	**Var. 9.**	**Var. 10.**
Tolerance	0,5241	0,3323	0,1512	0,1227	0,2968	0,3131	0.5907	0,2300	0,3924	0,2202
VIF	1,9082	3,0096	6,6126	8,1522	3,3696	3,1943	1,6930	4,3469	2,5484	4,5410

Source: developed by the author

Note: Dependent variable: Democracy Index 2006-2022
Independent variables:
Var 1. GDP (%) expenditure on education
Var 2. GDP (%) current health expenditure
Var. 3. Fragile state index
Var. 4. World Happiness Report
Var. 5. Income inequality Gini coefficient
Var. 6. AROPE
Var. 7. Infant mortality rate
Var. 8. Subjective poverty
Var. 9. Participation rate in education
Var. 10. Real GDP per capita

$$DemocracyIndex_{i,t} = \beta 0 + \beta 1\ EducationExpenditure_{i,t} + \beta 2\ HealthExpenditure_{i,t} + \beta 3\ FragileState_{i,t} + \beta 4\ Happiness_{i,t} + \beta 5\ Ginii_{,t} + \beta 6\ AROPE_{i,t} + \beta 7\ InfantMortality_{i,t} + \beta 8\ SubjectivPoverty_{i,t} + \beta 9\ ParticipationEducation_{i,t} + \beta 10\ Real\ GDP\ per\ capita_{i,t} + \varepsilon_{i,t}$$

Following the regression analysis, it was found that, from a statistical point of view, the dependent variable, *the average Democracy Index between 2006 and 2022*, is closely related to the other independent variables in the analysis. The correlation coefficient is 86%, , which indicates a very strong correlation between the variables used. The analysis is representative, with no multicollinearity issues, as all VIF scores are low, but not statistically significant enough (P-values).

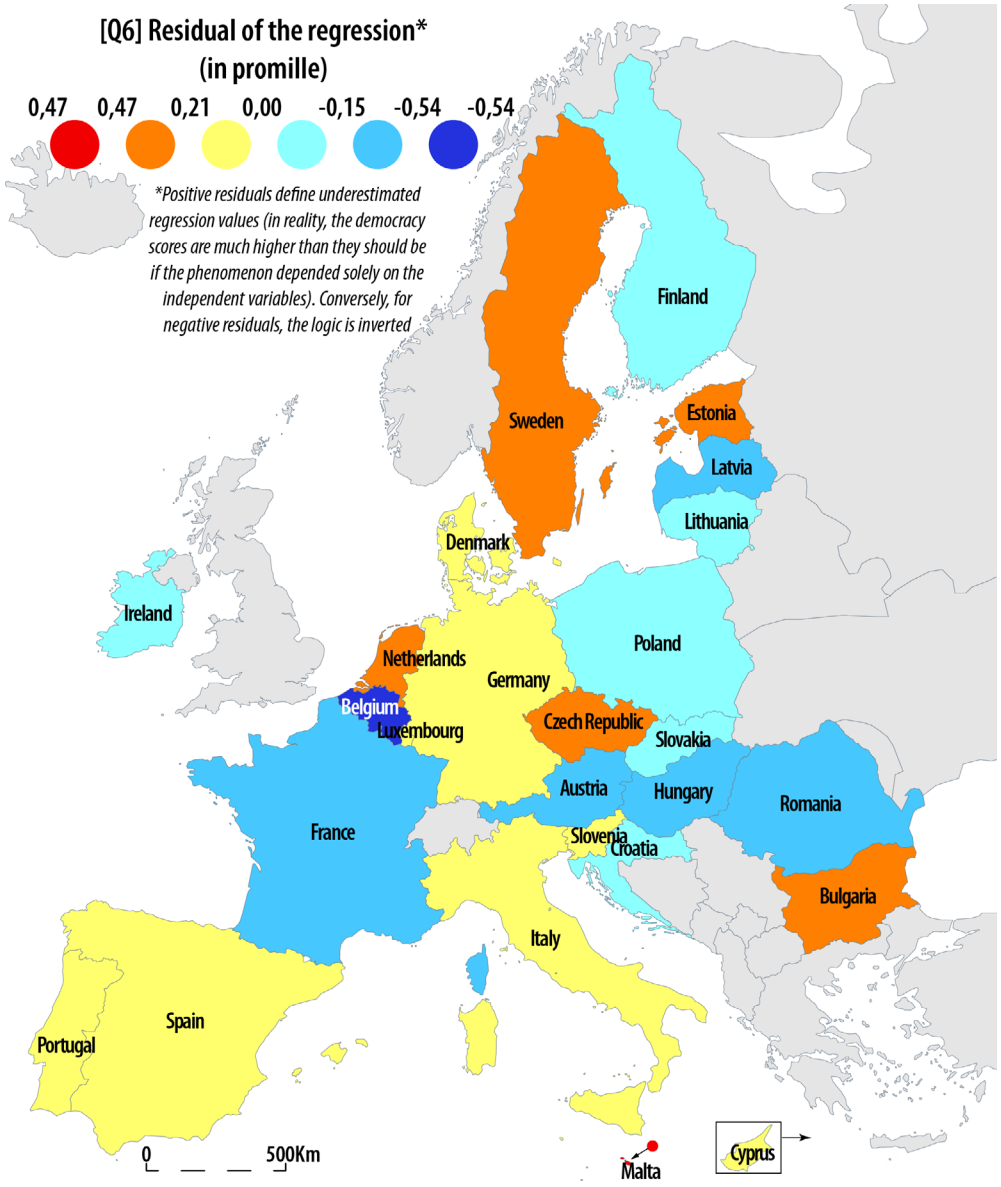
The regression results lead to a detailed analysis of the model's prediction at the territorial level. Statistically, the regression model explains 86% of the variance, which is a very high score overall. However, from a geographical point of view, the situation is more modest. Over 51.9% of the European Union countries studied, i.e. 14 Member States, are included in the middle classes of the distribution, which are even more representative of the model. Thus, 51.9% of EU countries, located above and below the median value, benefit from a good explanation of the spatial distribution of RD‰ values, with residuals ranging from very low values of -0.15‰ to +0.21‰. More importantly, the values of these classes are homogeneous, with low standard deviations, namely σ=0.18 for negative residuals and σ=0.18 for positive values. This shows that the model has good predictive power for countries such as Finland, Ireland, Poland, Lithuania and Denmark.

At the level of the European Community, two countries (Malta and Belgium) fit the proposed regression model very well, falling into the extreme classes (red and dark blue). At the intermediate level, 10 countries, representing 37% of the European Union members (orange and blue), have a situation that cannot be adequately explained by multivariate regression (Romania, Hungary, Austria, the Netherlands, etc.).

The areas that need to be addressed by political science specialists and others are those with positive residuals, i.e. those where official statistics show higher levels of democracy than would be expected if it depended solely on the combined influence of the 10 variables used in the analysis.

Figure 7.

Regression residual analysis



Source: developed by the author

The regression residual analysis (Figure 7) also highlights the limitations of explanations based exclusively on socio-economic variables. The existence of significant deviations from the model's estimated values indicates the influence of additional institutional and political factors, such as the quality of the rule of law, the level of corruption, civic culture or the particularities of the national political context. These results suggest the need for complementary methodological approaches that integrate qualitative and institutional dimensions into the analysis of democratic consolidation.

CONCLUSIONS

The results of the study confirm the general hypothesis that democratic consolidation is a structural and dynamic process, shaped by socio-economic performance and the quality of governance rather than constituting a definitive political outcome. The comparative analysis of European Union member states over the period 2006–2022 indicates that the functioning of democratic mechanisms is closely linked to the state's capacity to generate economic growth, reduce social vulnerabilities, and sustain high levels of individual and collective well-being. Empirical findings support perspectives that treat democracy as the result of the interaction between political institutions, socio-economic structures and values internalised at the societal level. Analysis of regional differences highlights the persistence of structural divides between Western Europe and Central and Eastern Europe. While the Nordic states and part of the western core of the Union maintain high levels of democratic quality, many Eastern European states remain classified as flawed democracies, marked by governance deficits, political polarisation and weaknesses in the rule of law. These findings suggest that the process of democratic convergence within the European Union is incomplete and that institutional integration is not automatically accompanied by uniform democratic consolidation.

The results of this research must be interpreted in relation to several methodological limitations. First, the temporal inconsistency of the data series used reduces the effective number of common observations and affects the stability of the estimates. Second, the high multicollinearity between the explanatory variables, highlighted by the VIF values, indicates conceptual overlaps between statistical indicators, limiting the interpretation of the impact of social and economic predictors. In addition, the model is exposed to the risk of endogeneity, particularly in the case of institutional and perceptual indicators, which restricts the possibility of formulating robust causal inferences. In conclusion, the linear regression model proves to be rather exploratory, without being statistically significant.

Future research could address these limitations by reducing dimensionality (e.g., principal component analysis), using panel models to control for unobserved heterogeneity, and applying dynamic models that capture delayed effects. Complementarily, the use of instrumental variable models or structural equation modelling (SEM) could contribute to a more rigorous testing of the causal relationships between socio-economic factors and the level of democratic consolidation.

REFERENCES

Acemoglu, D., Johnson, S., Robinson, J. A., & Yared, P. (2008). Income and democracy. *The American Economic Review*, *98*(3), 808-842. https://doi.org/10.1257/aer.98.3.808

Acemoglu, D. (2014, May 20). *Does Democracy Boost Economic Growth?* World Economic Forum. https://www.weforum.org/stories/2014/05/democracy-boost-economic-growth/

Acemoglu, D., & Robinson, J. A. (2024). *De ce eşuează naţiunile. Originile puterii, ale prosperităţii şi ale sărăciei.* Bucureşti: Editura Litera.

Almond, G. A., & Verba, S. (1996). *Cultura Civică. Atitudini politice şi democraţie în cinci naţiuni.* Bucureşti: Du Style & CEU Press.

Barro, R. J. (1999). Determinants of Democracy. *Journal of Political Economy*, *107*(S 6), 158-183. https://doi.org/10.1086/250107

Crăciun, C. (2017). *Romania's Second Democratic Transition*. Berlin: Friedrich-Ebert-Stiftung. https://library.fes.de/pdf-files/id-moe/13080.pdf

Dahl, R. A. (2000). *Poliarhiile. Participare si opozitie*. Iaşi: Institutul European.

Dahl, R. A. (2002). *Democraţia şi criticii ei.* Iaşi: Institutul European.

Dahl, R. A. (2003). *Despre democraţie*. Iaşi: Institutul European. https://ru.scribd.com/document/368304775/Robert-a-Dahl-Despre-Democratie

Diamond, L. (1999). *Developing Democracy: Toward Consolidation*. Baltimore: John Hopkins University Press. https://books.google.md/books?id=sInqr5ILPE8C&printsec=frontcover&hl=ro&source=gbs_atb#v=onepage&q&f=false

Diamond, L. (2002a). A luat sfârsit cel de-al treilea val al democratiei? *Revista românã de ştiinte politice*, *2*(1), 126-144. https://www.sar.org.ro/polsci/?p=409

Diamond, L. (2002b). Assessing global democratization a decade after the communist collapse. *Revista românã de ştiinte politice*, *2*(2), 52-68. https://www.sar.org.ro/polsci/?p=387

Diamont, L., Chu, Y.-H., Plattner, M. F., & Tien, H.-M. (2004). *Cum se consolidează democraţia*. Iaşi: Polirom.

Economist Intelligence Unite (EIU) (2024). *Democracy Index*. https://www.eiu.com/n/campaigns/democracy-index-2024/

Eurostat. (2024). Database. https://ec.europa.eu/eurostat/data/database

Grecu, S. P. (2012). *Modele de analiză în consolidarea democratică. Perspective comparate în Europa Centrală şi de Est*. Iaşi: Editura Universităţii „Al.I. Cuza".

Grugel, J. (2008). *Democratizarea. O introducere critică*. Iaşi: Polirom.

Huntington, S. P. (1991). Democracy's Third Wave. *Journal of Democracy, 2*(2), 12-34. https://www.ned.org/docs/Samuel-P-Huntington-Democracy-Third-Wave.pdf

Huntington, S. P. (1996). Democracy for the Long Haul. *Journal of Democracy, 7*(2), 3-13. https://www.journalofdemocracy.org/articles/democracy-for-the-long-haul

Iftimoaei, C. (2013). Problems of the democratic consolidation in post-communist Romania. *Scientific Annals of the "Al.I. Cuza" University of Iaşi. Sociology and Social Assistance Series*, *6*(2), 5-31. https://anale.fssp.uaic.ro/index.php/asas/article/view/47

Iftimoaei, C. (2015). *Despre securitate, consolidare democratică şi bună guvernare. România în context regional*. Iaşi: Lumen. https://www.researchgate.net/publication/325340674_Despre_securitate_consolidare_democratica_si_buna_guvernare_Romania_in_context_regional

Inglehart, R., & Welzel, C. (2005). *Modernization, Cultural Change, and Democracy: The Human Development Sequence*. Cambridge University Press. https://www.researchgate.net/publication/230557603_Modernization_Cultural_Change_and_Democracy_The_Human_Development_Sequence

Levitsky, S., & Way, L. A. (2010). *Competitive Authoritarianism. Hybrid Regimes after the Cold War*. Cambridge University Press. https://doi.org/10.1017/CBO9780511781353

Linz, J., & Stepan, A. (1996). Toward Consolidated Democracies. *Journal of Democracy,* 7.2 , 14-33. https://adpm.pbworks.com/f/Democratic+Consolidation-Linz+and+Stepan-1996.pdf

Lipset, S. M. (1959). Some Social Requisites of Democracy. *American Political Science Review*, *53*(1), 69-105. https://doi.org/10.2307/1951731

Lipset, S. M. (1994). The Social Requisites of Democracy Revisited: 1993 Presidential Address. *American Sociological Review*, *59*(1), 1-22. https://doi.org/10.2307/2096130

Mádr, M. (2022). Socio-economic factors driving consolidation of democracies in post-socialist economies. *Romanian Political Science Review, 22*(1), 43-57. https://doi.org/10.5281/zenodo.8154423

Mărginean, I. (1997). Indicators of Democratization in Romania. *Social Indicators Research*, *42*(3), pp. 353-366. https://doi.org/10.1023/A:1006868605688

O'Donnell, G., Schmitter, P. C., Whitehead, L., & Lowenthal, A. F. (1986). *Transitions from Authoritarian Rule: Comparative Perspectives*. Baltimore: Johns Hopkins University Press.

