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1.

**From crisis to permanent integration?
EU Policy after Covid: ECB, Fiscal Rules and
the RRF under Scrutiny**

Barbara Kolm, PhD, Associate professor

FROM CRISIS TO PERMANENT INTEGRATION? EU Policy after Covid: ECB, Fiscal Rules and the RRF under Scrutiny

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ABSTRACT:

The European Union was founded on the promise of peace, open markets and limited government. Over time, however, it has evolved into a system where crises regularly serve as opportunities for centralisation. The COVID-19 pandemic marked a turning point. The ECB's Pandemic Emergency Purchase Programme (PEPP) and the unprecedented issuance of joint debt through NextGenerationEU (NGEU) and its Recovery and Resilience Facility (RRF) stabilised markets and financed investment. Yet these "emergency" tools have blurred the line between temporary solidarity and permanent integration. PEPP bought time but entrenched the expectation of central-bank intervention; the 2024 reform of EU fiscal rules increased technical complexity but left discretion concentrated in Brussels; and NGEU established a precedent for Eurobond-like debt without democratic debate or proper safeguards. Five years on, the long-term consequences are clear: executive power has grown, subsidiarity has weakened, and citizens face the costs of common debt without clear accountability. The central question is whether the EU can return to rules, transparency and national responsibility—or whether crisis governance has locked Europe into a permanent fiscal-monetary Leviathan.

Key words: European Union governance; Fiscal rules reform; NextGenerationEU (NGEU); Recovery and Resilience Facility (RRF); Pandemic Emergency Purchase Programme (PEPP); Monetary and fiscal integration; Democratic accountability.

1. INTRODUCTION

Is the European Union still conducive to classical-liberal ideals—limited government, free trade, competition among jurisdictions—or has it become a system in which crisis policies entrench central power? The pandemic made this question inescapable. In early 2020, the ECB launched PEPP and Member States agreed, for the first time at scale, to issue joint EU debt to finance national plans under the RRF. Fiscal rules were suspended and later rewritten. These measures worked against panic. But they also set a template that could outlive the emergency. The core argument of this paper is that Europe's economic and political success has historically come from openness, competition and subsidiarity, and that the EU should beware of turning temporary crisis tools into permanent integration by stealth. The discussion draws on recent academic evidence from finance, macroeconomics and EU public law.

2. THE ORIGINAL FOUNDING OF THE EU

The early European project after 1945 was a practical, decentralised peace programme. It reduced barriers and made war between ancient rivals materially pointless. Its moral core aligned with classical-liberal thought: voluntary cooperation, competition of jurisdictions, and subsidiarity. Even from the start, however, two competing logics were present: one of open coordination among sovereign states, and one of central rule-making. When the latter dominates, diversity shrinks into one-size-fits-all regulation. The lesson of the "small steps" method is two-edged: incremental integration can deliver efficiency gains—but also accumulate authority at the centre when crises are used to stretch the system.

3. THE COVID DESCENT AND ITS LEGACY

During the pandemic, Brussels and national capitals acted with speed. Many measures were understandable as emergency tools; their long-run effects deserve scrutiny. Monetary policy. The ECB's PEPP calmed markets in March 2020. Academic studies show that spreads compressed around announcements and purchases, and that communication had independent effects on sovereign yields (Camarero Garcia et al., 2024; Pinto and Costa, 2023). In corporate bond markets, too, PEPP lowered risk premia, especially for firms exposed to COVID-19 shocks (Cohen and Furman, 2024). This

confirms a backstop-cum-signalling channel in acute stress. Yet as net purchases ended and reinvestments wound down by late 2024, spreads again reflected country risk. Central-bank balance sheets can buy time; they cannot solve solvency or productivity. Treating PEPP-style activism as permanent would blur fiscal and monetary roles and weaken reform incentives.

A further legacy of this monetary expansion has been inflationary pressure. The surge in liquidity, combined with supply shocks from energy markets, fuelled the sharpest inflation episode in the euro area since the 1970s. Critics note that the ECB's delayed exit from emergency programmes limited its room to react quickly. The result was a belated tightening cycle that hit heavily indebted member states harder and revived the debate on "fiscal dominance": the risk that monetary policy remains hostage to fiscal fragility. In this sense, PEPP did not only stabilise markets in 2020; it also constrained policy space in 2022–2024, with consequences still felt today.

Fiscal rules. The suspension of the Stability and Growth Pact was followed by a 2024 reform that centres surveillance on DSA and net-expenditure paths. Tailoring adjustment to each country is sensible. The weakness is model discretion: different, plausible assumptions about multipliers and potential growth can flip a country's assessment and, with it, the required fiscal effort (Heimberger et al., 2024). Earlier work shows how opaque models can become performative—they drive policy rather than merely describing reality (Heimberger, Huber and Kapeller, 2020). Without transparent scenario sets and independent replication, the new framework risks legitimising central discretion while claiming to be rules-based.

Comparison to the Euro crisis. In the sovereign-debt crisis of 2010–2012, the EU relied on temporary rescue funds (EFSF, later ESM) and strict conditionality. By contrast, the pandemic response softened conditionality and pooled risks up front. This marked a structural shift: from "discipline first, solidarity second" to "solidarity now, discipline later" (De Grauwe, 2018). It also established a dangerous pattern: every new crisis becomes a justification for more centralisation, but the extraordinary instruments rarely disappear afterwards. Europe risks becoming stuck in a mode of permanent emergency governance, where the exception quietly becomes the rule.

4. NGEU AND THE RRF: BETWEEN INNOVATION AND PERMANENT INTEGRATION

Legal analysis is clear that NGEU was achieved within the Treaties, but it carries "profound constitutional consequences" by setting a precedent for joint debt and by shifting power to EU executives (Fabbrini, 2022). Governance relies on layered conditionality: plans are negotiated ex ante, with milestone-based disbursements; this coordinates priorities but can dilute ex-post evaluation and blur accountability between Union and Member States (Fasone and Simoncini, 2024).

Accountability gaps. Comparative work describes "co-ordinative conditionality": plans are negotiated up front, sanctions are soft, and politics moves to the approval stage rather than the evaluation stage (Moury, Di Mascio and Stolfi, 2024). Paparella (2025) calls the RRF a "new legal technology": heavy on ex-ante paperwork, lighter on ex-post results unless auditing is tightened. This complexity risks making it harder for citizens or national parliaments to track whether money actually produced results.

Democratic accountability. A deeper problem is the bypassing of national parliaments. Budget rights—the "power of the purse"—are at the core of democracy. By shifting financial resources through NGEU, the Commission and Council executives gained influence without direct electoral legitimacy. Scholars speak of "federalism without a demos": fiscal capacity is centralised, but without a common political body to control it. This imbalance risks fuelling mistrust in both creditor and debtor countries: taxpayers feel exposed, while recipients perceive EU control without domestic debate.

Macro effects. ECB researchers find modest but persistent output gains if funds are absorbed and reforms implemented (Bańkowski et al., 2021; Bańkowski et al., 2024). A critical reading is that "modest" effects do not, by themselves, justify making joint borrowing permanent—especially if absorption is uneven and if results are hard to verify. Some legal scholars even frame the RRF as a genuine breakthrough in European economic policy coordination, marking a qualitative change in EU governance (Mahieu, Brans and Schulz, 2024).

Comparison with ESM. The ESM created in the Euro crisis was limited in size, with strong conditionality and no own taxation powers. NGEU, by contrast, uses EU borrowing capacity and is serviced by new own

resources. This marks a shift toward fiscal federalisation without explicit Treaty change.

5. EUROBONDS AND THE FUTURE OF EU INTEGRATION

Proposals for permanent Eurobonds promise cheaper financing and solidarity. The risk is to mutualise liabilities before risks are reduced. Classic analyses argue that sharing risk without strong national adjustment weakens incentives and invites political conflict (Brunnermeier, James and Landau, 2016; De Grauwe, 2018).

Eurobonds can only be sustainable if three conditions are met:

- Transparent, replicable DSAs that make risks visible.
- Strong, independent auditing that ties disbursements to real results.
- Automatic burden-sharing rules if targets are missed.

Scenario 2030. Imagine that by 2030, RRF debts are rolled over rather than repaid. The EU budget would face growing interest costs, forcing either higher own resources (new taxes at EU level) or cuts in existing programmes. Net contributors would resist higher transfers, while net recipients would demand stability. The result could be new conflicts between north and south, and between smaller states and larger ones. What began as a temporary health-crisis tool would have turned into a structural debt union. Without clear rules, Eurobonds risk turning temporary solidarity into a permanent soft budget constraint. They also raise democratic concerns: joint debt shifts fiscal power to EU executives less accountable to national voters. Before locking in Eurobonds, Europe must make a clear choice: move openly toward a federal union with hard central rules, or return to subsidiarity and market discipline. Half-way compromises blur responsibility and encourage blame-shifting.

6. POLICY PROPOSALS

- **Transparency in DSAs.** Publish full models and scenario ranges; mandate replication by fiscal councils and universities (Heimberger et al., 2024; Heimberger, Huber and Kapeller, 2020).

- **Results not checklists.** Link RRF disbursements strictly to measurable

outcomes; expand ex-post evaluation and clawbacks (Fasone and Simoncini, 2024; Paparella, 2025).

- **Risk reduction before risk sharing.** Any future Eurobond scheme must follow national clean-ups in banking, pensions and taxation (Brunnermeier, James and Landau, 2016; De Grauwe, 2018).

- **Sunset-and-review clauses.** All joint debt should expire automatically unless renewed after independent review (Fabbrini, 2022).

- **Markets first, central banks last.** Encourage capital-market development; reserve balance-sheet activism for true emergencies (Cohen and Furman, 2024; Camarero Garcia et al., 2024).

7. CONCLUSION

Europe's pandemic response stabilised markets and supported investment. But the cost was a shift toward centralised finance and model-driven discretion. PEPP bought time; it cannot be a standing policy. The new fiscal rules tailor paths but depend on opaque assumptions unless opened to scrutiny. NGEU/RRF is a Treaty-compatible innovation with constitutional ripples. Eurobonds without prior risk reduction would entrench moral hazard. Looking ahead, crises will not stop with COVID. Climate change, energy shocks and defence spending will all test EU finances. If the precedent of NGEU becomes the default, Europe risks sliding into permanent joint debt without openly debating the democratic and constitutional consequences. A rules-first agenda—transparent DSAs, results-based conditionality, sunset clauses, and subsidiarity—would preserve stability without losing accountability. This is the only way to ensure that Europe remains a community of open societies rather than a permanent emergency Leviathan.

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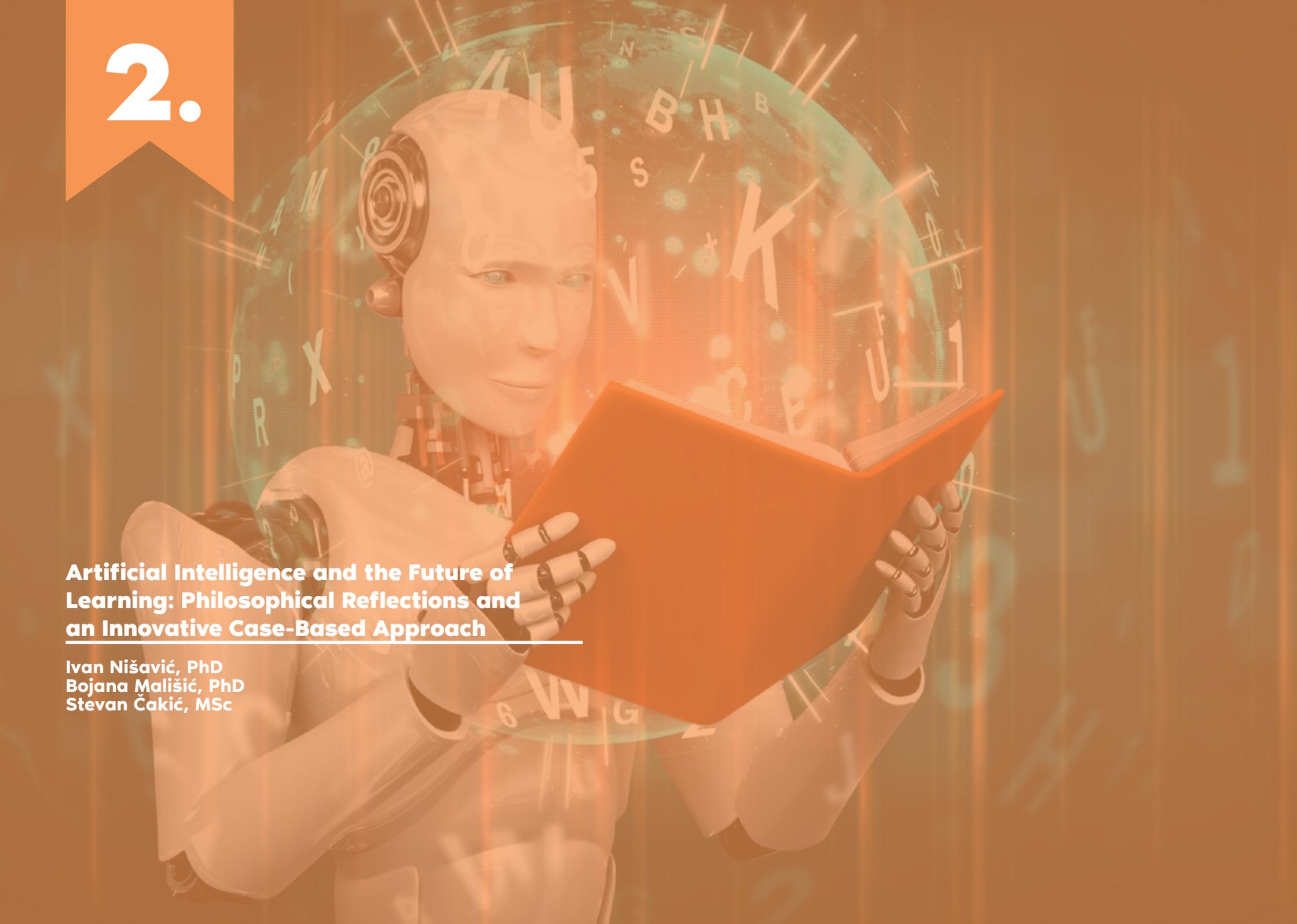


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2.

Artificial Intelligence and the Future of Learning: Philosophical Reflections and an Innovative Case-Based Approach

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Artificial Intelligence and the Future of Learning: Philosophical Reflections and an Innovative Case-Based Approach

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ABSTRACT:

This paper explores the complex intersection of artificial intelligence (AI) and education through a philosophical lens, presenting a case study of an innovative approach and course titled 'Artificial Intelligence in Education.' at University of Donja Gorica developed within MAGNET project. It reflects on the epistemological, ethical, and pedagogical implications of integrating AI into contemporary learning environments, drawing on classical pedagogical theories (Plato, Rousseau) and contemporary research. The study examines AI's impact on knowledge transmission, student autonomy, and the role of educators, while also addressing concerns about bias, equity, and the potential for algorithmic control. Ultimately, it argues for a balanced approach that leverages AI's potential for personalized learning and efficient knowledge delivery while safeguarding humanistic values and fostering critical thinking, creativity, and ethical awareness.

Keywords: artificial intelligence, education, philosophical lens, innovation

1. INTRODUCTION

Artificial intelligence (AI) in education refers to systems capable of performing tasks traditionally requiring human intelligence: reasoning, pattern recognition, adaptive response, and autonomous decision-making. New trends show that attitudes of using AI in education are now shifting. By mid-2024, 84% of educators report actively using AI tools in their teaching practice, and 74% plan to increase their use in 2025 (Policar, 2024). This surge in adoption correlates with growing AI literacy and exposure. For example, New York City schools reversed an early ban on ChatGPT and found that 65% of their teachers felt more passionate about teaching due to AI integration (Policar, 2024). As one district superintendent put it, "AI is here to stay... it cannot be feared but in education, we better understand its use and embrace it or we will be left behind."¹ As teachers become more familiar with AI, many are moving from fear to cautious enthusiasm. Despite increased uptake, teachers' perceptions of AI's value remain mixed. A late 2023 Pew Research Center survey of U.S. K-12 teachers found that a majority were unsure or saw more downsides than benefits to AI in education (Lin, 2024). Only 6% of teachers believed AI tools do more good than harm, whereas 25% felt they do more harm. The rest either see a mix of impacts or are undecided (Lin, 2024). High school teachers have been especially wary. About 35% view classroom AI negatively, compared to 19% of elementary teachers (Lin, 2024). Major concerns include potential misuse by students, increased cheating and the fear of being replaced or devalued as instructors.² Most educators recognize that AI will significantly affect teaching and learning the near future. In the aiEDU Pulse report of K12 staff, 78% of respondents said AI will definitely or probably impact their daily lives and over 80% believe teacher professional developers should now include training focused on AI. Around 75% even advocate introducing AI concepts into school curricula to help students understand the implications of this technology (aiEDU, 2024). In China, from the 2025 school year, education about AI started in primary school. Teachers see promise in AI's benefits but remain mindful of its pitfalls.

Craft (1984) notes that the English word "education" has two distinct Latin roots: Educare: Meaning "to train or to mold." Educere: Meaning "to lead out." The article emphasizes that while both meanings are represented in the word "education," they represent quite different concepts: Educare focuses on preservation, knowledge transfer, and shaping individuals according to existing norms. Educere emphasizes preparing a new generation

¹ <https://www.k12.com>

² aiEDU. (2024). Pulse survey report. Retrieved October 1, 2025, from <https://www.aiedu.org/pulse>

for change, fostering problem-solving skills, and promoting creativity.