O'Donnell, G. (1994). Democraţia delegativă. *Polis. Revista de ştiinţe politice,* 3, 72-88. https://revistapolis.ro/wp-content/uploads/2023/05/REvista-POLIS-nr.-3-pe-1994-c.pdf

Przeworski, A. (1996). *Democraţia şi economia de piaţa. Reformele politice şi economice în Europa de Est şi America Latina*. Bucureşti: Editura ALL.

Przeworski, A., Alvarez, M. E., Cheibub J. A., & Limongi F. (2000). Democracy and Development. Cambridge University Press. https://adambrown.info/p/notes/przeworski_alvarez_cheibub_and_limongi_democracy_and_development

Putnam, R. D. (2001). *Cum funcţionează democraţia*? Iaşi: Polirom. https://archive.org/details/putnam-robert-cum-functioneaza-democratia/Putnam%2C%20Robert%20-%20Cum%20Functioneaza%20Democratia%20-%20ctrl/

Rustow, D. A. (1970). Transitions to Democracy: Toward a Dynamic Model. *Comparative Politics, 2*(3), 337-363. http://biblio.institutoelcano.org/docs/VVidapolitica/Acienciapolitica/3Democratizacion/Transicionpolitica/Rustow_TransitionstoDemocracy.pdf

Sartori, G. (1999). *Teoria democraţiei reinterpretată*. Iaşi: Polirom.

Schedler, A. (1997). *Expected stability: defining and measuring democratic consolidation*. Wien: Institut für Höhere Studien (IHS). https://www.ssoar.info/ssoar/handle/document/26384

Schelder, A. (1998). What is Democratic Consolidation? *Journal of Democracy*, *9*(2), 91-107. https://doi.org/10.1353/jod.1998.0030

Schmitter, P., & Karl, T. L. (1991). What Democracy is...and is not. *Journal of Democracy*, *2*(3), 75-88. https://doi.org/10.1353/jod.1991.0033

Schumpeter, J. A. (1942). *Capitalism, Socialism and Democracy*. London and New York: Routledge. http://debracollege.dspaces.org/bitstream/123456789/441/1/schumpeter-joseph-a-capitalism-socialism-and-democracy.pdf

The Fund for Peace. (2024). *Fragile States Index (FSI)*. https://fundforpeace.org

World Happiness Report. (WHR) (2024). *Word Happiness Index*. https://data.worldhappiness.report

RESOURCES OF YOUTH RESILIENCE IN THE CONTEXT OF SOCIAL UNCERTAINTY: AN EMPIRICAL ANALYSIS

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SUMMARY

This article examines the psychological resilience of adolescents and young adults in Moldova within a multicultural social context. The study draws on empirical data from 160 university students aged 19–25, representing diverse ethnic backgrounds, and from 50 adolescents aged 16–18 enrolled in a vocational–technical institution. The research is grounded in contemporary approaches to resilience as a multidimensional construct shaped by personal, social, and cultural resources. Particular attention is given to the role of ethnic identity, shared cultural representations, and social competencies as potential protective factors that support young people's adaptation to socio-economic uncertainty. The study explores how resilience is structured across developmental stages and how internal and external resources contribute to young people's coping strategies, emotional regulation, and social interaction. Methodologically, the research integrates quantitative assessments of resilience components with analyses of culturally embedded perceptions and stereotypes. The article's scientific contribution lies in advancing a culturally sensitive perspective on youth resilience by conceptualising it as a dynamic system shaped by developmental context and ethnic diversity. The study provides an integrative framework for understanding resilience among Eastern European youth and offers a basis for designing preventive educational and psychosocial programs to strengthen adaptive resources in multicultural environments.

Keywords: *self-stereotype, self-image, ideal, resilience, uncertainty, socio-psychological resources, identity*

INTRODUCTION

In periods of socioeconomic uncertainty, young adults are among the most vulnerable social groups, as they are at a crucial stage of professional and personal self-determination. In this context, resilience becomes increasingly relevant and is conceptualised as a system of beliefs, attitudes, and coping strategies that enable individuals to overcome stress while preserving their functioning and continuing their personal development.

In a post-transitional society characterised by contradictions, fragmentation of group identities, and instability in social norms and expectations, resilience contributes to strengthening the integrity of the self-concept and to maintaining continuity across temporal perspectives (Caunenco et al., 2025).

Research on youth resilience is particularly relevant because its level may reflect the degree to which young people are ready for active integration into social life, professional achievement, and civic participation amid innovative and sociocultural transformations (Fergus & Zimmerman, 2005; Masten & Cicchetti, 2016).

In the context of accelerated social, economic, and political transformations, resilience has become a concept of central importance both theoretically and practically. These transformations, further intensified by technological progress, contribute to increased stress and emotional imbalance, posing significant challenges to individuals' psychological health. Thus, resilience is a fundamental concept for understanding the mechanisms through which individuals maintain psychological and social functioning, as well as the possibilities for strengthening these mechanisms under conditions of uncertainty and continuous change.

Empirical research on resilience confirms the need to develop and implement comprehensive public policies that promote the coordinated development of key areas—employment, education, infrastructure, and social assistance. The absence of such policies may intensify migration and social disintegration, particularly among young adults. Therefore, interdisciplinary empirical studies are required to deepen understanding of resilience across social groups (e.g., age, generational, and educational), (Caunenco & Gașper, 2025). In this context, the educational dimension plays a crucial role in developing psychological skills associated with resilience. A child's well-being is an integral indicator of the extent to which the child is oriented towards implementing the core components of positive functioning: personal growth, self-acceptance, environmental mastery, autonomy, purpose in life, and positive relationships with others (Cucer, 2025).

By reducing stress, stimulating academic engagement, and strengthening interpersonal relationships, the school environment can become not only a place of learning but also a space for personal and emotional development. It can foster socially competent, well-adapted students who maintain optimal well-being, thereby preparing them for a fulfilling and balanced life. Teachers and parents, through sustained collaboration and an empathetic approach, can significantly contribute to the formation of children who are socially integrated, emotionally healthy, and capable of adapting to diverse social contexts. An education that values the relational dimension ultimately becomes an education for life (Puzur, 2025, p. 101).

THEORETICAL FRAMEWORK

Recent research emphasises the importance of developing resilient capacities in youth as a foundation for long-term mental health, social inclusion, and civic participation (Masten, 2020; Arnett, 2000). Understanding how young people transform experiences of risk and adversity into developmental resources helps identify psychosocial mechanisms that support positive adaptation and informs the development and implementation of psychosocial interventions to strengthen individual and collective resilience (Ungar, 2019).

Individual resilience is conceptualised in the literature as a multidimensional process involving the interplay among personal characteristics, psychosocial resources, and the ecological context in which the individual lives (Luthar et al., 2000; Masten, 2018). Additionally, some studies highlight the contributions of cognitive factors (e.g., self-efficacy and emotion regulation) and personality traits (e.g., optimism and psychological flexibility) to strengthening individual resilience (Kalisch et al., 2017; Schäfer et al., 2024).

Among the dimensions of resilience described by local sociologists (Malcoci et al., 2025), personal resilience to stress is also included, reflecting how individuals integrate internal and external resources to cope with everyday adversities. The findings indicate that overall resilience is moderate but unevenly distributed. Although two-thirds of respondents report coping with stress effectively or very effectively – suggesting a reasonable level of resilience within the population – one-third still experience difficulties in stress management, with higher prevalence among women, older adults, and individuals with lower levels of education (Malcoci et al., 2025).

DATA AND METHODS

To assess the emotional-evaluative component of the ethnic stereotype, the Diagnostic Test of Relationships (DTR) was applied (Soldatova, 1998). This method was selected based on the premise that ethnic identity is understood as a category situated at the intersection of the individual and the social context. "Ethnic identity implies not only awareness of belonging to an ethnic community, but also its evaluation, the importance attributed to this belonging, shared ethnic feelings, and the experience of one's relationship with the ethnic environment" (Stefanenko, 1999).

The DTR was developed by G. U. Soldatova to examine the emotional-evaluative component of ethnic identity. It represents an original modification of the semantic differential method. The DTR includes 12 pairs of bipolar qualities (24 adjectives). The standard DTR format presents four cards on which respondents rate the qualities they believe characterise themselves, the "Ideal" person, and typical representatives of their own ethnic group and other ethnic groups. Participants were asked to consistently evaluate themselves, the "Ideal," and the "typical" representative of their nationality, among others, based on the proposed characteristics.

The DTR measures the following parameters of ethnic stereotypes: ambivalence, intensity, and orientation. Their quantitative indicators were treated as empirical indicators of the emotional-evaluative component of the ethnic stereotype. *Ambivalence* (A) characterises the degree of emotional certainty of the stereotype. The valence of this emotional certainty – positive or negative – can be determined based on the corresponding coefficients of intensity and orientation. *Intensity* (S) reflects the strength of the stereotypical effect and determines its positive or negative orientation. *Orientation* (D), or the diagnostic coefficient of the stereotype, characterises the direction and magnitude of the subject's general emotional orientation toward a given object.

The dominant stereotype orientation, according to the DTR methodology, was determined using nonparametric statistical tests: the Friedman test (Friedman ANOVA) and the Wilcoxon signed-rank test. IBM SPSS Statistics software was used for data analysis.

To assess psychological resilience, the Dispositional Resilience Scale (DRS) developed by S. Maddi was administered in its short form (DRS-12), comprising 12 items. The instrument assesses the three structural components of dispositional resilience – *commitment, control*, and *challenge* – as well as provides an *overall resilience score*. The Russian version described and psychometrically validated by E. N. Osin (2013) was used in this study.

To capture the subjective and experiential dimensions of resilience, the sentence-completion method was applied, formulated as: "I think that developing a person's resilience involves…". This method enabled the identification of significant dimensions of the personal and social experience of resilience, which are relevant to understanding adaptation mechanisms in contexts of uncertainty (Fomina, 2012).

The *aim* of the study is to examine resilience and its resources in situations of uncertainty among adolescents and young adults.

The *study population* consists of adolescents and young adults (students).

The *research subject* is the analysis of the structural components of resilience (commitment, control, and challenge).

The *methodological framework* of the study is grounded in several complementary theoretical perspectives that conceptualise resilience across the sociocultural, ecological, and existential-cognitive dimensions of human experience. The central research question guiding the study is: What resilience resources do young people draw on in situations of uncertainty?

Research on youth resilience draws on an integrative methodological approach that combines sociocultural, ecocultural, and existential-cognitive perspectives. The study is grounded primarily in the sociocultural approach, which considers the sociocultural context, ethnic status, generational belonging, and the characteristics of individuals and interacting groups (including identity and intercultural attitudes (Lebedeva et al., 2023).

At the same time, J. Berry's ecocultural approach is incorporated, emphasising that groups and individuals develop patterns of daily behaviour as adaptations to the ecological demands of their environments and function within specific ecological systems (Berry et al., 2004).

A central role in the study is played by the existential-cognitive approach of S. Maddi, in which resilience is conceptualised as a stable system of existential attitudes that ensures active stress management. Maddi's approach is rooted in the existential-cognitive paradigm, in which resilience (or hardiness) is understood as an integrative personal disposition that supports an active, conscious orientation toward stressful and uncertain life circumstances (Maddi, 1999, 2004). In addition to these theoretical frameworks, the study is based on the premise that each culture contains symbolic resources that may provide psychological support. Cultural traditions, in particular, provide individuals with a sense of stability and continuity within their sociocultural context (Fominova, 2012, p. 45).

MAIN RESULTS

The research sample consists of 160 respondents, comprising undergraduate and master's students from universities in Chisinau, Balti, Comrat (ATU Gagauzia), and Taraclia. Data were collected during the period 2024–2025. Participants were aged 19–25. The mean ages were: Moldovans (M = 20.3), Gagauz (M = 20.9), Bulgarians (M = 22.3), and Ukrainians (M = 21.9).

In the present study, the following comparisons were conducted:

- the self-image ("I" image) and the self-stereotype, in order to determine the degree of identification with the ethnic group at the personal level, that is, the importance of the ethnic component within the self-image;
- the self-image and the ideal image, in order to examine the relationship between personal traits and those attributed to the ethnic group. A content analysis of self-stereotypes and evaluations of the ideal image was conducted.

Table 1.

Mean values of ambivalence (A), intensity (S), and orientation (D; diagnostic coefficient) among Moldovan, Gagauz, Bulgarian, and Ukrainian youth

Type of evaluation	Bulgarians			Gagauz			Moldovans			Ukrainians		
	A	S	D	A	S	D	A	S	D	A	S	D
Self-image	0.64	0.23	0.21	0.63	0.24	0.22	0.59	0.25	0.21	0.63	0.23	0.19
Ideal	0.51	0.42	0.34	0.52	0.39	0.36	0.54	0.38	0.27	0.50	0.44	0.35
Self-stereotype	0.62	0.25	0.20	0.66	0.16	0.14	0.66	0.14	0.10	0.68	0.14	0.11

Source: *Authors' own elaboration*

Across all analysed ethnic groups, a positive self-stereotype was observed (Table 1), indicating positive group-level self-identification. At the same time, high levels of ambivalence (A) were found in all ethnic groups with respect to self-stereotypes and self-image, along with lower values for the "Ideal" component. Similar findings were reported in previous studies by Gașper (2008) and Horozova (2018).

For all ethnic groups examined, *statistically significant differences* were identified between the *ideal* and *self-image*: *Moldovans* (Z = −3.623, p = 0.0001); *Gagauz* (Z = −4.593, p = 0.0001); *Ukrainians* (Z = −5.375, p = 0.0001); and *Bulgarians* (Z = −4.796, p = 0.0001). Significant differences were also found between the *self-stereotype* and the *ideal*: Moldovans (Z = −3.931, p = 0.0001); *Gagauz* (Z = −4.983, p = 0.0001); *Ukrainians* (Z = −5.332, p = 0.0001); and *Bulgarians* (Z = −4.329, p = 0.0001).

When comparing *self-image* and *self-stereotype*, no statistically significant differences were observed among young Bulgarians (Z = −1.103, p = 0.27), suggesting a strong alignment between personal and ethnic self-perceptions. In contrast, statistically significant differences between self-image and self-stereotype were

observed among *Moldovans* (Z = −3.064, p = 0.002), *Gagauz* (Z = −2.974, p = 0.003), and *Ukrainians* (Z = −2.576, p = 0.01).

Overall, the findings indicate the presence of positive self-stereotypes across all analysed ethnic groups of young adults, reflecting a positive ethnic identity that may function as a socio-psychological resource for adaptation and resilience.

The content of ethnic stereotypes, as well as the self-image and the "Ideal" image, was further analysed among young adults. In examining the content of ethnic stereotypes, the analysis was based on the premise that *stereotypes are shaped by the characteristics of the group being stereotyped, as well as by the duration and intensity of its historical interactions with other ethnic groups*. The most frequently attributed qualities were those rated at 3 points or higher. For each ethnic group, the six qualities with the highest scores were selected for analysis (see Tables 2-5).

Table 2.

The dominant qualities of the self-image, the "ideal" image and the self-stereotype in Moldovan young adults

	Self-image	Mean (M)	"Ideal" image	Mean (M)	Self-stereotype	Mean (M)
1	orderly	3.38	orderly	3.79	proud	3.35
2	cautious	3.30	sociable	3.78	sociable	3.23
3	ingenious	3.20	active	3.73	active	3.13
4	sociable	3.13	ingenious	3.67	persistent	3.13
5	active	3.13	mentally sharp	3.54	ingenious	3.05
6	mentally sharp	3.05	diplomatic	3.49	mentally sharp	3.03

Source: Authors' own elaboration

As shown in Table 2, the shared qualities of Moldovan youth across the self-image ("I"), "Ideal" image and self-stereotype representations are: *ingenious*, *sociable*, *active*, and *mentally sharp*. At the same time, the self-stereotype of Moldovan youth differs from the "I" and "Ideal" images by placing greater emphasis on *pride* and *persistence*.

According to Soldatova (1998), pride fosters solidarity within the group; in other words, solidarity based on ethnic belonging represents an important value. In the self-image ("I"), *caution* emerges as a significant quality, which is not present in the other analysed representations. Conversely, *diplomacy* appears only in the "Ideal" image and is absent from both the self-image and the self-stereotype.

These findings suggest the presence of a stable positive ethnic identity among Moldovan youth. At the same time, the prominence of *pride* and *persistence* reinforces solidarity with the ethnic group. The presence of *prudence* in the self-image and *diplomacy* in the "Ideal" image indicates a tendency among Moldovan youth toward adaptive social behaviour strategies oriented toward balanced decision-making and constructive interaction.

Table 3.

The dominant qualities of the self-image, the "ideal" image and the self-stereotype in Bulgarian youth

	Self-image	Mean (M)	"Ideal" image	Mean (M)	Self-stereotype	Mean (M)
1	sociable	3.35	active	3.68	sociable	3.44
2	active	3.25	sociable	3.59	active	3.18
3	mentally sharp	3.05	mentally sharp	3.55	mentally sharp	3.13
4	persistent	3.00	diplomatic	3.50	persistent	3.11
5	orderly	2.95	orderly	3.40	ingenious	3.10
6	diplomatic	2.80	thrifty	3.38	diplomatic	3.00

Source: Authors' own elaboration

The shared qualities of young Bulgarians across the self-image ("I"), the "Ideal" image, and the self-stereotype are *sociable*, *active*, *ingenious*, and *diplomatic* (Table 3). In the self-stereotype of young Bulgarians, *mental sharpness* is prominently represented, reflecting cognitive flexibility. Only in the "Ideal" image is *thrift* highly valued, which reflects a cultural tradition of frugality, prudence in spending, and the importance of saving and planning, as emphasised in the Bulgarian proverb: "*And in a rich house, good is kept in moderation*."

These findings suggest that young Bulgarians cognitively internalise the ethnocultural qualities of their group; in other words, their perception of the typical Bulgarian largely coincides with their self-perception. This convergence between the self-stereotype and the self-image was also confirmed by the results of the emotional-evaluative component.

Among the Gagauz, the dominant qualities identified in self-stereotypes, self-images, and "Ideal" images are sociability and activity, underscoring the importance of social interaction and cooperation. In both the self-image and the "Ideal" image, *orderliness* ranks highly, indicating a preference for self-regulation and control over life circumstances, as well as the perception of order as an important adaptive mechanism in conditions of uncertainty. Only in the self-stereotype does *pride* rank highly (second position), reflecting a tendency toward cohesion with one's own ethnic group. Additionally, *stubbornness*, although less strongly expressed (M = 2.95), appears among the first six qualities in the self-stereotype and can be interpreted as reflecting a striving for stability in the face of external pressures.

Table 4.

The dominant qualities of the self-image, the "ideal" image and the self-stereotype in young Gagauz

	Self-image	Mean (M)	"Ideal" image	Mean (M)	Self-stereotype	Mean (M)
1	orderly	3.36	sociable	3.75	sociable	3.55
2	sociable	3.18	active	3.67	proud	3.32
3	cautious	3.05	orderly	3.56	active	3.15
4	persistent	2.95	ingenious	3.47	persistent	3.00
5	active	2.90	mentally sharp	3.46	stubborn	2.95
6	thrifty	2.88	diplomatic	3.45	mentally sharp	2.92

Source: Authors' own elaboration

Thus, the prominence of the qualities "*sociable*" and "*active*" in the self-stereotype, the "Ideal" image, and the self-image of Gagauz youth reflects a clear orientation toward social interaction. The high ranking of *order* at the personal level (in both the self-image and the "Ideal" image) indicates a tendency toward self-regulation and the maintenance of order under conditions of social uncertainty (Table 4). The prominence of *pride* in the self-stereotype highlights the importance of ethnic cohesion, while the inclusion of *stubbornness* among the most characteristic traits suggests a striving for stability and resistance to external pressures.

Table 5.

The dominant qualities of the self-image, the "Ideal" image and the self-stereotype in Ukrainian youth

	Self-image	Mean (M)	"Ideal" image	Mean (M)	Self-stereotype	Mean (M)
1	orderly	*3.20*	sociable	3.88	sociable	3.43
2	sociable	*3.18*	active	3.80	active	3.43
3	mentally sharp	*3.13*	diplomatic	3.75	persistent	3.15
4	active	3.10	mentally sharp	3.73	ingenious	*3.00*
5	ingenious	3.10	ingenious	3.70	mentally sharp	*2.97*
6	diplomatic	3.05	orderly	3.63	diplomatic	*2.88*

Source: Authors' own elaboration

Among young Ukrainians, the shared qualities across the self-image, the "Ideal" image, and the self-stereotype are *sociable*, *ingenious*, *active*, and *diplomatic*. Within this group, the overlap among the most highly rated qualities across the three representations is particularly pronounced. In the self-stereotype of young Ukrainians, persistence is a salient quality (absent from both the self-image and the "Ideal" image), suggesting a perception of their ethnic group as determined and capable of achieving results. In both the "Ideal" image and the self-image, *orderliness* ranks highly, underscoring the importance placed on maintaining order and self-regulation (Table 5).

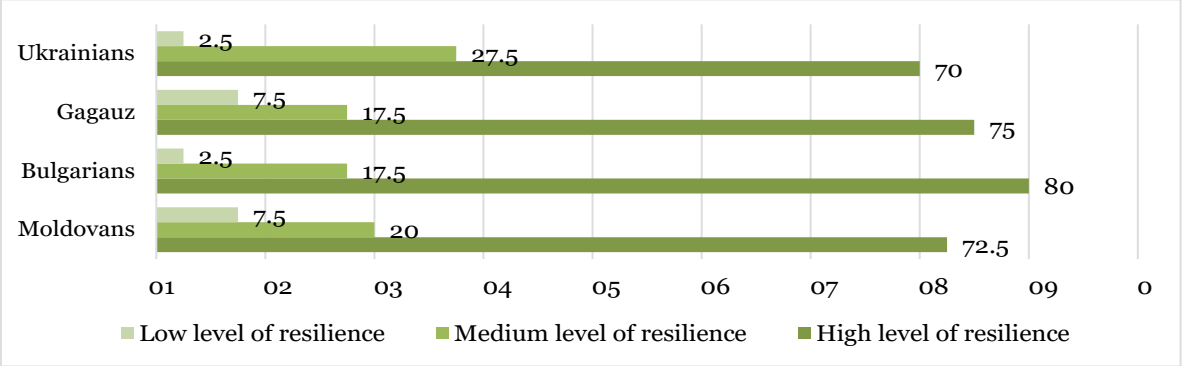
The concordance of qualities across the self-image, the "Ideal" image, and the self-stereotype reflects a stable and positive ethnic identity among young Ukrainians. The emphasis on *persistence* in the self-stereotype suggests a perception of the ethnic group as determined and achievement-oriented, while the importance of *orderliness* in the self-image and the "Ideal" image indicates an orientation toward self-regulation and structured social behaviour.

The significance of cultural and traditional values is also supported by psychological research. A study conducted by Rusnac (2025) examined the social representation of happiness across four generations in Moldova – Generation Z, Millennials (Y), Generation X, and Baby Boomers – using the free association method and structural analysis developed by Vergès. Among young adults from Generation Z (18-25 years, n = 72), a hybrid representation was identified, combining traditional values with experiential and expressive elements (Rusnac, 2025).

The resilience of young adults from the studied ethnic groups was assessed using the Dispositional Resilience Scale developed by S. Maddi. The findings indicate that high levels of resilience were predominant among Moldovan, Gagauz, Bulgarian, and Ukrainian young adults (Figure 1).

Figure 1.

Levels of resilience in young adults (%)

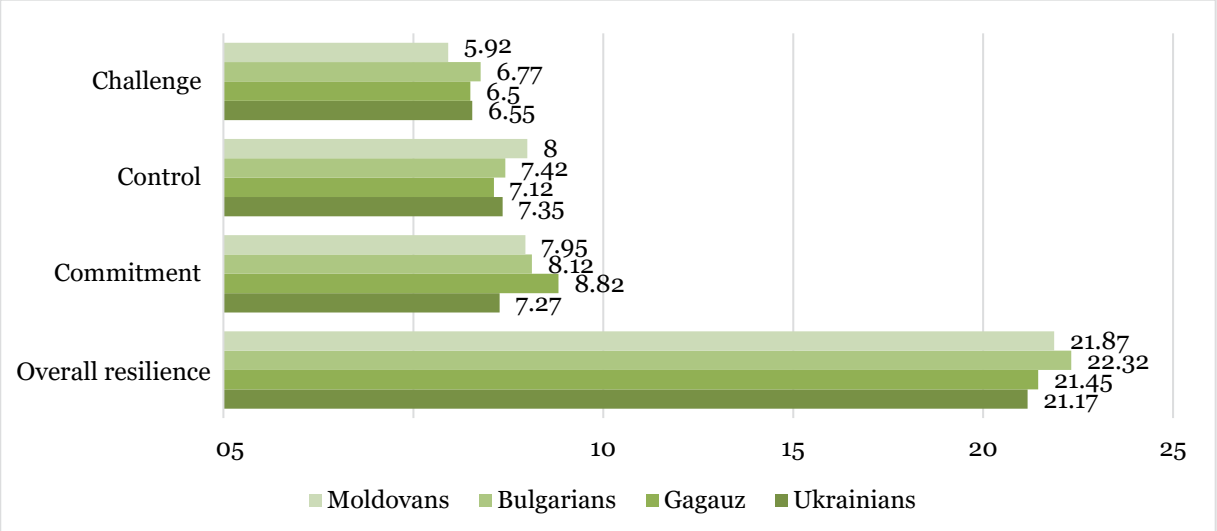


Source: Authors' own elaboration

The highest level of resilience is observed among Bulgarian youth (80%), whereas the lowest is among Ukrainian youth (70%). When comparing the scales (indicators): *commitment*, *control* and *challenge*, statistically significant differences were identified between challenge and control in all ethnic groups of young people studied: Moldovans (Z = −3.683; p=0.0001), Gagauz (Z = −3.853; p=0.0001), Bulgarians (Z = −3.307; p=0.001), Ukrainians (Z = −2.188; p=0.029). Thus, commitment predominates over control; young people believe that, through active participation in life events, they can achieve and find something valuable for themselves. This belief is more pronounced than the belief in control. Also, the comparison of the dimensions of challenge and control revealed statistically significant differences among Moldovan (Z = −4.717; p = 0.000), Gagauz (Z = −1.999; p = 0.046) and Ukrainian (Z = −2.566; p = 0.010) young adults. In the case of the Bulgarian group of young people, no statistically significant differences were identified between these dimensions (Figure 2).