The dual etymology of 'education,' encompassing both 'educare' and 'educere,' highlights a fundamental tension within educational philosophies and practices. While 'educare' emphasizes the transmission of established knowledge and skills necessary for societal integration and conformity, 'educere' prioritizes the *development of critical thinking, innovation, and adaptability to navigate future uncertainties*. This distinction is not merely semantic; it reflects divergent approaches to curriculum design, pedagogy, and assessment. An overemphasis on 'educare' may result in a system that produces proficient but uninspired individuals, ill-equipped to address novel challenges. Conversely, neglecting 'educare' risks undermining the foundational knowledge and cultural literacy essential for informed decision-making and responsible citizenship. Therefore, a nuanced understanding of the interplay between 'educare' and 'educere' is crucial for fostering educational systems that effectively prepare individuals for both present realities and future possibilities.

The tension between these two approaches is a central theme in discussions about education. The article suggests that a balance between educare and educere is essential for a well-rounded education system. In practice, these systems include adaptive learning platforms that customize instructional content for individual students, automated grading engines that provide immediate feedback, AI-driven tutors that emulate one-on-one instruction, and predictive analytics that forecast learner performance. Recent data suggests a potential decline in the use of AI platforms among students during summer months (Wilkins, 2025), possibly indicating a reliance on these technologies primarily for structured learning and assessment within formal educational settings. This raises concerns about the potential for over-dependence on AI to mold and train students, rather than leading them out to question, explore, and innovate.

Ultimately, the effective integration of AI in education hinges on striking a balance that leverages the benefits of personalized learning and efficient knowledge delivery while safeguarding opportunities for independent thought and creative problem-solving. As algorithms assume positions of epistemic authority, it becomes critical to consider whether machines can genuinely 'teach' in the broader sense of fostering intellectual curiosity and preparing students for a rapidly changing world. By framing AI as more than a collection of tools, this inquiry asks: Can machines genuinely teach?

More provocatively, what does it mean to learn when algorithms assume positions of epistemic authority?

Moreover, the integration of AI into educational settings is deeply enmeshed with economic and entrepreneurial imperatives. Efficiency gains, personalization at scale, and continuous technological innovation have been commodified, aligning closely with neoliberal values such as competition, self-optimization, and disruptive market dynamics. As a result, AI is reshaping not only how we learn but also why and for whom education exists. This paper examines the epistemological, ethical, and societal implications of AI in education, with particular attention to its impact on human development and prevailing economic paradigms.

2. LITERATURE OVERVIEW

2.1. A very brief reflection on some classical pioneers of pedagogical thought, Plato and Rousseau

Through the perspectives of classical pedagogical theorists, primarily Plato and Rousseau, this study seeks to identify resonances between their foundational concepts and contemporary AI-enhanced learning approaches. Despite the centuries-long divide between these thinkers and today's rapidly evolving (dis)course on education, we contend that enduring principles from their work can illuminate the promises and pitfalls of an AI-mediated educational landscape.

We now turn to Plato's Allegory of the Cave as a heuristic for understanding the ontological stakes of AI-mediated learning. In Book VII of *The Republic*, the cave's prisoners mistake mere shadows for reality; similarly, contemporary learners risk engaging with algorithmically generated simulations of knowledge rather than with living teachers or concrete experiences. This analogy compels us to ask whether AI platforms constitute a new "shadow" on the educational cave wall; one so polished that students might conflate optimized, data-driven content with holistic understanding and genuine wisdom (Nevin, 2021, p. 49).

Moreover, another critical question arises: does the exceptionally rapid and perhaps inexorable advance of AI technologies draw us deeper into a Platonic cave from which we can no longer attempt to emerge? While this may sound overtly metaphorical, the point remains that if we remain fixated

on these modern shadows – shadows that, in Plato’s view, signify what must be recognized as “not the real thing,” the counterfeit of knowledge of the Forms – we err if we now accept them as the sole truth or the only valid form of knowing.

Nevin meticulously unpacks Plato’s emphasis on the cave’s fire as the primary instrument of illusion. She argues that the fire, like the opaque data pipelines of today’s AI systems, both produces the shadows and conceals the mechanisms of projection, thereby reinforcing the prisoners’ ignorance (Nevin, 2021, p. 47). Translating this to modern pedagogy, AI engines become the new cave-fires: their algorithms not only generate personalized “knowledge shadows” but also mask the biases and value-judgments embedded within their training data.

For Plato, genuine education is a soulful transformation guided by dialectic, an inner ascent toward the light of universal truths. Yet AI’s data-driven feedback loops emphasize quantifiable metrics such as test scores, completion rates, engagement time... potentially sidelining the formative, self-reflective journey at the heart of spiritual and moral growth. As Nevin highlights, the philosopher’s dialectic is precisely the tool by which the freed prisoner interrogates the shadows and turns toward the sun; without this dialectical ascent, any claim to understanding remains as narrow as the cave itself (Nevin, 2021, p. 55). If the cave’s fire becomes an AI engine, what remains of the dialectical ascent toward truth? A question of paramount importance is equally pressing for Platonic philosophy and for dominant neoliberal educational practices: is it sufficient for education merely to satisfy the requirements imposed by standardized benchmarks, or must we also attend to that which is far less amenable to measurement (if not altogether immeasurable) such as learners’ well-being, general sense of comfort and satisfaction, mental health, the cultivation of virtuous character, the fostering of cooperation and empathy, and an appreciation for diversity?

2.2. Rousseau: Natural Development vs. Hyper-Socialization

Jean-Jacques Rousseau, in his seminal work *Émile*, advocates for an education that nurtures the natural development of the child, deliberately shielding it from the corrupting influences of society. His educational experiment was not aimed at molding individuals into predetermined ideals, but rather at cultivating the unique potential of each person through a “personalized and inimitable educational program of anti-socialization” (Nevin, 2021, p. 25). Rousseau’s pedagogical vision is thus rooted in the

belief that true autonomy and moral integrity can only emerge when the child is protected from premature social conditioning and allowed to unfold according to its own inner rhythm.

In stark contrast, artificial intelligence particularly in its current applications in education, embodies a hyper-socializing force. Through perpetual connectivity, algorithmic peer comparisons, gamified metrics such as badges and leaderboards, and the pervasive mining of behavioral data, AI platforms often embed social pressures directly into the learning process. Rather than isolating knowledge from societal expectations, these systems risk suppressing individual creativity under the weight of quantified competition. In this sense, AI appears antithetical to Rousseau’s vision of autonomous self-discovery.

Yet, a more nuanced question arises: could AI, if designed with principles of developmental psychology and pedagogical sensitivity, actually serve Rousseau’s aims? Could it function as a kind of “protective tutor,” offering children tailored experiences that respect their innate pace and shield them from premature socialization? The tension between AI’s capacity for personalization and its tendency toward surveillance and standardization remains unresolved. Rousseau’s educational model sought to counteract the corrosive effects of a flawed society by deliberately limiting the child’s exposure to premature socialization. To achieve this, he constructed carefully curated, fictional environments designed to simulate idealized experiences that would foster moral and intellectual autonomy. Might AI, paradoxically, be capable of constructing such worlds: digital environments that foster solitude, reflection, and moral imagination?

In contrast to the data-driven approach of AI, Biesta (Biesta, 2021) advocates for an education that prioritizes human subjectivity and engagement with the world. This perspective suggests that while AI can be a valuable tool for personalizing learning, it should not replace the human element of teaching and the importance of students developing their own unique perspectives and values. Education, according to Biesta, should be about more than just acquiring knowledge and skills; it should be about becoming a thoughtful and responsible citizen in a complex world or responsible citizen of a global world. On the other hand, while acknowledging the potential pitfalls of AI in education, Holmes, Bialik, and Fadel (2021) provide a more optimistic outlook, emphasizing the importance of thoughtful design and ethical considerations. They argue that AI can be a powerful tool for personalizing learning, providing students with individualized support and feedback. However, they also stress the need for educators to be

actively involved in the design and implementation of AI systems to ensure that they align with pedagogical goals and promote equitable outcomes.

Given that “[T]he future is increasingly digital, characterized by the proliferation of digital technologies, data-driven decision-making, and online connectivity. Digitalization enables new modes of collaboration, creativity, and productivity, while also presenting challenges related to privacy, security, and digital divide” (Storozhyk 2024, 24), we are compelled to reconcile these two paradigms: Rousseau’s classical ideal of self-directed moral development and the algorithmic logic of contemporary AI. If we fail to do so, we risk allowing the new to entirely subsume the old, not merely transforming education, but fundamentally altering the conditions of human becoming.

For example, Luckin highlights the potential for AI to enhance teaching practices and support personalized learning. „AI can analyze student data to identify areas where they are struggling and provide targeted interventions“ (Luckin, 2024). However, Luckin also cautions against over-reliance on AI and emphasizes the need for human oversight and critical engagement with AI tools. Educators should use AI to augment their own expertise, not to replace it. In contrast to purely technology-driven perspectives, Zhao (2018) offers a humanistic vision for the future of education that prioritizes creativity, innovation, and student agency. This perspective serves as a crucial reminder that AI should be viewed as a tool to support these goals, not as a replacement for human teachers or a means of simply automating existing educational practices. The ethical and pedagogical challenges surrounding AI’s integration call for a broader discussion of the overall purposes and outcomes in education, a focus on student empowerment as central.

3. EPISTEMOLOGICAL AND ETHICAL QUESTIONS

While AI can process vast amounts of data rapidly and personalize learning experiences, it fundamentally lacks the capacity for genuine understanding or intentionality. Integrating AI into education demands careful reflection on whether *technological efficiency can ever substitute the wisdom, moral judgment, and human connection integral to meaningful learning.*

Can AI “Know”? Searle’s Chinese Room argument draws a rigid line between syntactic manipulation and semantic understanding. AI algorithms process

symbols and optimize outputs based on statistical correlations, but they do not “understand” in the human sense. If teaching requires intentionality and genuine comprehension, can a machine ever transcend data processing to foster true understanding? AI’s performance of pedagogical tasks may mimic teaching without participating in the shared intentionality that underpins real human communication.

Information versus Wisdom - Delivering information at speed and scale is AI’s forte. Yet wisdom involves contextual discernment, normative judgment, and a capacity to integrate lived experience. Wisdom emerges from the interplay of cognitive, emotional, and moral faculties cultivated over time. Automated platforms risk reducing learning to content delivery and performance analytics, sidelining the cultivation of prudence and ethical insight that define wisdom (Rees 2025).

AI as Epistemic Rupture - Traditional education posits teachers as epistemic authorities who curate, interpret, and validate knowledge. AI introduces a rupture by dispersing authority across algorithmic systems whose decision-making processes are often opaque. This shift calls for a reexamination of knowledge transmission: who or what decides what counts as valid knowledge? The opacity of AI models may undermine trust in educational content, prompting demands for algorithmic transparency and accountability.

Bias, Fairness, and Inequality - AI systems trained on historical data risk perpetuating societal biases. In education, this can translate into differential recommendations, tracking, or assessment outcomes that disproportionately affect marginalized groups. Ensuring fairness requires not only technical debiasing but also deep reflection on whose values guide algorithmic design and how equitable access to AI-powered resources is distributed (Karpouzis 2024).

Surveillance and Autonomy - Continuous data collection (clickstreams, keystrokes, biometric indicators) enables hyper-personalization but also raises serious privacy concerns. Students may internalize surveillance norms, compromising autonomy and creating self-disciplining subjects optimized for measurable outcomes. The ethical challenge is to balance the pedagogical benefits of data-driven feedback with safeguards that protect learners’ dignity and freedom (Karpouzis 2024, p. 6-7).

Dehumanization and Instrumentalization - When learners become “data points,” education risks transforming into a factory for credential production.

Dehumanization occurs as relational and emotional dimensions of teaching. Empathy, mentorship, moral encouragement are sidelined in favor of quantifiable metrics. Philosophical critique must interrogate whether AI-mediated education treats learners as ends in themselves or merely as consumers and human capital.

The rise of AI in classrooms has sparked a host of ethical and pedagogical debates as is mentioned in Table 1

Theme	Core Issue	Risk / Challenge	Key Questions	Reference
Information vs. Wisdom	AI excels at delivering information rapidly, but wisdom requires contextual judgment, moral reasoning, and integration of lived experience.	Learning risks becoming reduced to content delivery and metrics, sidelining the cultivation of ethical insight and prudence	How can education preserve the development of wisdom in AI-rich learning environments?	Rees (2025)
AI as Epistemic Rupture	AI redistributes epistemic authority from teachers to opaque algorithmic systems.	Erosion of trust in knowledge validation, uncertainty about how truth is established.	Who or what determines what counts as valid knowledge when authority becomes algorithmic?	
Bias, Fairness, and Inequality	AI systems trained on historical data may replicate social biases.	Unequal recommendations, assessments, or opportunities that disproportionately affect marginalized groups.	How do we ensure fairness, and whose values shape algorithm design?.	Karpouzis (2024)
Surveillance and Autonomy	Hyper-personalization requires continuous data collection (click-streams, keystrokes, biometric data)..	Normalization of surveillance, reduced autonomy, creation of self-disciplining learners.	Where is the ethical limit between useful feedback and intrusive monitoring?	Karpouzis (2024, pp. 6-7)
Dehumanization and Instrumentalization	Students risk being treated as data points rather than persons with emotional and relational needs.	Education becomes a system of metric optimization instead of personal development.	Does AI-mediated education treat learners as ends in themselves or merely as human capital?	

Table 1. Ethical and Philosophical Dimensions of AI in Education

Beyond plagiarism, bias and fairness issues are significant. AI tools are trained on vast datasets from the internet, which may contain cultural biases, stereotypes, or gaps in representation. If these tools are used naively, they could reinforce biases. For instance, an AI-generated quiz question might assume cultural knowledge that not all students have, or a history summary might reflect a Eurocentric bias present in its training data. Educators and researchers have pointed out that AI in education must be monitored for algorithmic bias, especially if used for things like grading or recommending learning content (Jose et al. 2025). An unfair AI system could privilege certain groups of students over others (if an automated writing evaluation system were trained on language patterns of native English speakers, it might systematically give lower scores to English language learners' essays). The literature suggests countermeasures: use diverse training data, implement transparency in AI decision-making, and keep a human in the loop for high-stakes judgments (Jose et al. 2025). Some ed-tech developers are already working on fairness-aware AI models to mitigate these concerns. From a pedagogical view, this is also a teachable moment. Many argue that students should be made aware of AI's limitations and biases as part of digital literacy. Teachers can turn incidents of AI bias or error into class discussions, thus "discussing these biases with students" and building their critical evaluation skills (Ali et al. 2025).

4. HUMAN WITH MACHINE: THE (FUTURE) ROLE OF THE TEACHER

Teachers bring empathy, moral guidance, and mentorship that emerge from shared human experiences: narrative, compassion, and cultural memory, which resist simple codification. In the classroom's lived encounters, a teacher's concern is woven through voice inflection, eye contact, and the gentle modulation of tone that acknowledges each student's unique emotional landscape. Machines may simulate conversational empathy through programmed responses, but genuine moral formation requires spontaneous responsiveness to the unpredictable contours of a learner's life. Only a human educator, present in body and spirit, can perceive when a student's silence hints at misunderstanding or emotional struggle, and intervene with warmth rather than a predetermined algorithm. Bodily presence itself carries moral weight: the reassurance of a guiding hand, the warmth of a smile after a wrong answer, the subtle adjustments of posture that convey openness and encouragement. These qualities foster trust, inviting learners into a shared space where mistakes become opportunities for growth rather than data points to be corrected. In resisting the reduction of students to metrics, teachers

cultivate relational depth that grounds education in human dignity. It is this irreducible human element that positions the educator not merely as an information transmitter, but as a mentor in character and citizenship, roles that no machine, however sophisticated, can fully assume.

A fundamental philosophical tension arises between deploying AI as a supportive tool and pursuing full automation of teaching. In co-teaching models, AI undertakes routine tasks such as grading objective assessments, monitoring progress through analytics, and generating practice exercises, freeing educators to concentrate on critical, relational dimensions of pedagogy. Human teachers then become architects of dialogue, facilitators of inquiry, and stewards of moral development, roles that demand creativity and ethical judgment beyond the reach of code. This partnership amplifies human capacities, as machines provide data-driven insights while educators interpret those signals through the lens of contextual understanding. Conversely, the drive for full automation risks reducing teachers to technical overseers of algorithmic processes, eroding the professional soul of education. When instructional design is optimized solely for efficiency and scalability, the art of teaching: its improvisational flair, its moral intentionality, threatens to vanish behind dashboards and predictive models. If AI supplants the relational core of education, learners may become mere consumers of content, and schooling may devolve into a factory of credentials. The goal, then, must be a symbiotic alliance: AI and human educators in concert, ensuring that technological innovation amplifies human flourishing rather than replaces it.

By integrating personalized pathways grounded in the principles of andragogy, critically examining whether educational technologies shape autonomous learners or passive consumers, and orienting these efforts toward an ethos of lifelong flourishing, we can reimagine education as a dynamic, human-centered process responsive to both individual growth and collective well-being.

In andragogical contexts, AI transforms adult education by crafting personalized, just-in-time learning pathways that adapt to each learner's unique schedule and goals (Palenski et al. 2024). As adults juggle careers, families, and self-improvement, intelligent systems can recommend bite-sized modules exactly when they're needed, reinforcing motivation and deepening engagement (Ayyappan 2024). This level of customization honors the andragogical principle that learners bring prior experience into the classroom, allowing content to build directly on existing knowledge and real-world challenges. However, every data-driven nudge risks steering

learners toward predefined outcomes, making it essential to preserve learner autonomy even as we harness AI's scaffolding power (Almusaed et al. 2024).

Yet alongside personalization comes the commodification of education, as micro-credentials and badges proliferate into a marketplace of discrete skills (Palenski et al. 2024). When learning is packaged into bite-sized units, each with its own price tag, knowledge itself can start to feel like a transaction rather than a process of self-cultivation (Almusaed et al. 2024). The danger lies in valuing credentials solely for their immediate market utility: accreditation becomes an end in itself rather than a steppingstone toward deeper understanding. To counteract this trend, philosophical reflection must interrogate whether our investment in lifelong learning fosters genuine personal growth or merely continuous workforce reskilling. The market logic that drives AI in education often mirrors neoliberal and entrepreneurial values: efficiency, innovation, disruption, and self-optimization.

At its heart, this ecosystem prompts a profound question: Are we educating for freedom, critical citizenship, and human flourishing or for functional efficiency within a global marketplace? AI's allure lies in its power to optimize learning outcomes through predictive analytics and algorithmic insights, yet such optimization often privileges economic productivity over the intrinsic value of reflection and creativity (Palenski et al. 2024; Fidalgo & Thormann 2024). If left unchecked, metrics become our measure of success, and the rich tapestry of ideas that defines education gives way to narrow performance indicators. Preserving education as a public good demands we resist reducing learners to consumers and recommit to nurturing their capacity for inquiry, empathy, and collective responsibility (Almusaed et al. 2024).

Bridging these tensions calls for an ethos that balances technological innovation with humanistic purpose. We must design AI tools not only to streamline skill acquisition but also to cultivate moral imagination, critical dialogue, and a sense of shared destiny (Fidalgo & Thormann 2024). To safeguard learner agency and foster communal well-being, policymakers, educators, and technologists should collaborate to establish ethical guardrails addressing data privacy, consent, and inclusive design (Amigud & Pell 2025; Almusaed et al. 2024). By embedding philosophical reflection and participatory policy frameworks into the fabric of lifelong learning, we ensure that AI serves as a catalyst for self-cultivation and collective flourishing rather than a conveyor belt of credentials (Palenski et al. 2024; Ayyappan 2024).

4.1 Teachers' perspective

In day-to-day classroom practice, teachers are finding concrete ways to leverage generative AI as a “teacher’s assistant.” Common use cases reported in recent studies include: lesson planning and content generation, assessment design (quizzes and exams), personalized/adaptive learning, administrative and creative tasks, etc.

Educators use AI chatbots to brainstorm lesson ideas and generate instructional materials. For instance, one teacher prompted an AI to produce a “mock lesson plan” tailored to her students’ interests and found the suggestions “not that far off” from what she would have planned herself.³ Teachers also employ AI to create examples or explainer texts on a topic, to simplify complex concepts, or to draft stories and dialogues for class activities (Ali et al. 2024). Generative AI’s ability to produce novel questions and problems has proven useful for assessment creation. Tools like ChatGPT can rapidly generate quiz questions, practice problems, or test items aligned with a given topic or reading (Ali et al. 2024). This helps teachers save time when preparing assessments. A systematic review notes that ChatGPT has been used for “*generating quizzes [and] designing assessments*,” illustrating its multifunctional support for teachers (Ali et al. 2024). Teachers also use AI to vary question difficulty or create multiple versions of tests, aiding differentiation. AI can assist in adapting content to diverse student needs. For example, teachers use translation and simplification features to make reading materials accessible to English language learners or younger readers. ChatGPT can summarize or rephrase texts at different reading levels, offering personalized explanations or examples for students who need extra support. Early research highlights AI’s potential to facilitate more adaptive, personalized learning due to its interactive, on-demand nature. In practice, this might mean a science teacher asks an AI tutor to provide hints for struggling students while advanced students receive extension questions, all tailored to individual pace. Some of the good examples are Google Gemini Storybook creation and Google NotebookLM for generating interactive podcasts and presentations. Teachers are also entrusting AI with routine or creative tasks that fall outside direct instruction. A high school administrator described using an AI tool to “*write an email notifying parents about staff turnover*,” turning a rough prompt into a polished draft within seconds. Teachers report using AI to generate courteous letters to parents, translate classroom newsletters, or devise attractive slides and handouts. Some even experiment with AI-generated images or stories to spark student interest in a new topic.

³aiEDU. (2024). Pulse survey report. Retrieved October 1, 2025, from <https://www.aiedu.org/pulse>

One teacher recounted how her prompt yielded a unique piece of art from a student-written paragraph, which she then showed in class to stimulate discussion.⁴ Such examples show how AI can handle time-consuming tasks (like formatting documents or coming up with illustrative examples), allowing teachers to focus more on pedagogy and student interaction. These use cases demonstrate AI’s real-world utility in general education. Generative AI serves as a versatile assistant, helping with planning, materials, assessments, and clerical work, thereby freeing teachers to devote more attention to engaging students. Notably, none of these applications replace the teacher. Rather, they *amplify* a teacher’s productivity and provide inspiration or resources, which is why many teachers who have tried AI report generally positive experiences (aiEDU, 2024). AI handles the “*heavy lifting*” of draft generation or repetitive tasks, while the teacher remains the critical editor, decision-maker, and facilitator in the loop.

Teachers’ early experiences with AI have yielded a mix of enthusiasm and caution. Many educators see AI tools as valuable aids that can save time and important institutional resources. In the previously mentioned survey, the majority of teachers actively using AI reported an increase in job satisfaction. A national study in 2024 found that 65% teachers credited AI with increasing their passion for teaching, such as reduced workload on planning and more engaging resources for students (Polcar, 2024). Teachers often describe AI as a creativity booster, a source of fresh ideas for lessons or a collaborator for brainstorming and as a differentiation tool that helps them better meet each student’s needs. These perceived benefits feed into future expectations: in one poll, over 80% of educators agreed AI could provide personalized support at scale, such as giving real-time feedback or simulating one-on-one tutoring for students who need it. There is a growing sense that, if harnessed well, AI might help teachers be “more of a coach and less of a speaker” automating menial tasks so they can focus on higher-level mentoring and student relationships. At the same time, teachers are feared of the *challenges and concerns* AI brings. A top worry is academic honesty. Many have already caught students trying to pass off AI-generated work as their own. In 2023, over 26% of educators surveyed said they had caught a student cheating with ChatGPT (Polcar, 2024). Teachers are now grappling with how to detect AI-written essays and how to set new norms for student work, especially homework. Plagiarism detectors and stricter honor codes are one response, but these are imperfect solutions. AI writing can evade detection, and false positives can accuse innocent students (Young, 2023). Many teachers voice a pedagogical concern: How can we design assignments that foster original thinking and cannot be

⁴aiEDU. (2024). Pulse survey report. Retrieved October 1, 2025, from <https://www.aiedu.org/pulse>

easily faked by a chatbot? This question is prompting what some call “assignment makeovers”, redesigning assessments to be more authentic (e.g. personal reflections, oral presentations, in-class writing) so that completing them requires genuine student effort and insight. Another set of concerns revolves around *ethical and quality issues* of AI-generated content. Teachers worry about the accuracy and bias of AI outputs. By design, models like ChatGPT can produce incorrect information (or “hallucinations”) with a confident tone. In educational settings, the reliability of information is paramount, so teachers must double-check AI-generated content for factual accuracy (Ali et al. 2024). What if the data used to create AI model has gaps or cultural slants, its answers might reflect those and potentially mislead or exclude. Recent literature emphasizes that the “quality and bias of generated responses” are critical issues, alongside plagiarism and loss of content authenticity (Ali et al. 2024). This means educators feel responsible for validating AI’s contributions before passing them to students. Some have begun treating AI outputs as “first drafts” or idea generators, to be verified and edited. This extra step can be time-consuming, partially offsetting the efficiency gains. Teachers also express concern about student over-reliance on AI. If answers are only a click away, will students skip the effort of problem-solving or critical analysis? Looking ahead, teachers generally expect AI’s role in education to grow, and they are calling for guidance to manage it responsibly. A lack of training has been a notable hurdle: 72% of K-12 teachers in 2023 said their schools had given them no formal guidance on AI use (Policar, 2024). This is rapidly changing. By late 2024, 47% of teachers reported having at least some AI-related professional development, up from barely a quarter earlier that year (Peetz, 2024). Teachers see AI as useful but not plug-and-play. It brings new opportunities to enhance teaching, yet also new challenges that must be navigated through training, policy, and thoughtful pedagogy. Their prevailing attitude is a cautious optimism, an openness to embrace AI’s benefits, tempered by a commitment to preserve educational integrity and human-centered learning.

4.2 Students perspective

Students have not been far behind their teachers in exploring generative AI. By the 2023–2024 school year, teens were well aware of tools like ChatGPT. A Pew survey found that about two-thirds of U.S. teens (ages 13–17) had heard of ChatGPT, and among those aware, 19% admitted using it for schoolwork. Usage was highest in upper high school grades,

roughly one-quarter of 11th–12th graders had tried ChatGPT for school tasks (Policar, 2024). These numbers suggest that millions of students have experimented with AI as a homework helper or study aid. Qualitatively, students report using AI for a range of purposes. Looking up explanations for new topics, getting hints on math problems, checking their writing, or even generating ideas for assignments. Notably, many students seem to distinguish between what they view as acceptable versus inappropriate uses of AI. In the Pew study, 69% of teens said it’s acceptable to use AI “to research new topics” and 39% felt it’s okay to use it to help solve math problems (Policar, 2024). However, only 20% of teens thought using ChatGPT to write entire essays for you is acceptable. This indicates that students themselves recognize a line between using AI as a learning resource and letting AI do the substantive work for them. Many are likely aware that outright plagiarism or cheating with AI is unethical (and can be detected), whereas using AI to get unstuck on a problem or to learn background information feels closer to using a search engine or calculator. Even with these attitudes, the temptation for over-reliance is a real concern. Teachers and parents have observed some students turning to AI for answers a bit too quickly. If a student habitually asks ChatGPT to summarize a novel or solve an equation without attempting it first, the student may get the answer but lose the learning experience. Educators worry that this shortcut culture could undermine the development of critical thinking and problem-solving skills. Early evidence from research supports this worry. Heavy reliance on AI tools correlates with diminished critical thinking performance. In one 2024 study, college-age participants who used AI frequently had significantly lower critical thinking scores (measured by standardized tests) than those who used AI sparingly (Gerlich, 2025). The author attributes this to cognitive offloading, basically outsourcing mental effort to the AI. When students let the algorithm do the thinking, their own cognitive muscles don’t get exercised, leading to atrophy in skills like analysis and evaluation (Gerlich, 2025). Strikingly, the study found a strong negative correlation ($r \approx -0.68$) between AI usage and critical thinking ability, and qualitative interviews revealed that many young participants acknowledged they relied on AI at the expense of practicing skills (Gerlich, 2025). They even voiced anxiety that using AI for everything might make them “lose” their own capacity to think critically over time. One of the recent studies from MIT used EEG and NLP-based essay analysis to compare participants writing with a large language model (LLM), a search engine, or no external tool. Results show that LLM users exhibited the weakest neural connectivity and lower sense of ownership over their essays (Kosmyrna et al. 2025). Same study shows that over repeated sessions, LLM reliance correlated with measurable cognitive “debt”, participants underperformed (neural,

linguistic, behavioral) compared to those using no external tool. In the media and academic discourse, this phenomenon is sometimes dubbed digital dementia, a term coined by neuroscientist Manfred Spitzer to describe how overuse of digital technology can lead to the breakdown of cognitive abilities similar to dementia-like symptoms (Preiss, 2014). While digital dementia in the clinical sense remains debated, the core idea resonates in education. If students become too dependent on AI or devices to recall information, solve problems, or even think, they risk weakening the very mental faculties that education aims to strengthen. Besides undermining critical thinking, other risks of digital dependency have been detected by educators. One issue is that students might accept AI outputs uncritically, believing anything the AI says. This is dangerous because generative models can produce false or biased information. Without strong media literacy or fact-checking habits, students could be misled by AI in ways that distort their understanding. For example, an AI might confidently provide an outdated or incorrect scientific explanation. A student who relies on it could internalize that mistake. There's also the question of creativity and original thought. If students get used to AI generating ideas or text for them, they may invest less in their own creative processes. Some teachers have noted a decline in writing fluency or persistence on challenging tasks among students who lean on AI too often. One of the students said, "forgot how to start an essay on their own" because a chatbot was always there to provide a draft. Additionally, constant use of AI can affect motivation. A recent analysis warned that if "the thinking is done by AI, the students may lose motivation and engagement" in learning, since they no longer feel ownership of the intellectual work (Jose et al. 2025). Educators are thus grappling with how to obtain AI's benefits for engagement and personalized support without letting students become passive consumers of answers.

Table 2 presents the SWAT analysis for AI in the classroom approach from teachers' and students' perspectives as a summary of previous analysis.

Category	Strengths	Weaknesses	Opportunities	Threats
Factors	Internal positive factors	Internal negative factors	External positive factors	External negative factors
Analysis 1	Increases teacher productivity and saves time on lesson planning and assessment design.	Risk of cognitive dependence and "cognitive offloading" among students, potentially diminishing critical thinking skills.	Potential for scaling personalized support, including real-time feedback and one-on-one tutoring simulations.	Academic dishonesty, with students using AI to generate work and bypassing anti-plagiarism checks.
Analysis 2	Facilitates personalized and adaptive learning through content adaptation and simplification for diverse student needs.	Lack of formal guidance and professional development for teachers on responsible AI use has been a significant hurdle.	Growing necessity for "assignment makeovers" to redesign assessments to be more authentic and require genuine student effort.	Quality and bias concerns; AI models can produce factual errors ("hallucinations") or culturally biased content.
Analysis 3	Serves as a creativity booster and collaborator, generating fresh ideas, examples, and visuals for engaging lessons.	Teachers must spend time editing and fact-checking AI outputs, partially offsetting initial efficiency gains.	Increasing momentum in AI-related professional development for educators.	Potential for AI-generated text to evade detection, leading to false positives and accusations of cheating.
Analysis 4	Enhances job satisfaction and reduces workload, allowing teachers to focus more on pedagogy and student interaction.	Students may experience lower motivation and a lack of ownership over their work when AI generates the core output.	AI enables teachers to shift focus toward higher-level mentoring, coaching, and student relationships	Student over-reliance leading to skill atrophy and potential development of "digital dementia" symptoms

Table 2. SWAT analysis for the AI in the classroom approach

The program combined theoretical knowledge with hands-on tasks, demonstrating how AI can support, but not replace, the teacher's role. The agenda was structured into three parts:

- **ChatGPT in teaching:** using it for lesson preparation, delivery, and evaluation, while critically verifying the outputs.
- **Gamification:** designing activities that increase motivation and collaboration, with attention to avoiding superficial competitiveness.
- **Other AI tools:** exploring a wider spectrum of applications for tracking progress, adapting content, and ensuring inclusivity.
- **ChatGPT in studying:** supporting students in summarizing texts, generating practice questions, teaching mode, and clarifying complex concepts, while emphasizing critical checking and reflective use instead of shortcuts.

The emphasis was on dual empowerment. Teachers gained practical ways to reduce administrative workload and improve material quality, while students learned to develop a critical stance toward AI, verify information, and use it as a support rather than a shortcut. Course outcomes showed that this type of training increased teachers' confidence in experimenting with AI, while also deepening their awareness of the ethical boundaries and potential risks. In this way, a balance is achieved: AI becomes a helpful assistant, while human creativity and critical thinking remain at the center of the educational process.

6. CONCLUSION

Artificial intelligence is catalyzing a profound philosophical shift in education, challenging traditional notions of knowledge, pedagogical authority, and human development. While AI's efficiency and personalization offer powerful tools for empowerment, especially in entrepreneurial and lifelong learning contexts, the risks of dehumanization, bias, and commodification are real and pressing. The document advocates for an approach that balances technological innovation with humanistic purpose, designing AI tools not only to streamline skill acquisition but also to cultivate moral imagination, critical dialogue, and a sense of shared destiny.

To safeguard learner agency and foster communal well-being, policymakers, educators, and technologists should collaborate to establish ethical guardrails addressing data privacy, consent, and inclusive design. Navigating this crossroads demands careful philosophical inquiry, ethical vigilance, and an unwavering commitment to human dignity. The study emphasizes the importance of empowering teachers and students alike with AI literacy. This ensures they can obtain practical tools to reduce administrative workload, increase material quality, develop a critical perspective towards AI, verify information, and view AI as a support rather than a shortcut. Through such training, course outcomes reveal that AI can become a helpful assistant, while human creativity and critical thinking remain at the center of the educational process.

Ultimately, the question remains: Are we harnessing AI to educate for freedom, reflection, and collective flourishing, or are we orchestrating learners' optimization for market functionality? Navigating this crossroads demands careful philosophical inquiry, ethical vigilance, and an unwavering commitment to human dignity.

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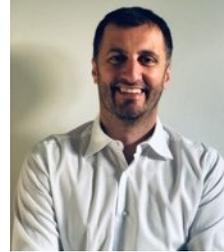
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3.