Figure 2.

Mean values of youth resilience



Source: Authors' own elaboration

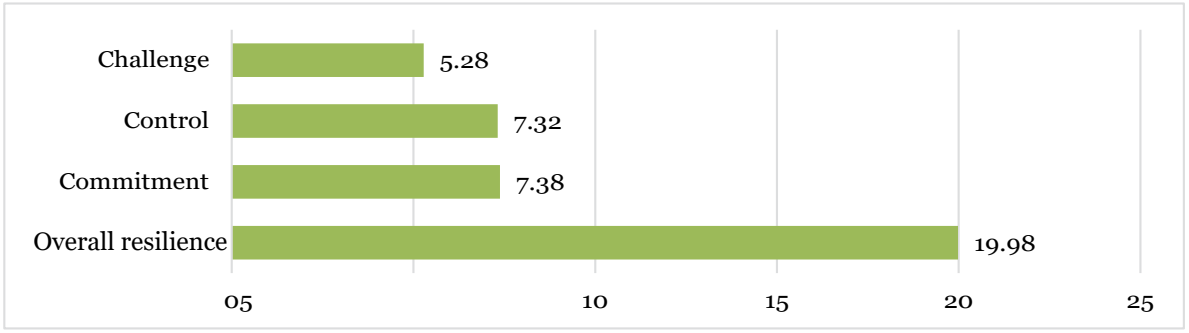
Overall, the findings indicate that the resilience of young adults from the studied ethnic groups is characterised by the predominance of *commitment* and *control*, with *challenge* being comparatively less pronounced. Statistically significant differences between the control and challenge components were identified among Moldovan, Gagauz, and Ukrainian youth, suggesting a preference for control over life circumstances rather than perceiving change as a challenge. In contrast, among Bulgarian youth, the differences between control and challenge did not reach statistical significance, indicating a more balanced relationship between these components within the resilience framework.

The study thus revealed a relatively consistent structural pattern of resilience among Moldovan, Gagauz, and Ukrainian young adults, reflecting similar adaptation strategies to uncertainty. Ethnocultural specificity is observed among Bulgarian youth, for whom the balance between resilience components appears more even.

These findings are further supported by a study conducted on a sample of 50 adolescents (aged 16-18, M = 16.8) from a vocational-technical institution in the city of Orhei. The study was carried out within the framework of the research project "Resilience as a Socio-Psychological Resource for Consolidating Human and Social Capital," part of Subprogram 01.05.01 "National Security of Moldova in the Context of Accession to the European Union: Legal, Political, and Sociological Approaches" (2025, Institute of Legal, Political and Sociological Research, State University of Moldova). The same short version of S. Maddi's Dispositional Resilience Scale was applied (Gașper, 2025; Gașper, 2024).

Figure 3.

Mean values of adolescent resilience



Source: Authors' own elaboration

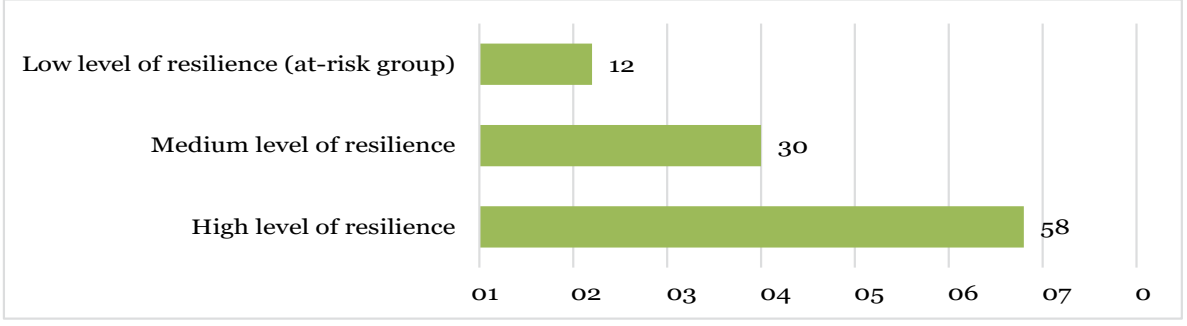
The results presented in Figure 3 indicate a high overall level of *resilience* (M = 19.98), suggesting a strong capacity among adolescents to cope with challenging situations and adapt to change. Within this structure, *commitment* had the highest mean (M = 7.38), reflecting intrinsic motivation and active engagement with personal goals and activities. Adolescents with a high level of commitment tend to perceive life as a space of opportunities and personal growth, fostering a positive orientation toward effort and learning.

The *control* component also recorded a high mean value (M = 7.32), indicating a strong perception of self-efficacy and personal responsibility for one's life outcomes. Respondents demonstrate a belief that they can influence events through their actions, reflecting well-developed cognitive and behavioural aspects of resilience necessary for emotional self-regulation.

In contrast, the *challenge* component obtained a lower mean value (M = 5.28), suggesting a more cautious orientation and a preference for stability. Adolescents appear more reserved in the face of uncertainty and tend to prefer predictable and structured contexts. Although this may limit engagement in new experiences, it can also be interpreted as a protective adaptive strategy in a vulnerable and uncertain environment. Overall, the resilience profile suggests a structure predominantly based on *commitment* and *control*, combined with a cautious attitude toward *challenge* – a configuration that supports effective adaptation while also indicating the need to further develop the exploratory dimension of resilience among adolescents.

Figure 4.

Levels of resilience in adolescents (%)



Source: Authors' own elaboration

The data emphasise a differentiated distribution of resilience levels among adolescents. The majority of respondents (58%) demonstrate a high level of resilience, suggesting a strong capacity for adaptation and personal resources for managing stress. However, the combined proportion of medium- and low-resilience individuals (42%) indicates the presence of a vulnerable segment that requires socio-psychological interventions and educational programs to develop socio-emotional skills.

Adolescents were also asked to complete the following sentence: "I think that developing a person's resilience involves..." (Fominova, 2012). Their responses were structured into three categories.

Category 1. Internal resources (32%): self-confidence, self-control, and inner strength. This category includes responses emphasising the role of personal factors—self-belief, self-knowledge, emotional regulation, and inner reflection. Adolescents perceive resilience as an individual capacity for self-regulation and the ability to mobilise inner strength in overcoming difficulties.

Sample responses include: "One's own strengths, self-confidence" (F., aged 17); "Self-confidence and the support of friends" (F., aged 17); "It is a way to hold ourselves together and calm down in a stressful situation, so as not to react negatively toward others" (F., aged 18); "Through prayer and self-confidence" (F., aged 16); "The spiritual strength of the person" (M., aged 16).

Overall, adolescents understand resilience as a process of psychological self-regulation grounded in faith in one's own resources, emotional balance, and personal reflection. Kobasa's (1979) model conceptualises hardiness (resilience) as a stable personal disposition characterised by commitment and control, supporting this interpretation of resilience as an internally grounded psychological resource.

Category 2. Social support and trusting relationships (46%). This category includes responses emphasising family members, friends, partners, or other trusted individuals as primary sources of resilience. Adolescents describe their social networks as the primary context for emotional recovery and support.

Examples of responses include: "With the help of parents and friends" (F., aged 17); "Parents support you all the time" (F., aged 17); "Friends, family" (M., aged 17); "Friends and family can help a person" (F., aged 18); "Family environment and emotional support" (F., aged 17); "Personally, my husband helps me get through all my problems" (F., aged 17).

In this perspective, resilience is conceptualised relationally, consistent with Ungar's (2019) socio-ecological model, which holds that social support serves as a protective resource that strengthens adaptive capacity.

Category 3. Contextual factors and compensatory activities (22%). This category includes responses referring to environmental influences, recreational or spiritual activities, and concrete stress-management strategies such as rest, hobbies, sports, reflection, or meditation.

Sample responses include: "Rest or a hobby to forget about stress or talk to someone" (M., aged 16); "Family, friends, hobbies, meditation, sport, being alone for a while" (F., aged 18); "The environment, support from those around, information" (F., aged 17); "Those around him" (M., aged 17). Adolescents recognise the importance of a balanced socio-emotional environment and of positive coping activities (e.g., hobbies, reflection, relaxation).

Overall, adolescents' responses indicate a mixed approach to resilience: some perceive it as an individual capacity, others as the result of interpersonal support, while a smaller group associates it with contextual coping strategies. This triadic structure corresponds to the integrative model of resilience proposed by Luthar, Cicchetti, and Becker (2000), which emphasises the dynamic interaction between internal, relational, and contextual resources.

The adolescent groups were further characterised by their resilience levels, as indicated by their scores on Maddi's scale (high, medium, and low). The responses from each group to the open-ended question, "I think that developing a person's resilience involves...", were analysed to highlight differences in perceptions of this psychological construct.

Adolescents with high resilience demonstrate a balanced, integrative perspective on personal development, drawing on internal and social resources. Many associate resilience with self-confidence, self-efficacy, and socio-emotional support. Their responses reflect both an awareness of relational factors and a recognition of personal responsibility in the adaptation process. Relevant examples include: "Self-confidence and the support of friends" (F., aged 17); "Family environment, emotional support, life experience, and emotional regulation skills" (F., aged 17).

This combination of intrapsychic and relational resources reflects a more developed resilience profile, in which social support is perceived not as a dependency but as a complementary mechanism to self-regulation, consistent with Ungar's ecological model (2019). The presence of reflective and empathic elements suggests a proactive orientation towards resilience, directed at personal development and the maintenance of emotional balance.

The group of adolescents with moderate resilience is characterised by ambivalence between the need for support and the striving for emotional autonomy. While adolescents recognise the role of the social environment, they often express uncertainty about their internal resources, alternating between passivity and attempts to exert control. Relevant examples include: "Family, friends, hobbies, meditation, sports, to be alone for a while" (F., aged 18); "To be helped by close people and to stay calm, not to panic" (F., aged 17).

These responses suggest that resilience is understood as the outcome of a combination of external support and partial self-regulation; however, the coping strategies described appear more reactive than proactive. The presence of ambiguous responses (e.g., "don't know," "no answer") may indicate a less consolidated sense of internal control and incomplete awareness of coping mechanisms. This pattern suggests a transitional stage between emotional reliance and resilient autonomy, highlighting the potential benefit of adaptive skills training programmes.

Adolescents with low resilience show a strong reliance on external resources and a predominantly affective orientation in their understanding of resilience. They perceive the ability to overcome difficulties as largely determined by emotional support from family members, partners, or friends, whereas intrapsychic resources are rarely mentioned and are described in vague terms. Relevant examples include: "Family help and self-confidence" (F., aged 17); "Personally, my husband helps me overcome all problems" (F., aged 17).

This profile suggests heightened psychosocial vulnerability, with emotional balance maintained primarily through supportive interpersonal relationships. The limited references to internal self-regulation mechanisms suggest a pattern of resilience anchored primarily in the immediate relational context. Within the framework proposed by Luthar, Cicchetti, and Becker (2000), these adolescents may be classified as at risk, underscoring the need for interventions to strengthen autonomy, self-concept, and emotion regulation.

CONCLUSIONS

A positive ethnic identity was identified across all analysed ethnic groups of young adults, representing an essential cultural resource for integration into sociocultural processes and for coping with uncertainty. This resource is grounded in intercultural communication, inclusion, and a sense of personal and collective control. All ethnic groups place high importance on sociability, activity, and ingenuity.

The need for communication appears to underpin the expansion of a shared space of meaning among young people from different ethnic backgrounds. At the same time, communication functions as a form of cultural capital through which the region has historically maintained its multicultural character. This multicultural experience entails diverse worldviews, which may foster adaptability and resilience in post-transitional contexts.

The empirical findings further indicate that the resilience of young adults from the studied ethnic groups is characterised by a predominance of commitment and control, with challenge comparatively less pronounced. Statistically significant differences between the control and challenge components were identified among Moldovan, Gagauz, and Ukrainian youth, suggesting a preference for control over life events rather than openness to challenge.

In contrast, among Bulgarian youth, the differences between control and challenge were not statistically significant, indicating a more balanced relationship between these components within the resilience structure. Overall, the study revealed a relatively consistent pattern of resilience among Moldovan, Gagauz, and Ukrainian youth, reflecting similar adaptation strategies under conditions of uncertainty.

The analysis of the three groups of adolescents indicated a progressive increase in the complexity of resilience perceptions, ranging from externally dependent patterns (low resilience) to the integration of internal and external resources (high resilience). Adolescents with high resilience demonstrate a reflective and adaptive understanding of this construct, whereas those with medium or low resilience exhibit unmet emotional needs and greater affective reliance on others.

This empirical differentiation confirms the dynamic nature of resilience as an adaptive process that involves the effective mobilisation of personal and interpersonal resources. The findings align with international models that conceptualise resilience as an ecological and contextual process grounded in the balance between individual and environmental resources (Masten, 2014; Ungar, 2012; Luthar et al., 2000).

Cross-national research on youth resilience highlights both convergences in adaptation strategies (Masten, 2014; Fergus & Zimmerman, 2005) and context-specific variations shaped by socio-historical, cultural, and institutional conditions (Ungar, 2012; Panter-Brick, 2015). In this context, resilience resources, ethnic identity, and intercultural socialisation processes are key variables for understanding how young people manage uncertainty, vulnerability, and adaptation in post-transitional contexts.

Future research should examine resilience across diverse social groups, including working adults differentiated by professional sector, migrants, and retirees, and explore the role of intercultural communication and uncertainty management in post-transitional societies. The findings of the present study may inform the development of applied social programmes – such as training in uncertainty adaptation, intergenerational initiatives, volunteering activities, and mental health support programmes – particularly those targeting young people.

REFERENCES

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist, 55*(5), 469-480. https://doi.org/10.1037/0003-066X.55.5.469

Berry, J. W., Poortinga, Y. H., Segall, M. H., & Dasen, P. R. (2004). *Cross-cultural psychology: Research and applications* (2nd ed.). Cambridge University Press.

Caunenco, I., & Gașper, L. (2025). Resurse culturale în condiții de incertitudine: Strategii de sprijin sociocultural = Cultural Resources under Conditions of Uncertainty: Sociocultural Support Strategies. In: D. Antoci, S. Chicu, & A. Cucer (Coord.), *Valorificarea stării de bine în sistemul educațional: oportunități și perspective*: materialele conferinței științifice naționale cu participare internațională, 15 mai 2025 (pp. 121-129). Chișinău: CEP UPSC. https://doi.org/10.46727/c.15-05-2025.p121-128

Caunenco, I., Horozova, L., & Horozov, S. (2025). Migration intentions, intercultural interaction, and dreams: Psychological orientations of student youth. *New Trends in Psychology, 7*(2), 171-179. https://dj.univ-danubius.ro/index.php/NTP/article/view/3326

Cucer, A. (2025). Starea de bine în sistemul educațional: Concepte, opinii, sugestii = Well-Being in the Educational System: Concepts, Perspectives, and Recommendations. In: D. Antoci, S. Chicu, & A. Cucer (Coord.), *Valorificarea stării de bine în sistemul educațional: oportunități și perspective*: materialele conferinței științifice naționale cu participare internațională, 15 mai 2025 (pp. 79-88). Chișinău: CEP UPSC. https://doi.org/10.46727/c.15-05-2025.p79-88

Fergus, S., & Zimmerman, M. A. (2005). Adolescent resilience: A framework for understanding healthy development in the face of risk. *Annual Review of Public Health*, *26,* 399-419. https://doi.org/10.1146/annurev.publhealth.26.021304.144357

Gașper, L. (2008). *Particularitățile psihologice ale identității etnice la adolescenți* [Teză de doctor în psihologie, Universitatea Pedagogică de Stat "Ion Creangă"]. Chișinău, Republica Moldova. http://www.cnaa.md/files/theses/2008/7904/lucia_gasper_abstract.pdf

Gașper, L. (2024). Reziliența ca resursă sociopsihologică de consolidare a capitalului uman și social = Resilience as a socio-psychological resource for consolidating human and social capital. In: V. Mocanu (Coord.), V. Mocanu, M. Potoroacă, I. Mocanu, O. Liseienko, V. Podshyvalkina, L. Malcoci, A. Pascaru, T. Spătaru, P. Negură, L. Negură, A. Dumbrăveanu, A. Mocanu, L. Gașper, I. Filipov, A. Staver, G. Rogovaya, L. Rustanovich, Y. Piontkovska, E. Deminet, . . . & D. Cemortan. *Consolidarea rezilienței sociale prin valorificarea capitalului uman în contextul aderării Republicii Moldova și Ucrainei la Uniunea Europeană* (pp. 166-173). Chișinău, Republica Moldova: Editura Universității de Stat din Moldova. https://doi.org/10.59295/crs2024

Gașper, L. (2025). Dimensiunea psihosocială a rezilienței ca parte a spațiului vieții = The psychosocial dimension of resilience as part of the life space. In: A. Pascaru & A. Perciun (Coord.), *Filosofia și perspectiva umană:* conferință științifică, ediția a 21-a, 21 noiembrie 2024 (pp. 218-231). Chișinău: Artpoligraf. https://msuir.usm.md/items/7869e4f1-8fb1-4019-be10-4f7c463e501c

Horozova, L. (2018). *Identitatea etnică a tineretului studențesc în condițiile migrației de muncă a populației din UTA Găgăuzia* [Autoreferat al tezei de doctor în psihologie, Universitatea Pedagogică de Stat "Ion Creangă"]. Chișinău, Republica Moldova. http://www.cnaa.md/en/thesis/54053/

Kalisch, R., Baker, D. G., Basten, U., Boks, M. P., Bonanno, G. A., Brummelman, E., Chmitorz, A., Fernández, G., Fiebach, C. J., Galatzer-Levy, I., Geuze, E., Groppa, S., Helmreich, I., Hendler, T., Hermans, E. J., Jovanovic, T., Kubiak, T., Lieb, K., Lutz, B., Müller, M. B., . . . & Kleim, B. (2017). The resilience framework as a strategy to combat stress-related disorders. *Nature Human Behaviour, 1*(11), 784-790. https://doi.org/10.1038/s41562-017-0200-8

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development, 71*(3), 543-562. https://doi.org/10.1111/1467-8624.00164

Maddi, S. R. (1999). The personality construct of hardiness: I. Effects on experiencing, coping, and strain. *Consulting Psychology Journal, 51*(2), 83-94. https://doi.org/10.1037/1061-4087.51.2.83

Maddi, S. R. (2004). Hardiness: An operationalization of existential courage. *Journal of Humanistic Psychology, 44(3)*, 279-298. https://doi.org/10.1177/0022167804266101

Malcoci, L., Mocanu, V., Potoroacă, M., & Mocanu, I. (2025). *Dinamica rezilienței sociale în Republica Moldova: Analiză sociologică*. V. Juc (Ed.). Universitatea de Stat din Moldova, Institutul de Cercetări Juridice, Politice și Sociologice, Centrul de Sociologie și Psihologie Socială. https://drive.google.com/file/d/1YqNUU59GsXm6CFzcmfSYoBfbg095aEOw/view?usp=drivesdk

Masten, A. S. (2014). Global perspectives on resilience in children and youth. *Child Development, 85*(1), 6-20. https://doi.org/10.1111/cdev.12205

Masten, A. S., & Cicchetti, D. (2016). Resilience in development: Progress and transformation. In: D. Cicchetti (Ed.), *Developmental psychopathology* (Vol. 4, pp. 271-333). Wiley. https://doi.org/10.1002/9781119125556.devpsy406

Masten, A. S. (2018). Ordinary magic: Lessons from research on resilience in human development. *Education Canada, 58*(2), 28-32. https://www.edcan.ca/wp-content/uploads/EdCan-2009-v49-n3-Masten.pdf

Masten, A. S., & Motti-Stefanidi, F. (2020). Multisystem resilience for children and youth in disaster: Reflections in the context of COVID-19. *Adversity and Resilience Science, 1*(2), 95-106. https://doi.org/10.1007/s42844-020-00010-w

Panter-Brick, C. (2015). *Culture and resilience: Next steps for theory and practice*. In: L. C. Theron, L. Liebenberg, & M. Ungar (Eds.), *Youth Resilience and Culture: Commonalities and Complexities* (pp. 233-244). Springer. https://doi.org/10.1007/978-94-017-9415-2_17

Puzur, E. (2025). Socializarea - factor predictiv al stării de bine în mediul educațional = Socialization - predictive factor of well-being in the educational environment. In: D. Antoci, S. Chicu, & A. Cucer (Coord.), *Valorificarea stării de bine în sistemul educațional: oportunități și perspective*: materialele conferinței științifice naționale cu participare internațională, 15 mai 2025 (pp. 89-102). Chișinău: CEP UPSC. https://doi.org/10.46727/c.15-05-2025.p89-102, https://dir.upsc.md/handle/123456789/8252

Rusnac, S. (2025). From Baby Boomers to Generation Z: A Psychosocial Intergenerational Analysis of Happiness. *EcoSoEn*, 1, 101-122. https://doi.org/10.54481/ecosoen.2025.1.10

Schäfer, S. K., Supke, M., Kausmann, C., Schaubruch, L. M., Lieb, K., & Cohrdes, C. (2024). A systematic review of individual, social, and societal resilience factors in response to societal challenges and crises. *Communication Psychology, 2*(1), article 92. https://doi.org/10.1038/s44271-024-00138-w

Ungar, M. (Ed.). (2012). *The social ecology of resilience: A handbook of theory and practice*. Springer. https://doi.org/10.1007/978-1-4614-0586-3

Ungar, M. (2019). Designing resilience research: Using multiple methods to investigate risk exposure, promotive and protective processes, and contextually relevant outcomes for children and youth. *Child Abuse & Neglect, 96*, Article 104098. https://doi.org/10.1016/j.chiabu.2019.104098

Лебедева, Н. М., Татарко, А. Н., Галяпина, В. Н., Лепшокова, З. Х., Будцева, М. А., & Бушнина, Е. В. (2023). Социокультурный подход в современной российской психологии. В: А. Л. Журавлев, Е. А. Сергиенко, & Г. А. Виленская. *Научные подходы в современной отечественной психологии* (pp. 561-580). Издательство «Институт психологии РАН». https://publications.hse.ru/chapters/888116566 / Lebedeva, N. M., Tatarko, A. N., Galyapina, V. N., Lepshokova, Z. Kh., Budtseva, M. A., & Bushnina, Ye. V. (2023). Sotsiokulturnii podkhod v sovremennoi rossiiskoi psikhologii. In: A. L. Zhuravlev, Ye. A. Sergienko, & G. A. Vilenskaya. *Nauchnie podkhodi v sovremennoi otechestvennoi psikhologii* (pp. 561-580). Izdatelstvo «Institut psikhologii RAN».

Осин, Е. Н. (2013). Факторная структура краткой версии теста жизнестойкости. *Организационная психология, 3*(3), 42-60. https://cyberleninka.ru/article/n/faktornaya-struktura-kratkoy-versii-testa-zhiznestoykosti / Osin, E. N. (2013). Faktornaya struktura kratkoi versii testa zhiznestoikosti. *Organizatsionnaya psikhologiya*, *3*(3), 42-60.

Солдатова, Г. В. (1998). *Психология межэтнической напряженности*. Смысл / Soldatova, G. (1998). Psikhologiya mezhetnicheskoi napryazhennosti. Smisl.

Стефаненко, Т. (1999). *Социальная психология этнической идентичности* [Докторская диссертация по психологии]. Moscova https://www.dissercat.com/content/sotsialnaya-psikhologiya-etnicheskoi-identichnosti / Stefanenko, T. (1999). *Sotsialnaya psikhologiya etnicheskoi identichnosti* [Teză de doctor în psihologie]. Moscova.

Фоминова, А. Н. (2012). *Жизнестойкость личности*. Монография. М.: МПГУ. https://www.phantastike.com/common_psychology/zhiznestoikost_lichnosti/html / Fominova, A. N. (2012). Zhiznestoikost lichnosti. Monografiya. M.: MPGU.

STRESS TESTING OF FISCAL RISK AND FUNDING PRESSURES ASSOCIATED WITH CONTINGENT LIABILITIES IN MOLDOVA

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SUMMARY

The article develops an integrated framework for assessing fiscal risk in Moldova, focused on stress-testing the budgetary position and quantifying contingent liabilities relevant to the sustainability of public finances. The aim is to estimate the sensitivity of the deficit and public debt to macroeconomic and fiscal shocks, and to incorporate contingent risks (state guarantees, exposures associated with public enterprises, litigation, and contractual commitments) into an operational monitoring tool. The methodology combines early warning indicators for macro-fiscal and financing risks, the estimation of budgetary elasticities of revenues and expenditures with respect to macroeconomic variables, and stress scenarios (baseline/adverse/severe) used for the projection of the deficit, the financing need, and the debt path. The data come from national official sources and are harmonised for the period 2010–2024 / 2014–2024, depending on availability. The applied stress scenario reflects a compound macro-financial shock, defined by GDP contraction, an interest rate increase, and exchange rate depreciation, with cumulative effects on the budget deficit, debt service costs, and financing needs. The implications aim to integrate stress testing and the fiscal risk register into the medium-term budgetary framework and to strengthen fiscal risk reporting.

Keywords: fiscal risk, budgetary stress test, contingent liabilities, budgetary deficit, public debt, refinancing risk, financing vulnerabilities

INTRODUCTION

In small, open economies, fiscal risk can erode fiscal stability, as external shocks quickly affect the tax base and budget revenues, and influence the government's financing costs and the exchange rate. In Moldova, macroeconomic volatility, structural rigidities in expenditure, and constraints on borrowing and refinancing conditions increase the likelihood of deviations from budget targets and can accelerate the accumulation of public debt.

In addition to conventional macro-fiscal risks, contingent liabilities represent a financial risk in the area of budgetary and fiscal relations with the potential to materialise, as they can transform potential obligations into actual payment obligations of the public sector. State guarantees, commitments associated with publicly owned enterprises, litigation, and commitments related to public-private partnership contracts can threaten fiscal stability by rapidly increasing financing needs and jeopardise the trajectory of public debt. However, in the current analysis, these exposures are often treated piecemeal, without explicit integration into deficit and debt stress testing.