The impact of Ai on democracy

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The impact of Ai on democracy

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ABSTRACT:

The rapid advancement of artificial intelligence has introduced profound political, ethical, and societal challenges, redefining the very foundations of democratic governance. This paper explores the multifaceted relationship between AI and democracy, examining how algorithmic decision-making, data surveillance, and automated communication systems reshape public discourse, political participation, and institutional trust. The study situates AI within a historical continuum of technological revolutions that have altered the balance between freedom and control. Through a qualitative and interpretative analysis of literature and real-world cases, the research argues that artificial intelligence is not a neutral force but a transformative agent capable of both reinforcing and undermining democratic systems. While AI can enhance transparency and efficiency, its unregulated use risks deepening inequality, polarization, and authoritarian tendencies. The paper concludes that the future of democracy will largely depend on society's ability to govern technology wisely, maintaining self-correcting mechanisms and

ethical frameworks that ensure technology remains subordinate to human values.

Keywords: artificial intelligence, democracy, surveillance, social credit system, inequality, algorithms, technological change

1. INTRODUCTION

The emergence of artificial intelligence represents one of the most significant technological transformations in human history—one that is already reshaping the way societies think, organize, and govern themselves. Far from being a purely technical innovation, AI has become a political and cultural phenomenon, capable of altering the balance between freedom and control, participation and manipulation, transparency and surveillance. Its integration into the political sphere challenges long-standing assumptions about the nature of democracy, raising fundamental questions about autonomy, accountability, and truth in an age of automated decision-making and algorithmic influence.

Throughout history, technological revolutions have redefined the structures of power. The invention of writing, the printing press, and the steam engine each gave rise to new paradigms of social and political organization, shifting authority from one form of elite to another. In this continuum, artificial intelligence stands as the next transformative force—one that expands the boundaries of human capability while simultaneously testing the resilience of democratic institutions. Just as the Industrial Revolution empowered new economic classes but also produced unprecedented social inequalities, AI today carries the dual potential to strengthen participatory governance or accelerate its decline.

Recent debates within political economy and philosophy underscore this tension. Acemoglu and Johnson (2024) argue that technological progress does not automatically lead to democratization or shared prosperity; instead, it often consolidates power in the hands of a few. Similarly, Suleyman (2024) warns of an approaching “wave” of technological disruption that could destabilize political systems and erode the foundations of liberal democracy. Harari (2024) emphasizes an even more fundamental risk—the collapse of truth itself—pointing to AI’s capacity to generate persuasive yet fabricated realities that undermine the informed public sphere on which democracy depends.

At the same time, optimism persists. Some scholars and practitioners

suggest that AI can renew trust in institutions, expand citizen participation, and strengthen transparency if guided by ethical and regulatory safeguards. Yet this optimism remains conditional: the same algorithms that enable civic innovation can, when misused, fuel disinformation, polarization, and digital authoritarianism. The trajectory of AI's influence on democracy, therefore, is not predetermined. It depends on human choices, institutional design, and the moral imagination with which societies respond to technological change.

The purpose of this paper is to examine this complex relationship by situating artificial intelligence within both its historical and contemporary contexts. By tracing parallels between previous technological paradigm shifts and the current digital transition, the research seeks to illuminate how AI is transforming the mechanisms of political power and civic engagement. Ultimately, the study argues that democracy's survival in the age of AI will depend less on the technology itself and more on humanity's ability to govern its creation—maintaining the delicate balance between innovation and responsibility, efficiency and freedom.

2.LITERATURE OVERVIEW

In the past decade, the accelerated development of artificial intelligence has sparked profound debates about its political, social, and ethical implications. One of the central focuses of these discussions is the relationship between artificial intelligence and democratic institutions - a relationship fraught with both promise and risk. In an increasing number of academic and popular-scientific sources, researchers attempt to capture the complex dynamics between automated technologies and democratic values, highlighting how AI can either strengthen or undermine the very foundations of modern political systems.

In the book *Power and Progress (2023)*, economists and Nobel laureates Daron Acemoglu and Simon Johnson analyze historical patterns of technological change and their impact on the distribution of power. They warn that technological advancement, including the contemporary development of AI, does not necessarily lead to widespread prosperity or democratization. Instead, if unregulated and unchecked by democratic institutions, AI can deepen inequalities and consolidate power in the hands of a small number of technological elites. In this context, their analysis offers an important framework for understanding how the political economy of AI might influence the future of democracy.

Similar warnings are raised by Mustafa Suleyman in his book *The Coming Wave (2023)*, where he predicts that new technologies, especially AI, will trigger a wave of destabilization in the global order. As a co-founder of DeepMind, Suleyman speaks from inside the field, with an understanding of how powerful algorithms, if left unchecked, can undermine transparency, enable manipulation of public opinion, and provide authoritarian regimes with new instruments of control. He advocates for a “controlled detonation” of technology - a gradual and carefully managed integration of AI into society to avoid consequences that could be fundamentally anti-democratic.

Yuval Noah Harari, a historian known for his global visions of the future, particularly in his essay from the book *Nexus (2023)*, but also in numerous earlier public engagements, emphasizes that artificial intelligence can become a “weapon for the destruction of truth”. According to him, AI's ability to generate convincing but false narratives through deepfake technology and automated content creation directly threatens the concept of an informed public, which is crucial for the functioning of democratic society. Harari warns that we may enter an era where distinguishing reality from fiction becomes impossible, potentially destroying trust among citizens and between citizens and institutions.

Some authors, like Shoshana Zuboff in *The Age of Surveillance Capitalism (2019)*, have earlier raised critical questions about privacy and surveillance, suggesting that democratic spaces are increasingly pressured by economic actors who use AI to extract data and shape behavior. This line of argument closely aligns with the critiques of Acemoglu and Johnson, where the focus is on asymmetries of knowledge and power between technological companies and citizens. Surveillance capitalism becomes the new paradigm in which private corporations, rather than public institutions, set the boundaries of what is possible in the social sphere, often without democratic oversight.

A notable contribution comes from the study conducted by *Inioluwa Raji (2020)*, which highlights that algorithmic decision-making can contain significant biases, leading to systemic discrimination against certain social groups. Such practices directly undermine the principle of equality before the law, one of the fundamental pillars of the democratic order.

On the other hand, part of the literature points to the potential of artificial intelligence to improve democratic processes, especially in the realm of deliberative democracy. For example, *Ethan Zuckerman (2021)* explores how digital technologies, including AI, can contribute to building new forms of political engagement and participation outside traditional institutions.

Similarly, Tim O'Reilly, in various essays and public appearances - particularly through the concept of "Government as a Platform" - advocates the use of digital tools to increase transparency, accountability, and efficiency in the public sector. However, both authors emphasize that such positive transformations depend on the existence of strong democratic institutions and carefully designed normative frameworks to ensure that technology serves the public interest, rather than exclusively corporate or political agendas.

While consensus in the literature is not complete, there is a clear recognition that artificial intelligence will not be a neutral factor in the political landscape. Its integration into social processes may deepen authoritarian tendencies in certain regimes, but also provide tools to strengthen participatory mechanisms where political will and institutional resilience exist. For this reason, the question of the relationship between AI and democracy becomes one of the key research and political challenges of our time - a challenge that requires an interdisciplinary approach and global coordination.

3. METHODOLOGY OF THE RESEARCH

The research applies a qualitative and interpretative approach, aimed at understanding the complex relationship between artificial intelligence and democracy through theoretical analysis and comparative interpretation. It explores conceptual patterns and societal implications that arise from the integration of AI into political and social structures. The method is rooted in critical reading of contemporary literature and real-world examples, focusing on how technological change influences power distribution, civic participation, and institutional resilience. Additionally, the historical approach in this research is based on the "Time Train" methodology, which aims to identify historical roots and causes of modern processes (Vukotić, 2024). By examining available literature, alongside historical analogies and documented cases, the study situates AI within a broader continuum of technological transformations that have historically reshaped human societies. This interpretative framework allows the research to trace parallels between past paradigm shifts and the current digital transition, identifying recurring mechanisms through which information technologies redefine the boundaries of freedom and control.

Through this hermeneutic and analytical lens, the research seeks to understand and uncover how AI, as both a tool and a socio-political force,

challenges existing democratic principles while simultaneously offering new forms of participation and governance. The methodological focus, therefore, lies in synthesis, reflection, and critical evaluation of emerging technological realities and their implications for the future of democracy.

4. RESULTS AND DISCUSSIONS

The type of communication, or information technology, between people within a community determines the type and character of that community, or society. In other words, fundamental technologies and means of communication shape the way people think, perceive the world, and behave as individuals and as a community - in short, they shape the paradigm (Vukotić, 2024). Modern society is undergoing a paradigm shift, which occurs precisely due to changes in fundamental information technology - from the steam engine to the computer, and now to AI.

As Harari argues, history is not the study of the past but the study of change (Harari, 2024). To understand the changes brought about by AI, it is crucial to comprehend the societal transformations caused by paradigm shifts resulting from changes in information technology throughout history. For example, as Professor Veselin Vukotić notes, the transition from communication via body language to spoken language expanded the number of people able to interact with each other, giving rise to the evolutionary formation of the tribe, which eventually becomes the seed from which the state evolves (Vukotić, 2024). With the emergence of writing, a distinct class of people capable of reading and writing appears, forming the elite from which kings and emperors are born - in other words, the paradigm of feudalism develops. The invention of the printing press led to a shift from the feudal paradigm to a new paradigm - capitalism - thereby changing the ruling elites of society. When the steam engine was replaced by the computer as the new information technology, a paradigm shift occurred, giving rise to a new system - informationalism - along with new ruling elites: instead of the capitalist elite, a new "netocracy" emerges (Vukotić, 2024).

Thus, when the foundations of information technology change - when the way people communicate is transformed - old understandings give way to new ones. Accordingly, the world is currently witnessing the birth of a new paradigm, of which AI is an essential part. The change brought about by AI is comparable to the transformations introduced by fire, the plow, and the steam engine (Vukotić, 2024). This is also supported by numerous studies

- for instance, The McKinsey Institute concluded in 2016 that, “compared to the Industrial Revolution, AI is transforming society ten times faster and at 300 times the scale, or roughly 3,000 times the impact” (Roubini, 2022).

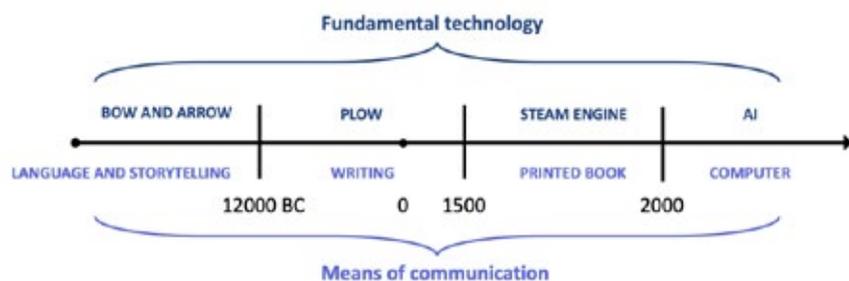


Figure 1. Changes of fundamental technology and means of communication throughout history (Vukotić, 2024)

As history shows, every new information technology brings unforeseen consequences - it solves some old problems but also creates new ones. New technologies often lead to disasters, primarily because people need time to learn how to use it wisely. As Harari explains, “the best example is the Industrial Revolution, which gave rise to experiments such as modern imperialism, Stalinism, and Nazism, while conflicting views on how to build an industrial society led to major clashes” (Harari, 2024). Beyond wars, the Industrial Revolution disrupted ecological balance and produced numerous other consequences. As Harari further argues, the lesson for the future is harsh: “If humanity needed so many terrible lessons to learn to manage steam power and the telegraph, what will it take to learn to manage bioengineering and AI?” (Harari, 2024).

By the close of the twentieth century, it became evident that imperialism, totalitarianism, and militarism were unsustainable paths for shaping an industrial society. Although far from perfect, liberal democracy emerged as the most resilient framework. Its greatest strength lies in the presence of internal mechanisms that allow societies to recognize and correct their own mistakes, curbing extremism and enabling renewal through debate and reform. Since the trajectory of artificial intelligence remains unpredictable, humanity’s best safeguard in the twenty-first century is to preserve those democratic capacities for self-correction—institutions and values that can detect errors early and respond to them before they escalate into systemic crises.

However, can liberal democracy survive the 21st century? As Harari argues, “one potential threat is that new AI technologies could destroy privacy and punish or reward people not only for what they do and say but also for everything they think and feel” (Harari, 2024). Can democracy survive under such conditions?

Therefore, it is to be expected that the new era will pose a challenge to the institutional structure of the state, and consequently to the political system as well. As Mustafa Suleyman asserts - “every previous wave of technology has had far-reaching political implications, and the same should be expected in the future” (Suleyman, 2024). Technology and political systems have always evolved in mutual dependence. Every major technological innovation inevitably reshapes the political landscape, altering how power is organized and exercised. In the same way that the invention of writing and the printing press redefined social structures and governance, emerging fields such as artificial intelligence, robotics, and synthetic biology are poised to bring about transformations of comparable magnitude (Suleyman, 2024). New technology has undoubtedly brought numerous benefits to society, but it has also created conditions that can exacerbate existing polarization and institutional fragility (Suleyman, 2024). Accordingly, the question arises - how will the changes brought about by AI affect democracy? Will they strengthen it, or threaten it?

4.1. The socio-political consequences of AI and algorithm advancement

The positive effects of social media on society are undeniable. In many countries, especially non-democratic ones, the development of the internet has provided individuals with greater access to information and the ability to share it more easily, thereby increasing the level of freedom in such societies. In certain cases, social media has directly influenced political processes, providing citizens with tools to resist authoritarian regimes and change governments. For instance, platforms such as Facebook and Twitter were used during the Arab Spring, playing a key role in the overthrow of long-standing autocrats in Tunisia and Egypt. As one of the protest leaders in Egypt and a computer engineer at Google, Wael Ghonim, noted - “The revolution started on Facebook. If you want to liberate society, give people the internet. If you want a free society, just give them the internet”. The co-founder of Twitter expressed a similar view: “Some tweets can lead to positive change in repressive countries” (Acemoglu & Johnson, 2024).

Moreover, according to Acemoglu, “Wikipedia provides a good example of how the collective intelligence promoted by early techno-optimists can function successfully - but only when the process is overseen by an appropriate organizational structure and when proper decisions are made regarding the use and direction of the technology.” (Acemoglu & Johnson, 2024). Nevertheless, the development of the internet and AI is a double-edged sword. While it has helped some societies increase freedom in their countries, it has simultaneously contributed to the erosion of personal freedoms in others.

In their original conception, both the internet and artificial intelligence were envisioned as instruments for empowering democracy and constraining authoritarianism, primarily by uncovering corruption, repression, and systemic abuse. However, the development of AI and social media has also produced the opposite effect on political discourse and democracy. Once these digital technologies became primarily oriented toward large-scale data collection and analysis, they slowly transformed into tools of surveillance and manipulation, serving the interests of states and corporations alike (Acemoglu & Johnson, 2024). Moreover, the influence of computers is clearly reflected in the way social media algorithms have fueled hostility and eroded social cohesion across many societies (Harari, 2024).

The dangers of AI when its objectives are not aligned with those of humanity have been demonstrated in practice. One of the first and most striking instances appeared during 2016–2017, when Facebook’s algorithms contributed to the outbreak of anti-Rohingya violence in Myanmar. After a period of democratization and optimism in the 2010s, ethnic tensions gradually escalated between the Buddhist Burmese majority and the Muslim Rohingya minority. According to Harari, “In response to the intolerance and discrimination from the majority Buddhist Burmese population, in 2016–2017, the Islamic organization known as the Arakan Rohingya Salvation Army (ARSA) carried out a series of attacks aimed at establishing a separatist Muslim state in Arakan/Rakhine. These attacks resulted in the killing and abduction of dozens of non-Muslim civilians and assaults on several military outposts.” (Harari, 2024).

In retaliation, “the Myanmar military and Buddhist extremists launched an ethnic cleansing campaign targeting the entire Rohingya community. Hundreds of Rohingya villages were destroyed, between 7,000 and 25,000 unarmed civilians were killed, 18,000–60,000 women and men were raped or sexually assaulted, and approximately 730,000 Rohingya were brutally

expelled from the country” (Harari, 2024). The violence was driven by deep-seated hatred toward the Rohingya, which was further inflamed by anti-Rohingya propaganda, largely disseminated via Facebook. By 2016, Facebook had become the primary news source for millions of people in Myanmar and the most important platform for political mobilization.

While anti-Rohingya narratives originated from extremist actors such as the Buddhist monk Ashin Wirathu, their amplification and dissemination were primarily the result of Facebook’s algorithmic mechanisms, which prioritized engagement over content integrity. As Amnesty International revealed, “the algorithms proactively promoted content on Facebook that incited violence, hatred, and discrimination against the Rohingya” (Amnesty International, 2022). Furthermore, a UN fact-finding mission concluded in 2018 that “by disseminating content that promotes hatred, Facebook played a decisive role in the ethnic cleansing campaign” (Miles, 2018). In other words, with minimal monitoring and an algorithm designed to promote content containing hate speech for greater user engagement, Facebook became the main platform for organizing genocide against Muslims in the country (Acemoglu & Johnson, 2024).

Thus, instead of promoting and recommending posts that encouraged empathy and calls for peace, the algorithm chose to spread conspiracy theories filled with hatred. This decision was made because the algorithm was designed to maximize user engagement, and according to experiments it conducted on millions of users, negative content generated the highest levels of engagement (Harari, 2024). In other words, people did not choose what to see - the algorithm chose for them. These cases illustrate that decisions generated by non-human intelligence are already exerting strong influence over major historical developments.