The aim of the paper is to develop an integrated framework for assessing fiscal risk that combines stress-testing of the budgetary position with the assessment of contingent liabilities based on their potential impact on the deficit, debt, and financing needs. Stress-testing measures the sensitivity of revenues and expenditures to macroeconomic shocks, using budget elasticities to estimate deficit deviations and the implications for the public debt trajectory. At the same time, contingent liabilities are treated as potential fiscal exposures, and their materiality is expressed by an applicable measure of additional financing pressures if they materialize. Thus, the research assesses the sensitivity of budgetary revenues and expenditures to macroeconomic shocks, identifies the scenarios that produce the largest deficit deviations from targets and the strongest debt pressures, and assesses the potential contribution of contingent liabilities to financing vulnerabilities. The central hypothesis is that combined shocks - a decline in gross domestic product, an increase in interest rates and a depreciation of the exchange rate - generate nonlinear effects on the deficit and debt, and the materialisation of contingent liabilities can amplify the financing needs in periods of increased risk exposure.

The main contribution of the paper is the proposal of a fiscal risk assessment tool, designed as a unique framework that uses early warning indicators, estimates of budgetary elasticities for revenues and expenditures, stress scenarios, and a register of contingent liabilities. The application of this tool allows tracking risks transmitted to the deficit, debt, and financing needs, and provides support for the formulation of policies within the medium-term budgetary framework. The article further includes a literature review, a description of the research methodology, and the presentation of the results, accompanied by discussion.

DEFINITION AND TAXONOMY OF FISCAL RISKS

The specialised literature distinguishes several analytical dimensions of fiscal risk, relevant for the assessment of contingent liabilities and financing pressures. These include: macroeconomic risks with an impact on public revenues and expenditures; operational budgetary risks, associated with execution and structural rigidities; public debt and financing risks, such as refinancing or exposure to interest rate fluctuations; as well as risks arising from contingent liabilities of the public sector – guarantees, state-owned enterprises, public-private partnerships and other potential obligations – the materialization of which

can directly affect the budget balance and the gross financing need. The diversity of these approaches reflects differences in focus and operationalisation, determined by each study's analytical objective. As a reference definition, this study starts from the formulation of the International Monetary Fund, according to which fiscal risk is understood as the possibility that actual budgetary results deviate from those anticipated in the budget or in official forecasts, as a result of the materialization of shocks and uncertainties that affect both fiscal flows (revenues, expenditures), as well as stock variables (public debt) and financing conditions. (IMF, 2008) This approach has two important analytical implications: (i) fiscal risk is not a singular phenomenon, but a set of interdependent risks, and (ii) robust assessment requires the explicitation of the transmission channels through which shocks are transformed into deviations in the deficit, debt and financing needs.

In this paper, fiscal risk is treated as a set of correlated risks that manifest through variations in budgetary revenues and expenditures, changes in financing conditions and the cost of debt, and the materialisation of contingent liabilities with budgetary impact. In aggregate, these risks are reflected in the budget balance, public debt and gross financing needs (IMF, n.d.). The taxonomy used in the paper distinguishes four categories of risks, relevant for fiscal stress testing and for estimating the impact on the main budgetary aggregates:

(a) Macroeconomic risks: variations in GDP, inflation, exchange rate and interest rates, which simultaneously affect the tax base, price-sensitive indexations/expenditures and the cost of debt service (IMF, 2008).

(b) Budgetary risks (revenue and expenditure): forecast errors and budgetary elasticities different from those implicit in the baseline projection, respectively, expenditure rigidities (e.g., expenditure that is difficult to adjust in the short term), which amplify the deficit deviation in adverse periods (IMF, n.d.).

(c) Debt and financing risks: risks associated with the structure of the debt portfolio (maturity profile, currency share, fixed/floating interest rate) and refinancing risk, which are reflected in the increase in financing costs and the vulnerability of the gross financing requirement to market shocks (Budina and Petrie, 2013).

(d) Contingent risks: obligations that can become explicit debts under certain conditions (state guarantees, litigation), as well as exposures from state-owned enterprises (SOEs) and PPPs, where obligations can be explicit or implicit and can quickly migrate to the budget in adverse scenarios (IMF, 2008).

The taxonomy provides an analytical framework for linking each risk category to the mechanisms by which effects are transmitted to the budget balance and, through it, to the public debt. Macroeconomic shocks are reflected in budget execution by altering tax bases and adjusting expenditures through indexation mechanisms, thereby directly influencing the balance. Budgetary risks are captured by revenue and expenditure deviations from the baseline scenario, which are explained by expenditure rigidities and by the insufficient calibration of the parameters used in the forecast, including fiscal elasticities. Financing risks operate through the cost of debt and the conditions for access to refinancing, with implications for interest expenses and the gross financing need. In this context, contingent risks can trigger temporary adjustments to debt and financing needs when contingent obligations become actual budgetary obligations. Thus, the taxonomy establishes the transmission channels to the balance sheet, debt, and gross financing need. On this basis, fiscal stress testing operationalises scenario analysis, incorporating macroeconomic shocks and contingent liabilities into projections of fiscal variables (IMF, 2016).

FISCAL STRESS TESTING: APPROACHES AND STANDARDS

Fiscal stress testing assesses the resilience of public finances to adverse scenarios by projecting severe, simultaneous shocks along alternative trajectories of fiscal aggregates. The exercise operationalises this analysis by projecting revenues, expenditures, and debt costs, built on explicit assumptions about macroeconomic variables and financing conditions, and by tracking the results through the budget balance, public debt, and gross financing needs. In the IMF toolkit, the Fiscal Stress Test standardises this approach by defining the shock parameters and transmission mechanisms used in projections, thereby enabling the quantification and comparison of the effects on the fiscal position across scenarios (IMF, n.d.; IMF, 2016).

In the literature, fiscal stress-testing approaches can be grouped into two analytical directions, depending on how the relationships between macroeconomic variables and budget aggregates are specified. The first direction uses semi-structural frameworks based on fiscal elasticities (or semi-elasticities), in which the responses of revenues and selected expenditure components to changes in GDP, inflation, or employment are modelled using explicit parameters, while the cost of debt is derived from assumptions about interest rates, exchange rates, and the structure of the debt portfolio (EC, 2020; IMF, 2016). A second approach uses econometric models, in which these relationships are estimated from data, providing an empirical basis for calibrating the responses of revenues, expenditures, and debt service in adverse scenarios.

From a methodological perspective, fiscal stress testing provides an operational framework for assessing the resilience of public finances to macroeconomic and financial shocks. Within the framework of fiscal

projections based on elasticities, revenues are projected using elasticities/semi-elasticities, differentiated by the main revenue categories and reported to relevant nominal bases (nominal GDP, consumption, wage bill), to capture volume and price effects simultaneously. Expenditures are treated through explicit rules for components sensitive to inflation and the economic cycle (indexation, labour market benefits), linked to assumptions regarding the degree of short-term rigidity of primary expenditures. The public debt analysis block operationalises the transmission of market shocks to the cost of financing through changes in interest rates on government securities, the exchange rate, and the structure of the debt portfolio. In this logic, changes in financing conditions are reflected in interest expenses and gross financing needs, through the debt service and refinancing channels.

The quality of the assessment is determined by the internal consistency of the scenarios and the explicit specification of the interdependencies between fiscal aggregates and financing conditions, including how shocks can occur simultaneously and amplify each other (for example, a slowdown in economic growth associated with tightening financial conditions and a depreciation of the exchange rate). A shock to interest rates is progressively reflected in the effective cost of debt through refinancing at maturity and reindexing of the variable-rate component, and foreign exchange exposure amplifies the impact by revaluing debt service and the stock of foreign-currency-denominated debt. The effects are transmitted directly to interest expenditure, the primary balance and the gross financing need. The relevance for financial risk management in the field of budgetary and fiscal relations increases when the set of scenarios includes severe adverse shocks with low probability, defined by explicit calibration criteria (historical distributions, stress episodes, standardized parameters) and oriented towards capturing the materialization of extreme risks, including jumps in the debt stock and accelerated deterioration of fiscal-budgetary sustainability indicators (IMF, 2018).

CONTINGENT LIABILITIES: TYPES, MATERIALIZATION AND IMPACT

In this context, contingent liabilities represent potential obligations of the public sector that become actual obligations only if a triggering event occurs. In the analysis and efficient management of financial risks in the field of budgetary and fiscal relations, the relevance of contingent liabilities is determined by two interdependent parameters: the probability of activation (materialization) and the amplitude of the budgetary effect, expressed by the impact on the balance, debt and financing needs (IMF, 2008; Budina and Petrie, 2013; IMF, 2016).

The operationalisation of these parameters requires classifying exposures by the nature of the commitment that generates them, since these conditions both affect the estimation of probability and the impact on the transmission channel. A useful typology for fiscal assessment starts from the distinction between explicit and implicit contingent liabilities. Explicit contingencies derive from regulatory acts or contracts and typically include state guarantees, indemnification clauses or contingent payments in contracts, as well as potential liabilities associated with litigation to which the state is a party (IMF, 2008; IMF, 2016). Implicit contingencies reflect expectations regarding state intervention in situations of systemic or social risk (e.g., support for public enterprises or entities considered strategic).

The probability of contingent liabilities materialising increases in adverse macroeconomic conditions, through channels that affect the solvency and liquidity of exposed entities and amplify the risk of activating public commitments. In recessions or amid financial market tensions and rising financing costs, the payment capacity of some secured debtors deteriorates, increasing pressure on public enterprises and the likelihood of activating guarantees, recapitalisations, or other forms of budgetary support (IMF, 2008; IMF, 2016).

From the perspective of fiscal stress-testing tools, this correlation with the business cycle is important because adverse scenarios tend to combine economic activity shocks, interest rate shocks and financing shocks, and contingent liabilities can simultaneously amplify the effects on the budget balance and debt dynamics (IMF, n.d.; IMF, n.d.). In the case of public-private partnership (PPP) contracts, contingent liabilities can materialise as a result of the private partner's failure to perform, the termination or renegotiation of the contract, as well as through the activation of guarantee clauses. This contractual structure requires the treatment of PPP exposures as a financial risk relevant to the field of budgetary and fiscal relations, by including them in fiscal risk registers/inventories and through sensitivity assessments that quantify the potential effects on the deficit, debt and financing needs (Aslan and Duarte, 2014; IMF, 2016; IMF, 2018).

The fiscal impact of materialisation is transmitted through three channels, each with distinct implications for budgetary and fiscal policy, as well as for public debt management. The first channel is the budget deficit, arising from additional spending (transfers, subsidies, compensations), recapitalisations, or other interventions that are immediately reflected in the budget balance (IMF, 2016; IMF, 2018). The second is public debt, which occurs when a materialised obligation is transformed into explicit debt or when the state assumes the liabilities of an entity. Thus, the contingent liability is converted into an increase in the debt stock and can have a significant impact on the sustainability of public finances (IMF, 2008; IMF, 2016). The third channel is the gross financing requirement, a particularly relevant channel in stressed conditions, as materialisation can concentrate payments in a short time frame, amplifying liquidity pressures and refinancing risk (IMF, 2016; IMF,

n.d.). From this perspective, contingent liabilities are also assessed through the time profile of cash outflows and through the interaction with market conditions and financing costs (IMF, 2016).

The integration of contingencies into the analysis of financial risk in the field of budgetary and fiscal relations is based on the following complementary tools: the fiscal risk register and the materiality assessment. The register provides a structured record of exposures, triggering events, legal/contractual basis, maximum exposure and monitoring threshold parameters. The materiality assessment allows for the ranking of risks according to the probability of materialisation and the size of the budgetary impact, providing a methodological basis for establishing management priorities and for the structured presentation of risks in fiscal reporting (IMF, 2008; Budina and Petrie, 2013; IMF, 2018). Within the framework of fiscal transparency practices, systematic reporting of financial risks in the field of budgetary and fiscal relations, as well as contingent liabilities, ensures budgetary discipline by improving information on exposures, control mechanisms and institutional responsibilities (IMF, 2008; IMF, 2018).

In Moldova, public finance sustainability assessments and financial risk analyses in the field of budgetary and fiscal relations are treated in separate analytical sections. Thus, financial stress scenarios in the field of budgetary and fiscal relations only partially capture the effects of contingency materialisation. In this context, a need is proposed to develop an integrated framework that explicitly links stress-testing in the field of budgetary and fiscal relations to the analysis of contingent liabilities across two analytical stages. The first stage is based on alternative macro-fiscal scenarios (a baseline and adverse scenarios) and estimates the evolution of the budget balance (deficit) and debt for each scenario over the projection horizon. The second stage identifies and quantifies relevant contingent liabilities and assesses their materiality based on two operational criteria — probability of materialization and size of budgetary impact — so that their materialization can be coherently introduced into stress scenarios and reflected in outcomes regarding the budget balance, debt and financing needs (IMF, 2008; Budina and Petrie, 2013; IMF, 2016; IMF, 2018).

METHODOLOGY AND DESIGN OF STRESS TESTING

The research is based on a quantitative-applicative approach, which integrates two tools frequently used in the modern architecture of financial risk management in the field of budgetary and fiscal relations: (i) stress-testing of the budgetary position and public debt based on alternative macroeconomic scenarios; and (ii) assessing the materiality of contingent liabilities through a fiscal risk register, operationalized through a scoring system. This integration allows the treatment of financial risks in the field of budgetary and fiscal relations as a single portfolio, in which risks with immediate manifestation in budget execution (macro-budgetary and financing) are analysed alongside contingent risks, whose materialisation is conditioned by triggering events. In this framework, the intended result is the quantification of potential pressures on the main budgetary and fiscal variables (budget balance, public debt stock, and gross financing need) within a unified analytical framework, enabling the comparability of results across scenarios.

In the adopted methodological architecture, stress testing quantifies the sensitivity of the main fiscal indicators to macro-financial shocks, using budget elasticities and projection rules for expenditure components with high rigidity. In addition, the fiscal risk register operationalises contingent liabilities through a materiality measure and materialisation scenarios that estimate the potential impact of conditional obligations on the fiscal position (IMF, 2016; IMF, 2018).

The dataset used includes: (a) macroeconomic indicators, namely nominal and real gross domestic product (GDP), GDP deflator and inflation, as well as the exchange rate; (b) monetary-financial indicators, in particular interest rates relevant to the cost of debt and financing conditions; (c) data on budget execution, including total revenues and by main categories, as well as public expenditures classified by economic and functional components; (d) information on the stock and structure of public debt, broken down by currency, maturity, interest rate type and cost.

For contingent liabilities, data come from official reports and documents on state guarantees, exposures associated with publicly owned enterprises (SOEs), disputes with potential tax impact and commitments related to public-private partnerships (PPPs). The series are harmonised at a temporal level, and the variables are transformed into standardised indicators (percentages of GDP, weights, growth rates), to ensure comparability across years and scenarios. In the empirical application, the analysis interval covers the period 2010–2024, respectively 2014–2024, depending on the availability of series for each indicator. The interval 2010–2024 is used to estimate and calibrate basic macro-fiscal relationships, in particular the elasticities of budget revenues (total and by main categories – VAT, excise duties, and direct taxes) with respect to nominal GDP, with control variables for the price level and the exchange rate. A longer time series increases the stability and precision of the parameters used in the stress test's transmission rules. The 2014–2024 interval is reserved for the main fiscal stress test application and the assessment of contingent liabilities. Starting with 2014, the relevant data sets for the fiscal indicators and the debt/financing block (including the variables used for the GFN, the debt structure and the inventory of contingents) are available in a more homogeneous and methodologically comparable form, in the context of the strengthening of the medium-term budgetary

framework and the gradual alignment with the GFSM standards. The partial overlap of the intervals thus reflects the separation between the calibration phase (2010–2024) and the main application phase (2014–2024), not analytical redundancy.

The robustness of the parameters used in the stress test is assessed by re-estimating the elasticities on the 2014–2024 sub-sample and by checking the stability of the sign and order of magnitude of the key coefficients. Usual stationarity and structural break tests are applied to the time series; when instability is indicated, we report alternative specifications or use conservative parameter calibrations in the scenarios.

The stress test model is defined based on three scenarios: the baseline scenario (S0), the moderate adverse scenario (S1) and the severe adverse scenario (S2). For each scenario, alternative trajectories of the main macroeconomic variables – gross domestic product (GDP), inflation, exchange rates, and interest rates – are established, and these changes are translated into the dynamics of revenues, expenditures, and the budget balance through transmission rules. The transmission is approximated by budgetary elasticities, estimated econometrically when the data series allow, respectively calibrated in situations where statistical information requires a parametric approach. The financing component reflects the effects of interest rate and exchange rate changes on the cost of debt service and the gross financing need (GFN), in line with fiscal stress-testing frameworks in the literature (IMF, 2016; EC, 2020; IMF, 2018).

The stress-testing design follows standard fiscal risk toolkits (IMF, 2016; EC, 2020) and draws on empirical work in Moldova that operationalises two ingredients used in the present transmission block: (i) potential-output/structural-balance decomposition and (ii) scenario-path construction for key macroeconomic drivers.

Covalschi and Lazăr (2016) estimate potential GDP for the Republic of Moldova using a production-function approach and employ cycle-sensitive fiscal parameters to derive structural fiscal measures. Although their contribution is not framed as a stress test, it provides a local operational precedent for the steps used here: linking revenue dynamics to a macroeconomic base, calibrating fiscal elasticities, and interpreting fiscal outcomes under alternative macroeconomic conditions.

On the scenario side, Toacă et al. (2025) implement autoregressive specifications with seasonal adjustment to generate forecast paths for Moldova's external sector dynamics. This approach is relevant for constructing coherent baseline and adverse macroeconomic trajectories, given the tight links between external demand, GDP, exchange-rate movements, and revenue bases.

Against this background, the present framework combines elasticity-based fiscal mapping with debt-dynamics and refinancing channels, and complements these with a fiscal risk register for contingent liabilities, so that deficit, debt and gross financing needs can be traced consistently under compound macro-financial shocks while preserving accounting identities.

The sensitivity of budget revenues to macroeconomic developments is quantified by estimating the elasticities between budget revenues and nominal gross domestic product (GDP), including inflation and the exchange rate as control variables. The estimation is carried out separately for total revenues and, where available, for the main revenue categories: value added tax (VAT), excise duties, and direct taxes. The basic specification adopts a logarithmic form, which allows the interpretation of the estimated coefficients as elasticities and their use in the transmission rules within the stress test:

$$\ln(R_t) = \alpha + \beta \ln(PIB_t^{nom}) + \gamma \ln(CPI_t) + \delta \ln(ER_t) + \varepsilon_t \qquad (1)$$

Where:

R_t - represents the budget variable analyzed at time t (for example, total or category revenues);

GDP_t^{nom} - nominal GDP;

CPI_t - price index (or deflator);

ERt - exchange rate;

α - constant (intercept): the base level of $\ln(R_t)$, when the explanatory variables are at their reference level.

β - coefficient (elasticity) of revenues with respect to nominal GDP.

γ - coefficient associated with the price level (CPI/deflator as an index): shows how income changes (in log terms) when the general price level changes, after controlling for nominal GDP and exchange rate.

δ - coefficient associated with the exchange rate *ERt*: captures the sensitivity of income to exchange rate movements

ε_t - error term (residual) at time t: everything that affects income in year/quarter t and is not included in the model (shocks, unmodeled discretionary fiscal measures, measurement errors, administrative factors, etc.)

Elasticities can be estimated using ordinary least squares (OLS), with standard time-series checks, including stationarity tests and identification of potential structural breaks. In situations where variables are non-stationary and cointegration relationships exist, robust specifications, such as error-correction models, can be

used while maintaining the economic interpretation of the estimated coefficients as elasticities.

Budgetary expenditures are projected differentially, reflecting structural rigidities and specific indexation mechanisms. Components with high rigidity (personnel costs, transfers, and interest payments) are estimated using dedicated rules, such as inflation indexation, quantitative volume rules, or formulas derived from the cost of financing, since discretionary adjustments are usually limited in the short term. For the discretionary components, a fiscal adjustment rule is introduced, such as maintaining a balance/deficit target or gradual stabilisation, to ensure coherence in the fiscal trajectory across scenarios.

Accounting identities are explicitly maintained in the projection exercise to ensure internal coherence between the budget and debt blocks. The budget balance is defined as the difference between total revenues and total expenditures:

$$BB_t = Inc_t - TE_t \qquad (2)$$

On this basis, the gross financing need is determined by the budget deficit (respectively surplus), debt amortisation, and the variation of the liquidity reserve (buffer), according to the identity:

$$GFN_t = -BB_t + Amort_t + \Delta Buffer_t \qquad (3)$$

Where:

BB_t – budget balance;

Inc_t – income;

TE_t – total expenses;

GFN_t – means the gross financing requirement in the period *t*.

$Amort_t$ – amortization of debt at the time *t*, i.e. principal repayments (amounts paid to return principal, not interest) that fall due during the period *t*

$\Delta Buffer_t$ – represents the variation in the Treasury's liquidity stock/financing reserves during the period *t*, introduced to reflect the policy of maintaining an operational buffer; a $Buffer_t > 0$ increases GFN, and a $Buffer_t > 0$ reduces it.

For interest expenses, the transmission of interest and exchange rate shocks is reflected gradually, through refinancing and interest rate adjustment, in accordance with the practice of budgetary-fiscal stress testing (IMF, 2016; IMF, 2018).

QUANTIFICATION OF CONTINGENT LIABILITIES

Contingent liabilities are analysed through a fiscal risk register, in which each exposure is assessed along three dimensions: probability of materialisation (P), potential budgetary impact (I), and time horizon (T). The materiality of the exposure is summarised by a composite score, defined as follows:

$$R = P \times I \times T \qquad (4)$$

Where:

P - reflects the probability of activation (e.g., on an ordinal scale of 1–5, from "very low" to "very high");

I - captures the magnitude of the potential impact (e.g., as ranges of % of GDP or as a score of 1–5 correlated with magnitude thresholds);

T - captures the temporal proximity (e.g., 1 = >3 years; 2 = 1–3 years; 3 = <1 year).

Based on the *R* score, exposures are classified into materiality bands (low, medium, high), enabling prioritisation of financial risk management interventions in the field of budgetary and fiscal relations. Mitigation measures are selected according to the type of exposure and include, among others, limiting or capping guarantees, introducing contractual clauses and risk-sharing mechanisms in public-private partnerships (PPPs), provisioning and strengthening reporting requirements, and establishing alert thresholds for state-owned enterprises (SOEs). For disputes with potential budgetary-fiscal impact, the approach aims at management strategies that reduce the probability of materialisation and the size of the potential loss (IMF, 2008; IMF, 2016; Budina and Petrie, 2013; IMF, 2018).

The stress register integration: the test is achieved by introducing the materialisation (total or partial) of contingent liabilities as an additional shock, reflected either in expenditures (e.g., transfers, recapitalisations, compensations) or directly in the gross financing need (GNF), when payments are concentrated in time. This mechanism is operationalised through dedicated scenarios ("S1+Cont", "S2+Cont"), built to capture the amplification of financing pressures under adverse conditions.

INDICATORS OF FINANCING VULNERABILITIES AND CONSTRAINTS

Financing vulnerabilities are assessed through a set of indicators that correlate the structure of public debt with liquidity pressures and exposure to macro-financial shocks. A first indicator concerns foreign exchange risk, measured by the share of foreign exchange-denominated debt in total public debt:

$$FX\_share_t = \frac{D_t^{FX}}{D_t} \qquad (5)$$

A second indicator captures refinancing risk through maturity concentration, operationalised as the share of repayments due in the next 12 months relative to total debt or, alternatively, to budget revenues. In addition, interest expenses reported to revenues are used as indicators of pressure on the fiscal space and the sensitivity of the budget position to increases in the cost of financing. The gross financing need (GFN), expressed as a percentage of gross domestic product (GDP), is a synthetic indicator of market pressure and refinancing dependence in scenarios, with increased relevance in stress conditions (IMF, 2016; IMF, 2018).

The limitations of the analysis derive mainly from the granularity and low comparability of public information on contingent liabilities, especially for state-owned enterprises (SOEs), litigation, and public-private partnerships (PPPs), as well as from potential methodological breaks in the statistical series. Under these conditions, the scenarios are documented transparently by presenting the parameters, projection rules, and transformations applied to the data, and the results are interpreted as risk ranges and orders of magnitude of pressures on the budget balance, public debt and gross financing need, not as point estimates.

FISCAL-BUDGETARY POSITION OF MOLDOVA IN 2024: STRESS TESTING BASELINE SCENARIO

The stress-testing calibration starts from the fiscal-budgetary position observed in 2024, used as a reference scenario for the initial levels of the aggregates and for the set of financing variables that enter into the construction of the gross financing need and the debt trajectory. From the macroeconomic perspective, nominal GDP was estimated at 323.8 billion lei (current market prices), and the real annual growth rate was 0.1% (NBS, 2025). Under these conditions, the variation of the tax base is weak, and the dynamics of budgetary revenues remain constrained; in the model, the transmission of macro shocks to revenues is captured through elasticities/ reaction coefficients (reported in the methodological annexe), which implies a limited potential for endogenous correction of budgetary deviations through growth, in the absence of discretionary adjustments.

On the execution side, the state budget recorded a deficit of 13.1 billion lei in 2024, approximately 4% of GDP (MF, 2025). The value sets the order of magnitude of the initial imbalance and serves as a benchmark for the amplitude of simulated deviations in stress scenarios, including for assessing effects on the GFN. On 31 December 2024, state debt accounted for 37.5% of GDP (MF, 2025). In stress testing, this anchor becomes relevant through two mechanisms that enter directly into the debt dynamics equations: (i) the interest rate channel, which influences the marginal cost of refinancing and, through portfolio rollover, interest and GFN expenses; (ii) the exchange rate channel, which affects the stock and debt service to the extent that the portfolio includes a component denominated or indexed in foreign currency, with implications for foreign exchange risk and refinancing risk.

To triangulate the order of magnitude through an external source, the IMF macro-fiscal framework places the fiscal deficit in 2024 at around 4.4% of GDP (IMF, 2024). The difference with the state budget deficit is treated as a result of distinct statistical parameters and methodologies, so the IMF figure is used strictly as an anchor of magnitude, not as an accounting equivalent of execution. Overall, the initial setting indicates an already significant deficit and a level of debt that makes the assessment of interest rate and exchange rate shocks in stress scenarios material (MF, 2025; IMF, 2024).

SCENARIO RESULTS: FISCAL BALANCE, DEBT AND GROSS FINANCING NEED (GFN)

The stress-test framework is formulated to preserve the accounting identities of the budget and financing blocks, ensuring the internal coherence of the transmission between macro-financial shocks and fiscal variables. The budget balance is defined by equation (2) as the difference between total revenues and total expenditures, and the gross financing need (GFN) is determined by equation (3) as a function of the deficit (respectively the surplus), debt amortisation, and the variation of the liquidity buffer. In adverse scenarios, the deterioration of the balance results from the dual mechanism of the contraction of economic activity (erosion of the tax base and, implicitly, of revenues) and the short-term rigidity of some categories of expenditures, including debt service, such that discretionary adjustments cannot fully absorb the shock in the immediate horizon (NBS, 2025; MF, 2025a).