A similar pattern began to emerge in Sri Lanka in 2018, where Facebook posts incited violence against Muslims. Two years later, the situation extended to India. Despite internal appeals from company employees, Facebook’s leadership declined to suspend the account of Indian politician T. Raha Singh, who publicly called for violence against Rohingya Muslim migrants and urged the demolition of mosques. During the same period, widespread anti-Muslim riots erupted in Delhi, resulting in the destruction of numerous mosques and the deaths of more than fifty individuals (Acemoglu & Johnson, 2024).

A comparable pattern emerged in the United States, driven by the same underlying mechanisms. Content containing hate speech, extremist rhetoric,

and misinformation proved especially effective at eliciting emotional reactions, thereby boosting user engagement and prolonging time spent on the platform—factors that, in turn, enhanced Facebook’s capacity to deliver highly targeted digital advertising. Consequently, the algorithm promotes such content (since its goal is user engagement), which during the U.S. presidential elections led to a flood of posts containing disinformation, fake news, and hate speech, particularly from right-wing users. It has also been shown that the January 6, 2021, Capitol attack by extremist far-right groups was partly organized through the use of Facebook and other social media platforms (Acemoglu & Johnson, 2024).

The spread of disinformation and hate speech extended well beyond Facebook. By 2016, YouTube had become a powerful medium for the radicalization and recruitment of far-right audiences. Its recommendation algorithms displayed the same underlying dynamic observed on Facebook—content provoking anger and outrage generated higher engagement, whereas moderation reduced it. As a result, the platform increasingly promoted sensationalist conspiracy theories to millions of viewers, while marginalizing balanced or moderate material. The social and political consequences were significant. As Max Fisher notes - “YouTube’s algorithms became a key driver of the rise of Brazil’s far-right, transforming Jair Bolsonaro from a marginal figure into the president of Brazil” (Fisher, 2022). Twitter (now X) was no different. During the rise of populism, particularly throughout President Trump’s tenure, Twitter became an important tool for communication among right-wing users, as well as among left-wing users.

When Facebook decided to change its algorithm after the 2020 U.S. presidential election to prevent the promotion of misleading stories and disinformation, the results were remarkable. Content that promoted hatred and disinformation was no longer viral. However, shortly thereafter, the changes were reversed, and the algorithm was restored to its previous settings. The reason was that internal testing revealed a decline in user engagement—when people were less outraged and emotionally stirred, they spent noticeably less time on the platform (Acemoglu & Johnson, 2024).

The profit motive was not the sole force steering the technology sector toward anti-democratic tendencies. In addition to the business models of technology companies, their founding vision played an equally important role, one that held that important decisions were too complex for ordinary people. According to Acemoglu and Johnson - “the political discourse of the masses becomes something to manipulate and exploit, rather than something to encourage and protect, allowing authoritarian governments

and technology companies to impose their vision on everyone else” (Acemoglu & Johnson, 2024). Consequently, such a vision favors an anti-democratic impulse, even though many tech company CEOs identify with the political center-left or center-right and consider themselves supporters of democratic institutions.

Consequently, artificial intelligence has begun to erode democratic principles, while at the same time equipping both authoritarian and democratically elected governments with new instruments for control and manipulation. Moreover, its influence on political electoral processes has already become visible. Indeed, the global wave of elections in 2024 was described as the first in the AI era, drawing particular attention to AI’s role in electoral processes and its potential impact on voters. According to *The Economist*, there were differing assumptions about what this would mean - whether AI would trigger a flood of disinformation, deepfakes, and spam content, or whether it would help politicians reach diverse voter groups and assist citizens in making informed decisions (The Economist, 2025).

Research by academics from the International Panel on the Information Environment has shown that AI was used in four out of five electoral processes worldwide, from the U.S. and the U.K. to India and Indonesia (The Economist, 2025). More than two-thirds of recorded uses were harmful - including deepfake videos of deceased Indian politicians endorsing candidates, or fake footage of candidates in Bangladesh withdrawing from races. According to *The Economist*, it is still unclear whether AI actually influenced election outcomes, although in Romania, for example, the Constitutional Court annulled the presidential election and ordered a rerun due to AI-driven interference. Nevertheless, the panel concludes that the electoral environment is undoubtedly being reshaped by AI, but the decision on how to respond remains in the hands of politicians, not scientists (The Economist, 2025).

4.2. Social credit system and its implications

The first serious indications that AI could be used to strengthen authoritarian rule have emerged in China, which is estimated to invest \$6.6 billion annually in monitoring and censoring online content (Acemoglu & Johnson, 2024). Among other initiatives, the Chinese government heavily invests in digital tools, particularly AI (approximately 20% of global AI spending), for the purpose of surveilling the population. This is especially evident in Xinjiang, where systematic data collection on the Uyghur population began following the suppression of riots in July

2009 (Acemoglu & Johnson, 2024). Major technology firms such as Ant Group, Huawei, SenseTime, Cloudwalk, and Megvii worked in partnership with the Chinese government to design systems capable of gathering, integrating, and analyzing extensive data on citizens' daily lives—including their communication habits, professions, spending behaviors, and personal interests, which were subsequently employed to enable “predictive policing” (Acemoglu & Johnson, 2024).

Over time, what began in Xinjiang expanded to the rest of China. China has become the world leader in the number of facial recognition cameras per capita and has made substantial strides toward establishing a nationwide social credit system. This system gathers data on both individuals and businesses to track behavior and impose penalties for actions deemed undesirable, including expressions of dissent or criticism toward the government. The first version of the social credit system was developed in collaboration with private-sector companies, including Alibaba, Tencent, and Didi, with the aim of distinguishing desirable from undesirable behavior and restricting the mobility and other actions of offenders (Acemoglu & Johnson, 2024).

Although this system has not yet been fully rolled out throughout China, many observers regard the Chinese model and its social credit framework as a prototype for a new form of “digital dictatorship,” where authoritarian control is sustained through pervasive surveillance and extensive data gathering. Moreover, many compare Chinese political discourse to George Orwell's 1984 (Acemoglu & Johnson, 2024).

Before drawing conclusions, it is important to consider China's cultural context, which differs significantly from Western culture - and from Western interpretations of individual freedoms. Given China's turbulent history, marked by numerous uprisings, civil wars, and natural disasters, the primary historical priority for both the Chinese government and its citizens has been the preservation of stability and unity. This goal takes precedence over the Western concept of individual liberties (Piper, 2024). Consequently, most Chinese citizens trust the government and support its policies, including the surveillance system and the social credit system - perceiving them as efforts to maintain order, peace, and security throughout the country. However, regardless of cultural context, it is clear that such a model significantly increases state power and, even more dangerously, serves as a template for other authoritarian regimes seeking to consolidate their control. Moreover, this technology is already being widely exported to countries such as Venezuela and Zimbabwe, Ecuador and Ethiopia, and

even the United States. The possibility of the emergence of totalitarianism is thereby elevated to a new level (Suleyman, 2024).

Therefore, the deployment of digital technologies to silence dissent is far from being a uniquely Chinese phenomenon. Countries such as Iran and Russia, among other authoritarian regimes, have likewise utilized these tools to track, intimidate, and punish dissidents, as well as to curtail access to independent and uncensored information. Because of the role social media played in pro-democracy protests and revolutions in these countries (e.g., the Green Movement in Iran), both Iran and Russia, like China, have intensified internet censorship and blocked numerous Western social media platforms and websites (Acemoglu & Johnson, 2024). In this process, the role of AI technologies is increasingly significant.

The misuse of digital tools to suppress protests by opposition groups is not limited to dictatorships. Research indicates that many democratic governments systematically abuse software such as the Israeli Pegasus. As Acemoglu and Johnson note, “in Mexico, it was initially used in the fight against drug cartels and in the operation that captured the head of the Sinaloa cartel, El Chapo. Over time, the government began using it against journalists, lawyers, opposition parties, and leaders” (Acemoglu & Johnson, 2024). In India, Pegasus is used on an even larger scale, particularly for monitoring prominent opposition leaders, student activists, journalists, and many others. Even the mobile phones of French President Emmanuel Macron and several senior U.S. officials were hacked using this software.

The situation is not much better in the world's most developed country, the United States. According to numerous reports, the National Security Agency (NSA), in collaboration with several technology companies, illegally collected large amounts of data on U.S. citizens, including their internet searches, online communications, and phone calls. Perhaps even more troubling, private firms like Clearview AI have started gathering facial data from hundreds of millions of individuals and providing this information to government bodies for use (Acemoglu & Johnson, 2024).

The Pegasus software, NSA activities, as well as the case of Clearview and its facial recognition technology highlights a broader issue: digital instruments for large-scale data collection are increasingly being embraced by numerous governments as means to monitor their populations. As Acemoglu and Johnson argue, “these tools will empower non-democratic regimes and enable them to suppress opposition far more effectively” (Acemoglu & Johnson, 2024). However, they could also lead to democratic

governments gradually sliding into some form of authoritarianism.

It is important to emphasize that, in their essence, digital technologies are neither pro-democratic nor anti-democratic. How they are used depends on the direction in which the technology evolves, and this direction largely depends on demand. Technology companies will focus on areas that generate profit and where power lies - which, at present, primarily involves state censorship, data collection, and surveillance. When AI technologies reinforce authoritarian tendencies, they set in motion a self-perpetuating cycle in which growing autocracy fuels an even greater reliance on AI to surveil and regulate citizens. The more governments demand these technologies, the more companies will produce them, further pushing AI toward becoming a fully-fledged surveillance tool (Acemoglu & Johnson, 2024). For this very reason, the EU's AI Act, proposed in 2021, specified social credit systems as one of several types of AI to be completely banned due to their potential negative impact on individual rights and freedoms (Harari, 2024).

Thus, for the time being, AI tools are significantly more a means of suppression than of supporting protests. Empowered by AI technologies, authorities become more effective at quelling and preventing dissent. Consequently, such demand also shapes the direction of innovation. Evidence from China indicates that government demand for surveillance technologies significantly shapes the direction and nature of later technological innovations. AI companies collaborating with local Chinese authorities increasingly redirect their research toward surveillance and facial recognition technologies. Consequently, these incentives have positioned China as a global frontrunner in surveillance technology, with Chinese start-ups increasingly exporting AI-based tools for monitoring and repression to other authoritarian regimes. For example, Huawei alone exports such tools to more than 50 countries (Acemoglu & Johnson, 2024).

As previously discussed, not all forms of social credit systems are viewed unfavorably by citizens or within specific cultural contexts. For some, such systems represent mechanisms for encouraging socially beneficial behavior, discouraging selfishness, and promoting a more considerate and cohesive society. The Chinese government, for instance, presents its social credit system as a tool to reduce corruption, fraud, tax evasion, misleading advertising, and forgery, thereby enhancing trust among individuals, between consumers and companies, and between citizens and state institutions. However, when implemented comprehensively, such systems can eliminate personal privacy and transform everyday life into a

continuous evaluation process. Every action, regardless of time or place, could influence one's prospects of securing employment, obtaining credit, forming relationships, or avoiding punishment. By leveraging the deeply ingrained cultural fear of "losing face" rather than wealth, a social credit system could, in certain societies, develop into a mechanism of totalitarian control (Harari, 2024).

As Harari warns, "social credit systems could create a new underclass of people with low credit scores" (Harari, 2024). Yet, one must ask what the consequences would be if such systems started penalizing individuals for expressing criticism of government policies, engaging with foreign literature, practicing minority faiths, abstaining from religion altogether, or simply maintaining relationships with those who hold low social credit scores. What might occur if the new social credit technology were combined with traditional religions? (Harari, 2024). As Harari notes: "many religious people have always believed that there is someone in heaven watching them, giving and taking away points for everything they do, and that their ultimate fate depends on the balance of these points" (Harari, 2024). This is precisely what a social credit system could do.

What could happen if, for example, the regime in Iran decided to use its AI and social credit system not only to enforce strict hijab laws, as it already does, but also to algorithmically assess whether someone is a sinner, a believer, or a saint? Would a system of this kind genuinely uncover people's true character, or would it merely serve as a mechanism for imposing conformity and exerting control over their lives? A similar problem could affect all social credit systems and regimes that fully monitor their populations. As Harari warns - "when governments claim to use such technology to identify sinners, terrorists, criminals, and antisocial or unreliable people, they may in fact impose unfounded religious or ideological prejudices with unprecedented efficiency" (Harari, 2024).

4.3. New risks to democratic systems and challenges ahead

Surveillance is only one of the threats that emerging information technologies present to democratic systems. Another lies in the potential of job automation to disrupt labor markets, with the resulting instability posing serious risks to the health and resilience of democracy itself. As Harari points out, "the fate of the Weimar Republic represents the most obvious example of such a threat, which, due to years of high unemployment rates and financial crisis, collapsed and gave way to totalitarianism" (Harari, 2024).

If merely three years of unemployment reaching 25% transformed a seemingly stable democracy into one of the most ruthless totalitarian regimes in history, it is worth asking what impact labor market disruptions and instabilities in the 21st century might have on the future of democracy.

It is important to emphasize that the assumption here is not that automation will lead to mass unemployment and the disappearance of human jobs in the coming decades. Instead, according to Harari, “the real problem will be the turbulent process of adjusting to new jobs and conditions, that is, retraining and adapting to an ever-changing labor market” (Harari, 2024). In the decades ahead, many traditional occupations will vanish while entirely new ones will arise. Yet even these new roles are likely to evolve and disappear rapidly, forcing individuals to continually retrain and redefine themselves multiple times throughout their lives, or risk becoming obsolete.

Nouriel Roubini argues that all indicators point to AI-driven alternatives reducing wages and salaries, thereby aggravating an already growing problem. As earnings decline, income inequality is expected to deepen even further (Roubini, 2022). As Roubini explains: “If you own the machine or are in the top 5 percent of the human capital distribution, AI will make you richer and more productive. If you are a low – or even medium-skilled blue- or white-collar worker, AI will eventually reduce your wages and make your job obsolete. Polarization will pit the rich against the poor.” (Roubini, 2022). Such polarization, caused by increasing inequality, would create fertile ground for the further growth of populism, which itself represents a serious threat to democracy, as numerous examples from different parts of the world already show. Another risk lies in the rapid acceleration of technological progress and the sweeping economic, social, and cultural changes it brings. These shifts could make moderate conservative agendas increasingly untenable, paving the way for the rise of unconventional and even radically revolutionary political movements and leaders. Moreover, the further development of technology and the increasing role of AI in decision-making processes concerning human lives could lead to a new wave of populist parties and leaders, which could directly affect democracy (Harari, 2024). The world is becoming ever more complex, while populist and charismatic leaders provide simple explanations, which is why they are gaining increasing support (Riemen, 2016).

Mustafa Suleyman argues that the world is not prepared for the wave that is coming: “This is a world already buckling under existing pressures. Western societies in particular have sunk into a deep anxiety; they are ‘nervous states,’ impulsive and quarrelsome. That constant unease

is partly the result of previous shocks – crises.” (Suleyman, 2024). Confronted with the sweeping transformations ahead, many nations are grappling with a range of profound challenges that erode their capacity to govern effectively, exacerbate internal divisions, and lead to slower and less effective decision-making. Since 2010, more countries have experienced democratic backsliding than progress, and this trend continues to accelerate. The resurgence of nationalism and authoritarianism has become widespread, from Poland and Hungary to Russia, China, Turkey, and the Philippines, and beneath this renewed wave of autocracy and political volatility lies a deepening current of social dissatisfaction (Suleyman, 2024). All of this has also led to declining trust in government in many democratic countries, particularly in the United States, while China recorded the best results - China’s citizen trust in their government stood at 77%, compared to 41% in the USA (Edelman Trust Barometer, 2025). Global challenges are approaching a breaking point. Stagflation, energy crises, stagnant incomes, a collapse of public trust, and the spread of populism and nationalism persist despite humanity enjoying the highest material living standards in history. In this context, the task of restraining, regulating, and guiding technological progress so that it truly serves human well-being becomes increasingly difficult. Building both national and international consensus, as well as setting new standards for managing rapidly evolving technologies, already poses challenges that seem nearly impossible to overcome.

It is clear that the development of technology cannot be stopped, as numerous historical examples from the Ottoman Empire, China, Japan, France and elsewhere demonstrate. Nor is it necessary to stop it, since the maintenance and improvement of living standards depend on technological progress. Wherever there is demand, technology always finds a way, a path, and new users. For instance, demographic challenges are pushing AI to take on an even greater role. “As China’s working population falls, factories turn to machines to pick up the slack,” the South China Morning Post reported in 2021 (Roubini, 2022). Once they emerge, waves are almost impossible to stop - it is in the nature of technology to spread, regardless of obstacles. For all these reasons, Suleyman argues that “instead of stopping, what is needed is containment, that is, shaping the unleashed power of technology so that it can continue to serve people and the planet” (Suleyman, 2024).

Containment implies a comprehensive capacity to control, limit, and, when necessary, abolish certain technologies. It also encompasses legal regulations, greater technical safety, new models of governance and ownership, as well as a new hierarchy of responsibility and transparency,

all of which represent a necessary (though not sufficient) precondition for safer technology (Suleyman, 2024). As Suleyman stresses, “containment should be thought of as a set of interconnected technical, cultural, legal, and political instruments that mutually reinforce each other to establish social control over technologies in a time when change is occurring at an unstoppable pace” (Suleyman, 2024). Containment also requires the establishment of national and international legal frameworks, including regulations enacted by governments and agreements upheld by the United Nations and other global institutions.

With the further development of AI technologies in mind, Suleyman outlines two possible paths. As he states: “On one trajectory, some liberal-democratic countries will continue to collapse from within. On the other trajectory, the reckless adoption of certain aspects of the wave will open the door to despotic state control, creating monstrous Leviathans whose power surpasses even that of the most radical totalitarian governments in history” (Suleyman, 2024). On all fronts, therefore, risks abound, as the approaching wave demands states that are self-assured, adaptable, and coherent, governments that remain accountable to their citizens while possessing the necessary expertise and institutional capacity. Confronting one of the most transformative moments in human history calls for mature, stable, and, above all, trustworthy administrations capable of meeting the magnitude of the challenge.

Amid the turbulence that lies ahead, and without a significant redirection of focus, many open democracies are likely to experience a gradual weakening of their institutional structures along with a loss of legitimacy and public trust. Meanwhile, authoritarian regimes will gain access to an expanded and potent arsenal for repression. As Suleyman observes, “nation states will undoubtedly respond to the new wave by employing the very tools it provides to tighten their grip on power and capitalize on the moment to reinforce their control. The coming wave could serve as rocket fuel for authoritarianism” (Suleyman, 2024).

Yet, democracy as a political system has already endured and adapted through multiple periods of profound transformation, consistently demonstrating an ability to reinvent and restore itself. The contrasting outcomes of the 1930s economic crisis in the United States and Germany underscore this resilience, as political developments are never shaped solely by economic conditions. The fall of the Weimar Republic was not merely the result of three years of mass unemployment; it was also a consequence of its fragile foundations, a young democracy born from defeat, lacking

deeply rooted institutions and cultural legitimacy (Harari, 2024). Thus, the essential human capacity for survival in the 21st century will likely be adaptability, and in that regard, democracy possesses far greater flexibility than authoritarian or totalitarian systems.

Considering the unprecedented pace of AI development, it remains impossible to foresee its full trajectory or to devise comprehensive safeguards against all possible future risks. This uncertainty marks a fundamental distinction between artificial intelligence and earlier existential threats, such as nuclear technology. As Harari explains, “nuclear technology confronted humanity with a few easily predictable scenarios, the most obvious of which was nuclear war. This meant that it was possible to conceptualize dangers in advance and explore ways to prevent them. By contrast, AI confronts the world with numerous doomsday scenarios, some of which are relatively easy to understand and predict, while others remain unimaginable” (Harari, 2024).

Throughout most of human history, large-scale democracy was unfeasible simply because available information technologies lacked the sophistication needed to enable broad and sustained political dialogue. Today, the opposite is the case: democracy may run into problems precisely because information technologies have become too sophisticated. If algorithms continue to fuel hatred and confusion instead of promoting reasonable arguments, public debate can hardly be sustained. Nevertheless, if democracy were to collapse, the cause would not lie in technological inevitability, but rather in humanity’s inability to govern and regulate emerging technologies with foresight and responsibility.

Democracy is currently in crisis globally, while polarization among populations is becoming more pronounced. Some cite ideological differences as the main reason, but in the past, opposing parties nevertheless managed to find common ground on many issues despite ideological divides (Caldeira, 1986). Others point to social media algorithms, as shown by examples in Myanmar and Brazil. Yet this is only part of a bigger picture, and a definitive explanation is still unknown. Information technologies have grown so intricate that individuals now struggle to answer even the most fundamental political questions, such as what drives the growing conflicts and polarization within many societies? If people cannot discover what the problem is and resolve it, the question arises whether large-scale democracy will be able to survive the rise of AI. Still, the question remains whether totalitarian regimes will be able to survive it either.

The wave is coming, creating whirlpools of centralization and decentralization simultaneously. Where and how these forces will act will vary significantly depending on existing social and political factors. Some sectors or regions will follow one path, others a completely different one, while still others will experience sharp turns on both paths (Suleyman, 2024). Some hierarchies and social structures will be reinforced, while others will be overthrown; in some places equality or authoritarianism will increase; in others not to the same extent. In any case, mounting pressures, growing instability, the unpredictable expansion of technological power, and the profoundly disruptive influence of emerging innovation hubs will continue to erode the very foundations of the liberal-democratic nation-state system.

5. RESEARCH LIMITATIONS

The main limitation of this research lies in its conceptual and interpretative nature. Without empirical or longitudinal data, the analysis depends on existing literature and selected case studies, which reflect a rapidly changing technological and political landscape. As artificial intelligence evolves faster than social and institutional responses, many of the conclusions remain provisional. The study therefore offers a theoretical lens rather than definitive answers, an attempt to interpret emerging dynamics between AI and democracy, acknowledging that their full implications can only be understood through future empirical research.

6. CONCLUSION

The rise of artificial intelligence marks a new epoch in the evolution of human society—one in which the boundaries between human and machine decision-making, truth and manipulation, freedom and control, are increasingly blurred. As this paper has shown, AI embodies both the culmination of centuries of technological progress and the emergence of an unprecedented political challenge. It amplifies long-standing tensions between knowledge and power, efficiency and ethics, innovation and accountability. Whether it becomes a force for democratic renewal or a catalyst for authoritarian consolidation will depend not on the technology itself, but on the values and institutions that govern its use. Throughout history, societies have faced similar moments of transformation. The printing press, the steam engine, and the computer each redefined social hierarchies and the structure of power, yet democracy endured by adapting to new realities. Its strength

lies in flexibility—the capacity to self-correct, to question, and to reform. In this sense, the survival of democracy in the age of AI will depend on humanity's ability to sustain those same mechanisms of reflection and restraint amid accelerating change. Artificial intelligence does not inevitably lead to the decline of freedom, nor does it guarantee progress. It is a mirror reflecting human intentions and institutional choices. If guided by wisdom, transparency, and ethical responsibility, AI can become a means of strengthening democratic participation and improving governance. If left unchecked, it may deepen inequality, distort truth, and erode the autonomy upon which democracy rests. The challenge, therefore, is not to resist technological evolution, but to ensure that it remains anchored in human dignity and collective responsibility. Only then can the digital age become not a threat, but a continuation of the democratic project in its most demanding and transformative form.

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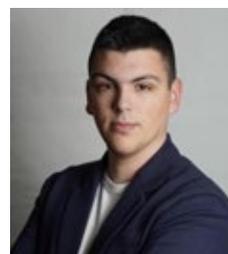
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4.

Development opportunities of Montenegro under the influence of climate factors and policy: Regression analysis of financial system

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Development opportunities of Montenegro under the influence of climate factors and policy: Regression analysis of financial system

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ABSTRACT

The phenomenon of global climate change presents considerable challenges to contemporary economies, necessitating the development of innovative strategies for adapting and reinforcing financial systems. This paper explores the relationship between climate factors (average temperature, number of rainy days and sum of monthly precipitation) and financial indicators (total loans, liabilities to non-residents, and mandatory reserves) on gross domestic product (GDP) in Montenegro. The study employs regression analysis on quarterly data from 2013 to 2023. The findings indicate a robust correlation of 96%, thereby, substantiating the substantial influence of financial indicators on GDP. Conversely, an augmentation in rainy days has been observed to exert a harmful effect. The findings have led to the proposal of strategic measures that have the potential to enhance the resilience of the financial system. These measures include the implementation of differentiated rates of required reserves, the development of green lending and the promotion of green foreign investments.

Keywords: financial stability, climate change, resilience, transition, uncertainty.

1. INTRODUCTION

Climate change poses a substantial challenge for contemporary society. The consequences of disasters caused by changes in nature, which are becoming increasingly frequent, have a profound impact on the functioning of modern society. In years past, this phenomenon was recognized as socially significant. Consequently, scientists and researchers around the world are attempting to identify alternative models of how society functions. The objective of the models is to mitigate, to the greatest extent possible, the harmful effects of climate change. The economy, being the driving force of society, necessitates radical transformation to adapt to the new circumstances. The effective management of the financial system can be regarded as a pivotal element in the process of change and transition.

The objective of this study is to assess the resilience of Montenegro's financial system in the face of the inevitable consequences of climate change, which have the potential to impact the Montenegrin economy. The present study is grounded in a comprehensive review of extant literature on the subject, encompassing the contributions of prominent scientists and researchers who have endeavored to explore this topic and advance existing knowledge. Montenegro, in its capacity as a prospective member of the European Union, is undertaking initiatives to modify its prevailing business practices in accordance with the directives outlined in the European Green Agenda. In light of these considerations, it is imperative to enhance the financial infrastructure of the nation. An efficiently coordinated financial system provides the economy with the optimal foundation for generating additional value, thereby contributing to the comprehensive development of the economy and system itself.

The financial system, regarded as the origin of transformation, exerts a substantial influence on the actualization of all prospective initiatives and activities. The present study employs a regression model to examine the statistical relationship between financial indicators of Montenegro and indicators of climate factors, thereby investigating the resilience of financial stability. The research question is – *What strategies can the Central Bank of Montenegro employ to booster the financial system's resilience to climate-related financial risks through investments in green initiatives and financial instruments?*

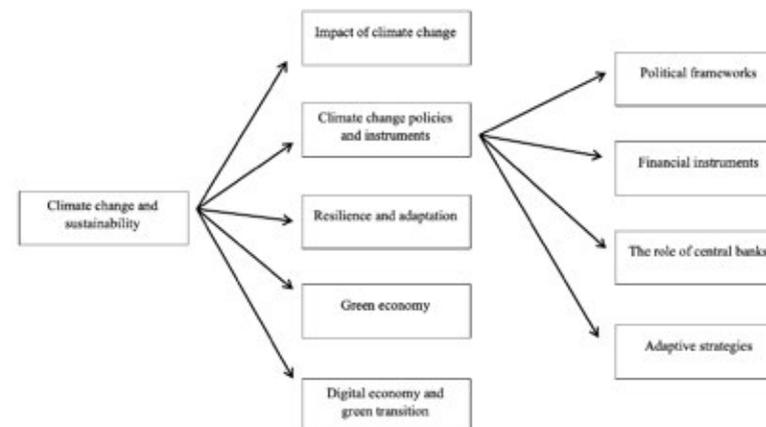
The finding of this study can serve as a solid foundation for the formulation of strategies by the Central Bank of Montenegro, and other financial

institutions and decision-makers at the state level. Given that the research is of an empirical nature, the study has collected data on the activities implemented at the level of Montenegro. The reference period of the research is a 10-year period (on a quarterly basis) and thus the collected data clearly reflect the state of the economy. The findings of this study are intended to propose prospective solutions that may address the market's demand in response of climate change.

The structure of the paper is organized into five sections. Subsequent to the preliminary section, a comprehensive examination of extant literature and prevailing theoretical frameworks, is conducted. The literature review is predominantly composed of scientific works, articles, and research from recent years that are deemed to be the most relevant. The third section delineates the research methodology employed in the study. A concluding chapter is devoted to the analysis of regression models, the empirical analysis of paper, and the proposed development measures and strategies. The paper's conclusion offers a synopsis of its findings and puts forward several subjects that could be explored in the future research.

2.LITERATURE REVIEW

Modern civilization is distinguished by a series of unanticipated and enigmatic transformations. A substantial body of historical evidence suggest that the management of time and the various elements that surround an individual can be formidable challenge. The influence of external factors and constant vigilance compel humanity to improve and advance. Consequently, there is ample opportunity for advancement and scientific exploration. It is a common academic practice to study phenomena such as "climate change" and "financial system" in tandem. Given the well-documented ways in which business activities can damage the environment and negatively affect natural events, the connection between the two and the methodological used to study them are self-evident.



Graph 1. The literature overview – mind map of key terms.

Source: Author's research

A comprehensive review of scientific literature, as illustrated in the graphic above, highlights the key concepts universally recognized by researchers globally. As previously mentioned, climate change and sustainable development are pivotal for all scientific disciplines. Their multidisciplinary nature enables them to influence diverse aspects. The literature underscores the following interconnected relationships: climate change, climate policies and instruments, resilience and adaptation, green economy and digital economy, and transition.

Although climate change threatens the current way of functioning, there are a number of different ways in which this effect can be slowed down or mitigated. Resilience and adaptation, as a function of resistance, provide the opportunity for society to adapt to new market conditions. As a practical example, adaptations to climate change can be activities related to agriculture or tourism. Taking into account the unpredictable weather conditions (and disasters), the subjects of these markets will adapt their products and/or services to the new market conditions. The green economy, more precisely the digital economy (and transition) is based on the premise of such decisions. The green economy appears as a potential solution, which puts into use alternative ways of functioning, production or use. The focus of the green economy is on preserving the environment and reducing the negative impact on nature. The digital economy, as a form of execution of those activities, on the other hand, focuses on business

activities using the latest IT achievements. The digital economy completely rationalizes the time spent in performing an activity, in a way that optimizes the physical performance of the person himself. However, the other side of this medal is often represented by the resistance of economic entities in adopting these or similar practices. Although apparently there are many advantages and facilitated circumstances, practice shows that it is extremely difficult to change the way of acting in society. All these paradigms and directions of the economy often remain only strategies because their implementation requires much longer and more complex work. People's resistance to change is something that represents human nature. But, at the same time, man is a dynamic personality who constantly develops, grows and improves his knowledge and skills. It is necessary for all strategies and regulations to find and recognize the correct way and direction, which will act and really make a change. This is the only way significant change will be realized, as well as progress in the context of climate change resistance.

Climate policies and instruments are a key point in the development and implementation of different practices for the purpose of improving the resistance of the financial system to climate change.

Political frameworks and the importance of institutions

To substantiate the aforementioned claims, numerous scholarly works underscore the direct impact of political and regulatory frameworks on the efficacy of climate response strategies. Ofori, Figari, and Ojong (2023) highlight the significance of enhanced market openness, government integrity, and regulatory efficiency in fostering an environment conducive to innovation and investment, thereby contributing to inclusive green growth. Nazir et al. (2025) emphasize the moderating role of institutional quality, encompassing political stability, government effectiveness, regulatory quality, the rule of law, and corruption control, in shaping the impact of financial technologies and investments on sustainable development. Yahya, Lee, and Chen (2025) corroborate that institutional quality is a pivotal factor in mitigating the adverse effects of climate risk on the resilience of central banks, particularly in terms of independence, transparency, and solvency.

According to the authors, Trotter et al. (2022) argue that the formal adoption of climate change mitigation policies does not invariably translate into tangible transformations, particularly in low- and lower-income countries.

They point out substantial discrepancies between the aspirations articulated in climate policies and their actual implementation. The primary challenge faced in such nations lies in the absence of clear and enabling legislation, characterized by incentive-based policies lacking the force of law. This absence of legal enforceability renders them susceptible to non-compliance. In their research, the authors identify the key factors for success as the consistent commitment of the political leadership, seamless coordination among ministries, and adequate capacities.

As a potential obstacle, the lack of awareness among decision-makers and the general population regarding the long-term socio-economic opportunities of green growth significantly hinders the implementation of climate policies. Conversely, the primary global driver is the Paris Agreement, international donors, and similar entities.

Within the Western Balkans, Turan and Toto (2024) conducted research within the member countries of the region. A common thread among these countries is their participation in the European Green Deal Strategy. However, they lack legal frameworks that harmonize with the European Union's regulations. Consequently, one of the primary recommendations is the enhancement of administrative capacities and alignment with the aforementioned strategy. Through research, the authors concluded that Montenegro has made substantial progress in integrating renewable energy sources. Notably, Montenegro's energy policy underwent a significant transformation when it canceled plans for the construction of a new coal plant, Pljevlja II, in 2019. The authors' analysis revealed that in Montenegro, an increase in GDP by 1% leads to a corresponding decrease in non-renewable energy consumption by 1.31% and carbon emissions by 1.14%. These findings suggest that economic development in Montenegro, considering its existing conditions and policies, can be positively correlated with environmental improvement. Furthermore, Hwang (2023) underscores the positive impact of institutional quality and government integrity on GDP per capita, effectively mitigating the adverse effects of climate risk.

Financial instruments

The literature underscores the escalating significance of financial instruments specifically designed to support environmental and sustainable objectives. A robust political and regulatory framework is essential to ensure the transparency and efficiency of these investments. The primary focus should be on directing financial flows towards green and efficient

energy projects and investments.

Green bonds emerge as a pivotal element in financing sustainable projects globally (Environmental Finance, 2025), including those in the Western Balkans (Đurašković, Konatar, & Radović, 2021). Research conducted by Torvanger, Maltais, & Marginean (2021) reveals that banks worldwide actively participate in the issuance of green bonds and provide support for the development of the green bond market. German banks are recognized as leading providers of secure assets and liquidity within the green bond market. The EU Green Bond Regulations (EU GBS) represent a significant advancement towards establishing a standardized issuance framework. Green bond funds exhibit high demand and demonstrate the ability to generate financial returns and impact. Sustainability-related bonds finance portfolios of sustainability-related loans and are considered tools for transition financing, particularly in cases of decarbonization (Environmental Finance, 2025). Transitional bonds, on the other hand, primarily target high-carbon sectors (oil, gas, aerospace, automotive, transportation) to finance decarbonization efforts and facilitate the transition to green operations. Additionally, blue bonds are a financial instrument experiencing expansion, financing projects related to the preservation of aquatic ecosystems. According to the authors and institutional projections, all these instruments have the potential to significantly accelerate and expedite the implementation of climate policy, thereby enhancing the resilience of the entire system to climate change.

Green financing and green loans, focusing on green activities, are gaining importance. Espinoza-Zambrano et al. (2024) mention preferential interest rates for certified assets, while Umar et al. (2025) highlight banks' role in implementing green banking and providing green lending. Wang et al. (2025) emphasize central bank policies to facilitate capital flow towards green activities. Bhadury, Pratap, & Gajbhiye (2025) stress accessible finance for the renewable energy sector and infrastructure development for climate projects. Montenegro has a significant share of renewable energy sources in its gross consumption (Đurašković, Konatar, & Radović, 2021).