The year 2024 provides a quantitative anchor for this mechanism. Nominal GDP is estimated at around 323.9 billion lei, and real growth is almost zero (0.1%), which limits the support provided to revenues by the dynamics of the economic base (NBS, 2025). At the same time, the state budget deficit is around 4.0% of GDP (approx. 13.1 billion lei), which serves as the starting point for calibrating the imbalance (MF, 2025b). Interest expenses are around 1.33% of GDP (approx. 4.3 billion lei) and become immediately relevant in stress testing when interest rate shocks affect the marginal cost of refinancing and, through portfolio rollover, interest expense and GFN (MF, 2025b).

In the debt channel, shock transmission operates simultaneously through the accumulation of deficits and through changes in the differential between the effective cost of financing and the dynamics of nominal GDP (r–g mechanism). Even under conditions of a moderate initial level of debt (below 40% of GDP in 2024), the combination of weak real growth, volatile deflator/ inflation and rising interest rates can accentuate the slope of the debt trajectory, with first-order effects on the refinancing risk (MF, 2025). In this architecture, the GFN tends to become the critical variable in stress, as it reflects not only the current deficit, but also the volume of principal refinancing and the policy of maintaining or rebuilding liquidity reserves. As a result, financing pressures may increase rapidly, especially in years with concentrated maturities and in a restrictive market regime, when the quantity and price of financing become effective constraints on fiscal adjustment.

Thus, for Moldova, the profile on scenarios S0–S2 shows an orderly and cumulative deterioration of the three target variables (BB, debt, GFN), with effects that amplify towards the end of the horizon, exactly as suggested by the r–g mechanism and the role of GFN as a constraint variable.

In the baseline scenario (S0), the budget balance remains around −4% of GDP in 2024–2026 (−3.9; −4.1; −4.0), after which it gradually improves to −3.5% in 2028. Government debt rises almost linearly from 37.8% of GDP in 2024 to 45.0% in 2028, suggesting persistent debt accumulation. The GFN increases from 4.5% to 5.3% of GDP, suggesting increasing financing pressure even without shocks, amid refinancings and the maintenance of amortisations in the debt profile.

In the moderate adverse scenario (S1), the deterioration of the budget balance compared to S0 is relatively stable, but material: between −0.4 p.p. (2024) and −0.8 p.p. (2026–2027), remaining at −0.7 p.p. in 2028. This deviation is gradually translated into the stock: the debt exceeds the baseline trajectory by +0.7 p.p. in 2024 and reaches +3.5 p.p. in 2028 (48.5% vs 45.0%). In parallel, the GFN increases by +0.5 p.p. in 2024 and by +1.0 p.p. in 2028 (6.3% vs 5.3%), indicating that financing pressure increases not only "through the deficit" but also through the refinancing component and buffer management as conditions become more restrictive.

In the severe adverse scenario (S2), the dynamics are steeper and concentrated in the second part of the interval. The budget balance deteriorates from −5.0% (2024) to a minimum of −5.9% (2027), remaining at −5.7% in 2028; as a deviation from S0, it increases from −1.1 p.p. (2024) to −2.2 p.p. (2028). The cumulative effect on the debt is substantial: the difference from S0 rises from +1.7 p.p. in 2024 to +7.5 p.p. in 2028, when the debt reaches 52.5% of GDP. GFN becomes the variable that most directly "signals" the constraint: it increases from 5.8% in 2024 to 8.0% in 2028, i.e. +1.3 p.p. above S0 in 2024 and +2.7 p.p. in 2028. This profile suggests a rapid increase in financing pressure in the short term, in line with the hypothesis that, in stress, the gross financing need simultaneously aggregates the current deficit, principal refinancing and liquidity policy.

INTEGRATION OF CONTINGENT LIABILITIES AND MATERIALITY

Integration of contingent liabilities extends stress testing beyond macro-fiscal sensitivities captured by the balance and debt, by including rare, "tail" risks that are activated episodically but can generate concentrated fiscal pressures. In the context of the Republic of Moldova, this analytical layer is justified by the nature of some exposures that become budgetary relevant when they materialize (guarantees, state-owned enterprises, energy sector, litigation, disasters and PPP commitments), as well as by good practice recommendations on the identification, quantification and systematic reporting of fiscal risks (IMF, 2016).

The materiality of exposures is assessed by an ordinal prioritisation index, defined by equation (4), R=P×I×TR = P \times I \times TR=P×I×T. In this formulation, PPP reflects the probability of activation on a scale of 1–5 (from "very low" to "very high"), III captures the magnitude of the potential impact, calibrated on thresholds in % of GDP, and TTT encodes the temporal proximity (1: >3 years; 2: 1–3 years; 3: <1 year). The RRR index is used to prioritise and select mitigation measures, without being interpreted as an expected loss in a probabilistic sense. In order to anchor the scoring in orders of magnitude relevant for a small economy and to maintain comparability between heterogeneous exposures, the proposed thresholds for III are: I=1I=1I=1 <0.1% of GDP; I=2I=2I=2 0.1–0.3%; I=3I=3I=3 0.3–1.0%; I=4I=4I=4 1.0–3.0%; I=5I=5I=5 >3.0% (with internal marking for systemic impact at >5% of GDP). On this basis, exposures are grouped into operational alert classes: low (≤10\le 10≤10), moderate (11–25), high (26–45) and very high (>45), in line with the "heatmap" logic used in fiscal risk management frameworks (IMF, 2016). The detailed register of exposures and P–I–T scoring is presented in Annexe A.

The integration in the S0–S2 scenarios is performed as a "layer" on top of the BB–debt–GFN trajectories already estimated for macro-financial shocks, precisely to separate a continuous transmission channel (gradual deterioration of the fiscal position and tightening of financing conditions) from a discrete channel (activations with a concentrated temporal profile). In the S1 scenario, the activation of an exposure classified as "high" (R=26R=26R=26–45), introduced in the year of materialisation in the form of a one-off shock on expenditure and/or a concentrated increase in the gross financing need, depending on the nature of the obligation (e.g. transfers/recapitalisations versus quick payments associated with guarantees). In the S2 scenario, either the activation of a "very high" exposure (R>45R>45R>45) or the simultaneous activation of two "high" exposures with T=3T=3T=3 is considered, to capture situations in which financing pressures increase abruptly. This specification aims to reproduce the essential property of contingencies: they can convert an adverse but incremental trajectory into an immediate financing need, with persistent effects on debt when covering the shock involves borrowing (IMF, 2016).

Interpreting the results through the GFN lens is central in this framework. While the budget balance reflects deterioration through revenue and expenditure mechanisms, the GFN reacts more quickly to the materialisation of contingencies, as it aggregates the current deficit, principal refinancing and liquidity policy (buffer). Therefore, two scenarios may have relatively close balance profiles, but may diverge significantly in terms of financing constraints when a contingent liability with concentrated payment is activated. In a more restrictive market environment, this jump in the GFN takes on operational significance: it influences the timing of issuances, the composition of financing and the marginal cost, amplifying the risk of refinancing even before the full effects are observed in the debt stock. In this sense, the inclusion of contingent liabilities is not only descriptive but also enhances stress testing's ability to assess fiscal resilience under adverse conditions by explicitly linking the macro-financial channel with the discrete channel of rare, high-impact events (IMF, 2016).

CONCLUSIONS

The stress-testing analysis applied to the Republic of Moldova shows that fiscal vulnerability is not determined exclusively by the initial level of debt, but by the combination of a persistently negative budget balance, the sensitivity of the cost of financing and the profile of the gross financing need. In the reference scenario, the fiscal position improves slowly, but the debt dynamics and the gradual increase in the GFN indicate a financing constraint that remains relevant even in the absence of major shocks. In the adverse scenarios, the deterioration of the balance is transmitted cumulatively to the debt stock, and financing pressures increase more rapidly than the deficit-only reading would suggest, highlighting the role of refinancing channels and the marginal cost of borrowing.

The comparative results indicate a significant asymmetry between the balance and financing pressure paths: differences between the scenarios are moderate for BB but substantial for GFN, particularly towards the end of the projection horizon. This finding is critical for assessing resilience, as the GFN synthesises the current deficit, principal refinancing and liquidity policy, so that its variations are directly relevant to the issuance schedule, the funding mix and refinancing risk. The integration of contingent liabilities strengthens the analytical value of the framework by introducing rare risks with concentrated fiscal impact, which can transform gradual debt pressures into abrupt financing needs. The materiality index, based on probability, impact and temporal proximity, provides a replicable prioritisation scheme compatible with medium-term budgetary planning, allowing contingencies to be treated as a "layer" over macro-financial scenarios. The direct implication is that fiscal resilience depends not only on the average trajectory of indicators, but also on the institutional capacity to anticipate activations with a concentrated temporal profile that immediately affect the GFN and, through financing, the debt trajectory.

From a policy perspective, the results support three directions: (i) strengthening debt and refinancing risk management (maturities, currency, cost), (ii) explicitly integrating GFN into sustainability assessment, alongside balance and debt, and (iii) strengthening fiscal risk governance through operational registers, alert thresholds and regular reporting mechanisms that link contingent exposures to macro-fiscal scenarios. Overall, the proposed framework provides a coherent basis for simultaneously interpreting "continuous" (macro-financial) and "discrete" (contingent) vulnerabilities, providing a more complete reading of financing constraints and risks of deviation from the baseline trajectory.

The main limitations stem from the reliance on calibration assumptions (elasticities, refinancing rules, buffer treatment) and the level of granularity available for contingent liabilities. A natural extension of the research is to refine the parameters based on historical series and the structure of the debt portfolio, and to explicitly quantify the contingencies through alternative activation scenarios, so that the contributions to GFN and debt can be systematically decomposed and compared across risk sources.

REFERENCES

Aslan, C., & Duarte, D. (2014). *How Do Countries Measure, Manage, and Monitor Fiscal Risks Generated by Public-Private Partnerships?* Policy Research Working Paper, WPS 7041. World Bank. https://documents1.worldbank.org/curated/en/485861468307741430/pdf/WPS7041.pdf

Biroul Naţional de Statistică al Republicii Moldova. (2025, 17 martie). *Produsul Intern Brut în trimestrul IV şi anul 2024*. https://statistica.gov.md/ro/produsul-intern-brut-in-trimestrul-iv-si-anul-2024-9497_61702.html?utm_source_

Budina, N., & Petrie, M. (2013). Managing and Controlling Fiscal Risks. In: M. Cangiano, T. Curristine, & M. Lazare, M. (Eds.) *Public Financial Management and Its Emerging Architecture*. Washington, DC: International Monetary Fund. https://www.elibrary.imf.org/display/book/9781475531091/ch005.xml

Covalschi, T., & Lazăr, S. (2016). The sustainability of public finances in Republic of Moldova under EU fiscal rules. *Scientific Annals of Economics and Business, 63*(2), 149–159. https://saeb.feaa.uaic.ro/index.php/saeb/article/view/1009?utm_source

European Commission. (2020, January 24). *Debt Sustainability Monitor 2019*. European Economy. Institutional Paper 120. Directorate-General for Economic and Financial Affairs. Luxembourg: Publications Office of the European Union. https://economy-finance.ec.europa.eu/publications/debt-sustainability-monitor-2019_en_

International Monetary Fund. (n.d.). *Fiscal Risk Management*. https://www.imf.org/en/topics/fiscal-policies/fiscal-risks

International Monetary Fund. (n.d.). *Fiscal Stress Test (FST). Fiscal Risks Toolkit*. https://www.imf.org/en/topics/fiscal-policies/fiscal-risks/fiscal-risks-toolkit/fiscal-risks-toolkit-fst

International Monetary Fund. (2008, May 21). *Fiscal Risks-Sources, Disclosure, and Management*. Washington, DC: IMF. https://www.imf.org/external/np/pp/eng/2008/052108.pdf

International Monetary Fund. (2016). *Analyzing and Managing Fiscal Risks: Best Practices*. Washington, DC: IMF. https://www.imf.org/external/np/pp/eng/2016/050416.pdf

International Monetary Fund. (2018). Pillar III: Fiscal Risk Analysis and Management. In: *Fiscal Transparency Handbook* (pp. 95-136). Washington, DC: International Monetary Fund. https://www.elibrary.imf.org/downloadpdf/display/book/9781484331859/ch04.pdf

International Monetary Fund. (2024). *Republic of Moldova: Sixth reviews under the Extended Credit Facility and Extended Fund Facility arrangements, request for modifications of performance criteria, and second review under the Resilience and Sustainability Facility arrangement-Press release; staff report; and statement by the Alternative Executive Director for the Republic of Moldova*. IMF Staff Country Report 355). https://doi.org/10.5089/9798400297151.002

Ministerul Finanţelor al Republicii Moldova. (2025a). *Datoria de stat a Republicii Moldova la 31 decembrie 2024*. https://mf.gov.md/sites/default/files/Buletin%20statistic%20dec%202024.pdf?utm_source_

Ministerul Finanţelor al Republicii Moldova. (2025b). *Raport privind executarea bugetului de stat pentru anul 2024*. https://mf.gov.md/ro/trezorerie/rapoarte-privind-executarea-bugetului/rapoarte-anuale

Toacă, Z., Staver, L., Stratan, A., Lopotenco, V., & Cociug, V. (2025). Forecasting Moldova's monthly exports using autoregressive models with seasonal dummies. *Cogent Business & Management, 12*(1), 2519988. https://doi.org/10.1080/23311975.2025.2519988

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