Results-based investment ensures the real impact of green finance, subject to detailed monitoring and evaluation (Trotter et al., 2022). Green corporate venture capital, investments by large companies in "green" startups, positively impacts green technology innovations (Bendig et al., 2022). Greenfield investments promote sustainable development, especially with institutional quality (Ofori, Figari, & Ojong, 2023). However, Environmental Finance (2025) predicts mixed-development finance will drive the greatest

innovation, especially in addressing current issues.

The literature also focuses on investment in R&D by companies, as it allows for real-world data analysis and market phenomena. This investment ensures long-term growth, development, and enhances the company's market value. Standardization, transparency, foreign investor demand, efficiency, green practices, innovation, and FinTech development are reasons why these financial instruments deserve attention and a place in the traditional financial system.

The role of central banks

The central bank of a nation acts as the primary intermediary for all financial transactions, both domestically and internationally. In the global context, characterized by its continued centralization, the central bank's role as an initiator of change holds paramount significance. The promotion of financial instruments and/or financing methods engenders a distinct and transformative environment both domestically and internationally.

D'Orazio (2023) eliminates the pivotal role of the central bank in ensuring financial stability and overseeing the banking system. This entails the establishment of regulations, legal frameworks, and guidelines for capital adequacy, liquidity management, credit risk mitigation, and corporate governance. Furthermore, the central bank assumes the primary responsibility of supervising monetary policy, a function that is central to its role in Montenegro. However, the evolving market conditions necessitate an enhancement of the central bank's role and the acquisition of additional and crucial competencies. In the realm of climate change, central banks pose a significant threat to the nation's financial stability. Consequently, central banks confront novel risks that necessitate enhanced preparedness to respond to unpredictable market fluctuations.

In their research, Wang et al. (2025) presented the findings of previous literature, as well as their own findings. They state that mitigating financial risks under the influence of climate change can be achieved by adopting "green tools" or "Green policies of the central bank." These tools would serve as the primary defense mechanism for the financial system against the uncertainties posed by climate change and its associated changes. Additionally, they would mitigate the adverse effects of these changes. Green policies can be categorized into three main areas: regulatory requirements, promotion of green finance, and the inclusion of climate risks within macro-prudential frameworks.

Regulatory frameworks, by their inherent nature, were among the earliest to be established and the most widely adopted. However, the current state of the global market necessitates the integration of all three norms as a matter of urgency.

Central banks are also institutionally vulnerable to the risks associated with climate change. Shocks can significantly impact their independence, transparency, and solvency. Therefore, it is of paramount importance that central banks have effective risk management strategies in place to enhance their resilience. Numerous literature sources offer various approaches for central banks to preserve their role within the institutional chain, but there is no universally applicable solution. Research indicates that green banking can contribute to green recovery and influence the promotion of sustainable development, particularly in regions such as the Western Balkans (Turan & Toto, 2024).

Adaptive strategies

In the face of uncertainty and the numerous climate disasters that have occurred, today's civilization must devise an adequate systemic response to this challenge. Unfortunately, short-term solutions in this scenario can only exacerbate the situation rather than improve it. Consequently, the literature has devoted significant attention in recent years to identifying appropriate tools that can mitigate the adverse effects of climate change.

In countries where these changes are quantified and numerically expressed, it becomes significantly easier to develop quantitative models that can accurately predict the actual consequences of such phenomena. One such approach is stress testing, which examines the macroeconomic perspective of the situation under consideration. By employing stress testing, the potential consequences of economic shocks caused by external factors can be evaluated. In most instances, the predicted outcomes closely align with the actual state of the economy, which is why this testing model garners considerable attention in situations like the one at hand. Stress testing is frequently utilized in practice, serving as a primary indicator of quantitative changes in macroeconomics and a predictor of the side effect of external factors, such as shocks.

Another type that has significantly gained popularity is CRISK (climate risk), a testing method that also demonstrated significant results in predicting consequences in the context of climate-related disasters. This index

originated from practical needs to monitor changes caused by climate change. Uncertainty is inherent in risk, and risk can be perceived positively or negatively by economic subjects. Their perception of risk has a substantial impact on their decision-making and risk management processes.

The third and most commonly employed method (strategy) for assessing the impact of climate change on financial indicators is regression analysis (linear and/or multiple). The Academy continues to assert that a statistically significant model serves as the foundational starting point for the development of all subsequent strategies and objectives. Consequently, it is not uncommon for the literature to utilize numerous variations of regression analysis and investigate the relationship between financial indicators and climate factors. A number of studies yield divergent results, suggesting a diverse range of data and a broad spectrum of possibilities and combinations of variables that can be examined and investigated.

3. THE RESEARCH METHODOLOGY

The primary objective of this paper is to examine the statistical relationship between the gross domestic product (GDP) of Montenegro and independent variables that influence the potential growth and development of the economy. Regression analysis is a statistical method used to describe and quantify the relationship between one dependent variable and one or more independent variables. In both literature and practice, it is frequently employed for the purpose of predicting, understanding and controlling other factors. In this particular manner, the independent variable refers to financial indicators, as well as climate factors, that were quantified in the previous period in Montenegro.

The model's climate factors (i.e. independent variables) consist of the following average values: monthly temperature, number of rainy days and total monthly precipitation (in liters per square meter). The financial indicators under consideration are as follows: first, total amount of loans; second, the total amount of liabilities to non-residents (foreign direct investments); and third, the total amount of mandatory reserves. The financial indicators were selected according to the principle of financial instruments and components of the overall system with the aim of increasing the degree of resistance to external factors and shocks. The selected independent variables are presumed to constitute a representative sample

based on the studied area. To elaborate, with regard to the allocation of total loans and mandatory reserves, the research analyzes the banking sector (i.e. financial market). However, liabilities to non-residents (FDI) are also components of the financial market, predominantly manifested through capital market. Accordingly, the research study under consideration examines the existing resistance, as well as the current state of affairs. It goes on to identify the “space” that shows potential for enhancement, i.e., development opportunities.

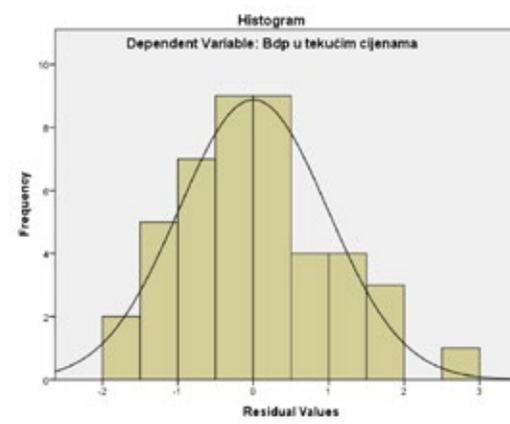
Given that the objective is to examine the statistical relationship between the selected variables (dependent and independent), the original linear regression model exhibited a certain “irregularity”. Consequently, the model was improved and further studied. The model was tested within the statistical program SPSS, but additionally checked in RStudio and EXCEL. The quarterly values of all variables were considered during the period from 2013 to 2023, resulting in a total of 44 data points per variable. The collected data were obtained from the official portals of MONSTAT and the Central Bank of Montenegro.

In addition, the available data concerning climate factors encompassed five distinct cities in Montenegro: Pljevlja, Nikšić, Podgorica, Bar and Herceg Novi. An analysis of variance (ANOVA) was conducted on the number of rainy days to ascertain whether there is a discrepancy among the cities. Given Montenegro’s diverse topography, this information can play pivotal role in formulating strategies tailored to specific regions and urban areas.

The main shortcomings of the official Monstat and Central Bank websites are the lack of clarity and precision in the available data. For many types of research, the data must be additionally processed. Another issue is the time coverage: most reports provide time-series data that often need to be adjusted depending on the analysis being conducted. For the purpose of this research, data from the aforementioned websites were taken from several reports and further processed to align them within a unified time frame. This may or may not affect the quality of the data, but it is certainly an important consideration.

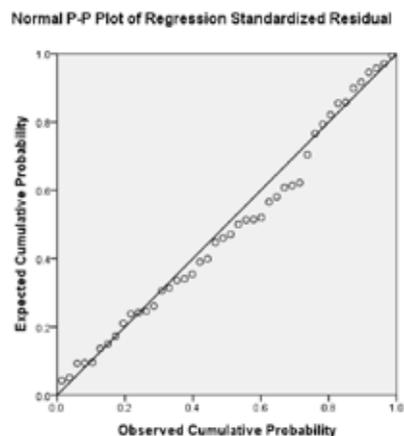
4.EMPIRICAL RESEARCH – REGRESSION MODELS

As previously stated, the analysis of the model was conducted in SPSS. An additional check was also carried out in EXCEL. The preliminary analysis yielded the following results: the mean value of the residuals approximates zero, a configurational optimal for regression analysis. This finding suggest that the model exhibits a high degree of fit. The standard deviation (Stv. Dev.) was found to be 0.928, and the sample size (N) was determined to be 44. In the context of regression analysis, the distribution of residuals is typically modeled as a normal distribution, which is characterized by bell-shaped curve, Gaussian curve.



Graph 2. Histogram of standardized residuals
Source: Author's research

Distribution histogram the residuals visually suggest a distribution that is similar to normal. The schedule is similar to normal, with minor deviations. However, a more precise check of the normality of the residuals is made through the PP plot, which shows clear deviations from the ideal diagonal line (in the central part).



Graph 3. PP plot
Source: Author's research

For the purpose of this research, several models were developed to enhance our comprehension and delineate the variables that warrant improvement. These findings are further elaborated upon in the "Development Opportunities" section. The correlation and determination coefficients are presented in the table below.

Regression Statistics	
Multiple R	0.96
R Square	0.93
Adjusted R Square	0.92
Standard Error	101,458.01
Observations	44

Table 1. Coefficients of correlation and determination.
Source: Author's research

The coefficient of determination, as indicated in the table, is 93%. This statistic suggests that GDP can be reliably explained by independent variables with a certainty of 0.93. This corroborates the assumption that the relevant variables were appropriately selected to construct this model.

	Coefficients	Standard Error	t Stat	P-value
Intercept	(1,395,112.27)	209,195.75	(6.67)	0.00
Total loans	0.52	0.15	3.48	0.00
Liabilities to non-residents	(0.19)	0.25	(0.76)	0.45
Mandatory reserves	3.43	0.57	6.07	0.00
Average monthly temperature	33,907.54	3,630.18	9.34	0.00
Number of rainy days	(23,767.38)	8,439.01	(2.82)	0.01
Monthly precipitation	549.56	143.68	3.82	0.00

Table 2. Regression model with six independent variables, dependent variable GDP
Source: Author's research

The regression analysis presented in the table above utilizes six independent variables. Based on the obtained coefficients, the analysis of the results is as follows:

- An increase of one unit in the independent variable Total credits leads to a corresponding 0.52 unit increase in GDP (in current prices). The p-value indicates statistical significance for this independent variable.
- An increase of one unit in the independent variable Liabilities to non-residents results in a decrease of 0.19 units in the dependent variable. The p-value indicates statistical insignificance for this variable within the specific model.
- An increase of one unit in the independent variable Mandatory reserves leads to a corresponding 3.43 unit increase in the dependent variable. This variable is statistically significant.
- An increase of one unit in the independent variable Average monthly temperature leads to a significant increase of 33,907.54 units in the dependent variable.
- An increase of one unit in the independent variable Number of rainy days leads to a decrease of 23,767.38 units in the dependent variable. This variable is statistically significant for this model.
- An increase of one unit in the independent variable Monthly precipitation leads to a significant increase of 549.56 units in GDP. This variable is statistically significant for the model.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	(1,308,915.64)	174,866.36	(7.49)	0.00
Total loans	0.41	0.03	12.71	0.00
Mandatory reserves	3.54	0.55	6.48	0.00
Average monthly temperature	34,891.49	3,373.03	10.34	0.00
Number of rainy days	(23,853.68)	8,391.33	(2.84)	0.01
Monthly Precipitation	570.28	140.29	4.07	0.00

Table 3. Regression model with five independent variables, dependent variable GDP
Source: Author's research

The second step of the analysis consisted of testing the model without a statistically insignificant variable. Within this model, all independent variables exhibited a strong positive or negative correlation, with only the number of rainy days exhibiting a negative sign. The modified model also indicated that all variables currently possess statistical significance for this model.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	301,606.10	141,664.57	2.13	0.04
Liabilities to non-residents	0.83	0.13	6.19	0.00

Table 4. Regression model with just one independent variable
Source: Author's research

A straightforward model corroborates a direct correlation between the variable Liabilities to non-residents and GDP in current monetary terms.

However, since this variable was found to be statistically insignificant in the previous, more complex model, this suggests the presence of multicollinearity. In other words, the variable is likely capturing information that is already contained in another independent variable included in the initial specification. Such situations are common in statistical and economic research, and they require the analysis to go beyond the initial model in order to identify and address overlapping explanatory effects.

The fact that this variable became statistically insignificant in the more complex model indicates the likely presence of multicollinearity. This outcome suggests that the variable does not provide additional explanatory power beyond what is already captured by another independent variable in the model, resulting in an overlap of information. Consequently, the model is unable to clearly distinguish their individual effects, which leads to unstable coefficient estimates and reduced statistical significance.

Importantly, the loss of significance does not imply that the variable lacks economic relevance; rather, its contribution is already embedded within another predictor. This finding highlights the need to move beyond the initial specification by reconsidering the set of independent variables, testing alternative model structures, and ensuring that each included variable captures a distinct aspect of the underlying economic relationship.

A potential issue arising from this research is the non-linear relationship between the variables. Given that this empirical analysis was primarily conducted using multiple linear regression, these variables can be examined using alternative economic and statistical analyses and models.

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1,755.49	5	351.10	12.65	0.00	2.23
Within Groups	21,820.67	786	27.76			
Total	23,576.16	791				

Table 5. ANOVA (single factor) - number of rainy days
Source: Author's research

Given that the data on climate factors were collected for five distinct cities (Pljevlja, Nikšić, Podgorica, Bar, and Herceg Novi), they are cumulatively presented within the linear regression model for facilitating analysis. However, since the variable representing the average number of days with rain exhibits a negative sign in both models, the research was additionally analyzed using the ANOVA table to test hypotheses. The objective of the analysis was to ascertain whether there exists a disparity in the number of rainy days across different cities. ANOVA analysis revealed a significant difference between the cities, which was anticipated given the diverse regions of Montenegro.

The statistical distinction is substantial, indicating that the influence of location (city) constitutes a significant factor. The source of variation between groups (referring to the cities in this analysis) pertains to the variation of the mean values of the number of rainy days for each individual city, while within groups, it encompasses the variation of the number of rainy days within each individual city. The test statistic (F value) is elevated, indicating that the variation between groups is greater than within groups. The P value is exceptionally low (close to 0), consequently, the null hypothesis is rejected, asserting the absence of a statistically significant difference in the mean number of rainy days between the five cities.

Simultaneously, this analysis serves as a solid foundation for the development of strategies pertaining to climate change, tailored to the specific regions of Montenegro.

Development opportunities of Montenegro

The objective of the empirical research presented in this paper is to identify sectors and fields within the Montenegrin economy and financial system that are receptive to innovative interventions and improvements. The model was conducted for a reference period spanning the past decade, providing a comprehensive and realistic portrayal of Montenegro's economic landscape.

The variable Total loans included in the model showed a positive correlation with GDP growth. According to the literature, the development potential of this variable lies in green financing, particularly green loans. Currently, Montenegro's financial system has a limited share of loans that promote sustainable practices. While some commercial banks have established credit lines for renewable energy projects in collaboration with European funding institutions, loans specifically targeting businesses that adopt green practices remain absent. Given their positive impact, the introduction of such loans could foster greater understanding, acceptance and adoption of green practices across Montenegrin society. Potential applications include financing for renewable energy, green buildings, the use of alternative resources such as bio-materials, and other environmentally friendly initiatives.

In the model, Mandatory reserves also had a positive impact on GDP. A development strategy could involve differentiated reserve requirements for commercial banks. For instance, the Central Bank of Montenegro could implement lower rates for banks actively financing green projects, thereby encouraging sustainable investments and reducing financing costs. Conversely, higher rates for banks heavily invested in high-carbon industries would discourage environmentally harmful investments. Such measures not only align with regulatory frameworks but also promote green financing and integrate climate-related risks into macro-prudential oversight.

Liabilities to non-residents (FDI), which in the simple model showed a direct correlation with GDP, may overlap with the Total loans variable. Further research could isolate the impact of green FDI to better assess its contribution to GDP and sustainable development. Literature suggests that capital market instruments can support green investments. In Montenegro, FDI primarily takes the form of equity securities, foreign franchises, and

investment inflows from international actors. While these initiatives introduce new practices, it is crucial for them to become embedded within Montenegro's economic system. By creating differentiated financial instruments and opportunities that enhance global competitiveness, Montenegro can attract more FDI to its domestic market.

The negative correlation between Number of rainy days and GDP is expected and well-documented. Montenegro's reliance on service-based activities means that increased rainfall can reduce value creation in sectors such as tourism and agriculture. Construction and transportation are also affected, leading to project delays, higher costs and reduced efficiency.

In summary, Montenegro has significant potential to improve its financial system and implement innovative, environmentally friendly policies within the banking sector. Market-aligned regulations and norms can foster development and enhance economic efficiency. Due to its smaller size and responsiveness, the Central Bank of Montenegro has a competitive advantage and can implement the proposed strategies relatively quickly, yielding tangible results.

The recommendation of this study is for the Central Bank of Montenegro to pursue initiatives such as risk insurance, economic diversification, and adaptation financing. By introducing innovative financial products and funds, the Central Bank can help the Montenegrin economy become more competitive in the global market.

5. CONCLUSION

Financial resilience, the system's ability to withstand external shocks, is challenging to achieve. Montenegro, a developing country, faces numerous external shocks, including climate change, a significant challenge for modern society. The research aimed to examine the relationship between climate factors and Montenegro's economy.

The findings confirmed a statistically significant relationship between climate factors and economic development, with financial indicators showing a positive impact and rainy days a negative impact on GDP. These findings suggest the financial system can drive the green transition through banking innovations and regulatory frameworks. Proposed measures, including green lending, differentiated mandatory reserve rates, and encouraging

green FDI, are based on empirical data and can enhance the economy's resilience to climate risks.

This work quantifies the relationship between climate and financial indicators in Montenegro and defines recommendations connecting regulatory policy with sustainable development goals. Successful implementation requires coordinated action from the Central Bank, financial institutions, and decision-makers, with continuous monitoring of climate risks and performance evaluation. This positions the Montenegrin financial system as agile and resilient, while strengthening economic competitiveness globally.

The macroeconomic situation in Montenegro is now prepared for change, which is necessary due to the numerous physical elements and conditions affecting the country's economy. Montenegro's quick expansion on the global map would be impacted by the shift to a digital and green economy. One of the indicators of the change and transition is green finance, which makes it an ideal case study for assessing a nation's preparedness for change. Because of this, any potential delay in the changeover would be detrimental to the growth of the Montenegrin economy.

Future research should monitor implemented policies, analyze isolated green investments (FDI), and conduct climate change risk analysis. Given climate change's insufficient research and widespread impact, all research is crucial for mitigating its effects on the Montenegrin economy.

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5.

Multilingualism - an infrastructure of innovation

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ABSTRACT

This overview serves as an argument that multilingualism is the quiet plumbing beneath every “eureka,” fusing Cognitive Linguistics’ claim that metaphors shape thought (Lakoff & Johnson, 1980) with Koestler’s idea that creativity ignites when two mental railways collide in “bisociation” (Koestler, 1964). This review paper discusses the evidence that multilingual experience is related to divergent thinking, ambiguity tolerance, and flexible problem solving, by reading policy cases from the European Union, Canada, and Singapore as demonstrations of how multilingual infrastructures scale inventive capacity.

Keywords: *multilingualism, multilingual education, innovation, cultural models, conceptual metaphors*

1. INTRODUCTION

If we thought of innovation as a superhero, would their costume be tailored only by engineers and investors? It seems like the tailoring also includes language masters who secretly choose colors, cuts, and logos. Brilliant ideas do not fall from Mars but from very earthly sociolinguistic workshops. In further text, this paper will examine how multilingualism contributes to innovative thinking.

With all due respect to the legacy of Alan Turing, we have to state that the language is no longer viewed as just a data wire. It is a complete 3D printer experience. When we say TIME is MONEY, we don’t read a calendar, but invoke a totemic metaphor that sanctifies productivity and runs the discourse patterns, often treating “saving time” as a moral good. Metaphors, therefore, are not sentence lanterns but generators of innovative thinking (Sharifian, 2011) and could carry a whole set of cultural models. These cultural conceptualisations (or models) are networks of “distributed representations” that emerge from interaction, and yield properties at the group level that cannot be reduced to any single mind (Sharifian, 2011). They are being negotiated across time and communicative events, enabling members to “think as if in one mind” while the remaining is only partially shared and constantly in flux. Language does not merely mirror these models, as it’s not a fixed, but a dynamic system. It helps build and circulate them through metaphor, discourse routines, and pragmatic expectations, which is why what counts as a reasonable inference or persuasive frame is culturally patterned. Concretely, the relevant units are cultural schemas and cultural categories, together with recurrent metaphors that “organise” human experience (Sharifian, 2011).

Metaphorical mapping theory by Lakoff and Johnson (1980, 1999) showed that almost any abstract thinking relies on transferring meaning from the body (space, movement, body parts) into abstract concepts. These transmissions vary from culture to culture; therefore, the “range of possible thought” also widens or narrows depending on the language we are immersed in. The same example - capitalist metaphor of TIME is MONEY, allows time to be “wasted”, “saved”, “lost”, or “invested”. In this optics, time-saving innovations become a moral imperative. Where time is experienced cyclically, relationships are more important than efficiency, so “saving time” may not be a culturally relevant goal; hence, different problems and solutions arise.

This article seeks to illustrate how multilingualism expands the cognitive search space for innovation. Every language offers its own spatial schemas, idioms, value-laden distinctions, and problem-solving scripts. Moving among them is not just code switching; it is frame switching.

2. MULTILINGUALISM AND DIVERGENT THINKING

Multilingualism is like walking through parallel worlds (Grosjean, 2010). Each language offers a different mental furniture (Jessner Schmid, 2015); the speaker has several versions of the same living room and the freedom to move those ready conceptual pieces that structure everyday reasoning: i.e., how respect is encoded, how emotions are carved up, which actions “count” as efficient or polite. Moving between languages rearranges that set, bringing different affordances into reach. The outcomes are greater cognitive flexibility, creative “mismatch” of ideas, and easier perception of what is normal in one culture and a taboo in another (Dewaele & Li, 2012). That is why Stavans & Hoffmann (2015) label multiple language competence as an incubator of divergent thinking.

Traditionally, divergent thinking refers to the ability to generate a wide range of possible solutions, often by approaching a problem from multiple conceptual angles and producing numerous and varied responses. Classic assessments, such as the Torrance Tests of Creative Thinking and the Alternative Uses Test, view this ability through scoring fluency, flexibility, originality, and elaboration of responses (Torrance, 1966; Goff, 2002). More recent measures, such as the Divergent Association Task, operationalize the same construct by asking participants to produce words that are maximally unrelated, with greater semantic distance predicting performance on downstream creativity tasks (Olson et al., 2021). In contrast, convergent thinking narrows the possibilities to identify the most appropriate or effective solution (Cropley, 2006). Creativity emerges at the intersection of these two processes, where divergent thinking provides originality, and convergent thinking secures adaptiveness (Simonton & Damian, 2013). Within this framework, multilingualism is particularly relevant. The experience of managing multiple linguistic codes increases the pool of associations available for divergent exploration while simultaneously strengthening the executive control mechanisms that support convergent selection (Kharkhurin, 2011; Bialystok, 2017; Chung-Fat-Yim, Fernandez-Duque & Marian, 2024). As a result, multilinguals are often positioned not only to generate a greater number of potential ideas but also to identify those that are both novel and contextually appropriate.

Empirical research confirms that multilinguals use alternative problem-solving strategies more often (Bialystok, 2007), tolerate uncertainty better (Dewaele & Li, 2012; Keysar et al, 2012), and show greater empathy (Pavlenko, 2012). It doesn't mean they're automatically more innovative, but

their cognitive soil is more fertile - more seeds have a chance of sprouting.

We can use Arthur Koestler's classic insight that creativity ignites when two independent “matrices of thought” intersect and are “bisociated” into a single frame that neither could have produced alone (Koestler, 1964). Biassociation denotes a cognitive leap resulting from the merging of otherwise separate matrices of experience or knowledge, whereby a new heuristic, solution, or aesthetic effect emerges in the intervening space. Every language command is such a matrix, with its patterned system of metaphors, values, and problem-solving scripts. Multilingualism supplies not just extra vocabulary but a ready stock of mutually foreign matrices whose collision can spark the inventive leap. Where monolingual ideation moves along one rail, the multilingual mind runs a switchyard, recoupling tracks until novelty emerges.

3. INNOVATION ACROSS NARRATIVES

In many Western narratives, progress is conceptualized as a linear arrow towards a “better tomorrow”; hence, startups worship charts under a sharp tilt. Contrary to that, communities whose root pattern is circularity value innovation when maintaining cyclical equilibrium instead of exponential growth (Sharifian, 2011). The form of novelty as an idea itself depends on the cultural map of change.

Terms such as Japanese *karoshi* or Icelandic/Danish *hygge* calibrate work-rest ratios. In Japan, *karoshi* stands for the concept of a specific type of exhaustion. Often translated as “death from overwork”, it turns the spotlight to the risks at the edge of productivity. In Denmark and Iceland, *hygge* labels cultivated coziness and everyday well-being, a feel for warmth, ease, and social comfort that pushes back on hustling. As these ideas circulate, they quietly redraw what companies present as normal. We can call these conceptualisations myths at work, as they are living frames of identity in a corporate context. This, along with many other examples, shows that Western innovator is usually a norm-breaking hero soloist, while in Japanese narratives, innovation is the collective achievement of harmony. It seems like that might be the reason that now AI, as a novelty, sounds like a Promethean threat, and in another culture, sounds like natural evolution.

Every language carries a certain archive of order, written and hidden rules. It is not only lexemes but also idioms that sit on the surface where

we can see the archive at work. “The squeaky wheel gets the grease” invites rule-bending initiative, while “the nail that sticks out gets hammered down” warns of harmony and restraint. “Nothing ventured, nothing gained” points you toward risk; “better safe than sorry” pulls you back. These expressions teach us what counts as reasonable action and how the world supposedly works, so they mark the most visible properties of a cultural model (Sharifian, 2011). As discourse repeats them, the cultural models are maintained and renegotiated across time, which is why a small phrase can cue a whole frame of conduct.

In one language, knowledge can represent vertically transmitted wisdom, but in another language, it is a dataset for constant testing. Innovation then means not just an “invention” but a restructuring of the model of what knowledge is, who possesses it, and how it changes. Sharifian (2011) emphasizes that in every community, there is heteroglossia, competing variants of meaning. Innovation, therefore, is less often born as a thunderbolt and more often as a negotiation within and between models of thinking, a thing that multilinguals practice every day. A multilingual who moves across several archives becomes attuned to the intersection points where scripts meet. Having contradictory directives lined up side by side allows space to redo, from which new things emerge. Classical cognitive linguistics bases meaning in the body, but Sharifian (2011) incorporates the social component, stating that meaning is distributed historically, collectively, and linguistically over a community, and language itself is an emergent, dynamic, heterogeneously shared system. Multilingualism is, therefore, access to multiple systems of cultural conceptualisation, each with its own visible idioms and its own default instructions.

What a multilingual mind rehearses privately, societies enact publicly. Once meanings are distributed and renegotiated, they can also be recoded in services, laws, and interfaces. This is why we should see innovation as a cultural edit. For the sake of portraying this matter, we will turn to a few prominent examples. Perhaps the important one to start with might be that Uber did not invent taxis or GPS. This idea reversed the cultural model of service and ownership. Instead of a licensed driver in the hierarchy, ordinary people were able to offer a ride, while trust was built by a rating system, and ownership became availability. In a culture where driving is placed in collective logic (the Balkans, India, the Arab world), the same idea mutates into a solidarity rather than a market platform. In the Balkans, BlaBlaCar became very popular as it allowed rides to be a shared journey rather than a metered service. IKEA did not invent furniture, but the concept of shopping. This idea allowed the customer to be a co-producer, which

resonates with the Scandinavian cultural model of practical modesty. But, in societies expecting a finished, delivered product, the model encounters odium. WhatsApp developed the WhatsApp voice messaging option for users in Latin America, where slower typing and emotional speech create a need for talk-over-type communication. We can also point out that Airbnb practically transformed the home from an intimate sanctuary into a resource open to the unknown. In cultures where the home is sacred, this concept is met with resistance; in more hospitable environments, and where the word “guest” carries positive weight, this idea thrives.

Some ideas live or die on whether a single narrative validates them, while others travel only when they can be recast inside a different frame. Western innovation discourse loves war metaphors. In many English-language tech circles, ARGUMENT IS WAR and INNOVATION IS DISRUPTION. We “attack problems,” “build moats,” “capture markets,” “move fast and break things.” These metaphors preload attention and inference toward speed, rupture, and victory. In other traditions, the active frames stress flow, harmony, and steady refinement, so ARGUMENT IS A DANCE, INNOVATION IS CULTIVATION. In China, people “tune systems,” “tend relationships,” and “improve the line”. Whatever is proposed in these different narrative climates will be “felt” differently. If ARGUMENT IS WAR, westerners prepare counterattacks, defend positions, and aim to win; if ARGUMENT IS A DANCE, we attend to rhythm, coordination, and mutual attunement. The choice of metaphor silently loads procedures for attention and inference. Because communities nurture distinct clusters of source domains across history, the same problem can be “seen” through different scaffolds. In this sense, even metaphors provide us with a way to discover the cultural models and understand what kind of ideas would be accepted and rejected. Perhaps the famous myth of genius, the Protestant myth of the lone inventor of the model patents, is very popular in the Western world for all the individualistic reasons. In East Asian conceptualization, being a genius is equal to a well-orchestrated team effort. Ideas that do not fit into one cultural narrative often remain under the radar.

In fact, conceptualizations don’t significantly move away from their culturally embodied ones, but we can see innovations that serve multiple frames of thought. For instance, in the Anglo-American world, the term fail celebrates a quick lesson, while in southern languages it carries a moral insult. Through the internet, we encounter hybrid neologisms such as “test drop,” which allows polysemy. Then, in Apple’s advertisements in the US, they blur the human-device boundary, while in Korea, they emphasize togetherness. One product, two myth-frames, heroic visionary and upgraded community. The

multicultural consumer reacts to both, so the marketing teams sound the tone towards cultural segments.

4. CULTIVATING MULTILINGUALISM

Innovation blooms in ecosystems that treat language the way a city treats power grids and broadband as a critical infrastructure. The European Union makes this view explicit with its language technology strategy that funds cross-lingual AI so that a Finn can prototype with an Italian and push code to a Bulgarian tester without the need of translation. By underwriting tools that “break down language barriers while preserving diversity,” Brussels frames multilingualism as the plumbing of its Digital Single Market (Language Technologies and Multilingualism).

Canada’s official languages action plan offers another societal lens through which we can observe the cultivation of multilingualism and innovations. Ottawa is funding minority language universities and French immersion programs with its 2023-2028 action plan (2023) and Protocol for Agreements for Minority-Language Education and Second-Language Instruction, because a bilingual workforce is seen as economic infrastructure for AI, gaming, and aerospace clusters in Québec and Ontario. The wager is already paying off in Montréal, where a cosmopolitan talent pool fuels one of the world’s densest AI hubs.

Singapore shows the same logic in miniature. Its bilingual education policy (English plus a “mother tongue”) was conceived for social cohesion (Dixon, 2005), yet it also primes the island’s export-oriented economy to read patents in Mandarin at breakfast and code-switch to English for the investor pitch before lunch. The policy fosters habitual code-switching across English, Mandarin, Malay, and Tamil, a pattern documented in corpus and cognitive studies from Singapore (Lyu et al., 2010; Ng & Titone, 2021). Economic surveys link that linguistic dexterity to the city-state’s consistent top ten rank in the Global Innovation Index (WIPO, 2024a; WIPO, 2024b)

But linguistic diversity is not a magic wand. When we turn to China and its dialects, a 2024 study of 276 Chinese cities found that dialect fragmentation can dampen innovation when it mirrors social segmentation rather than cross-group dialogue (Luo & Tan, 2024). Dialects are the side streets of every language city, and in diglossic settings, the speaker’s voice

moves continually between a “high” prestige code for written compacts and a “low” code for gut feelings (Ferguson, 1959). That oscillation is a built-in simulator for redesigning the same idea for different social arenas. Where dialect boundaries ossify into identity walls, regional trust falls, and patent counts dip, reminding us that diversity alone is not the fuel. Instead, it is the circulation of cultivating. Just as Xiong & Chen (2022) notice, dialects can give an economy extra gears only if schools, media, platform algorithms, etc., let ideas shift without grinding. When that mechanism works, diglossia becomes a public accelerator of innovation.

Arabic diglossia shows the same dynamic on a continental scale. A fintech slogan may debut in Modern Standard Arabic to signal juridical authority, then ripple through Egyptian memes or Gulf voice notes that wrap the promise in a warmer vernacular rhythm. Because every Arab listener inhabits both codes, the novelty arrives both official and intimate (Giolfo & Sinatora, 2016). Marketing research in Saudi Arabia finds that campaigns that slip into local dialects earn higher engagement precisely because they sound less imported and more relational (Al Alaslā, 2020; Aldawish, 2024). Yet the region is far from uniform. Morocco’s newly documented “dual diglossia,” where Amazigh varieties now share the stage with Arabic, shows how even within a shared macro language, the adoption curve of an innovation bends with each additional strain of cultural narrative (Fathi, 2009).

5. CONCLUDING REMARKS

This paper reframes multilingualism as an infrastructure of innovative thought. The ability of multilinguals lies in reconfiguring myths and metaphors, which hold the key to innovation that is both local and global, technological and cultural, profit and value-driven. Managing the metaphor means managing the horizon of change. In the end, a consciously reshaped myth becomes the scenario by which the community decides whether to embrace the new or reject it.

Innovation is cognitive infrastructure itself, and there it bridges with multilingualism. It is the ability to hold multiple frames in parallel, to overlap and “distort” them until a third thing is born. This is precisely Koestler’s bisociation the collision of independent matrices that would never meet in a single language or cultural model. Multilingualism is therefore more than a tool for communication: it is a daily training in divergent thinking.

If languages can open up horizons, they can also narrow them. Linguistic gatekeeping is not a mere cultural loss but a reduction in the number of mental matrices available, an impoverishment of the switches in the system. When an Indigenous language disappears, the engineering knowledge encoded in its verb forms, the pharmacology hidden in its plant names and the ethics nested in its pronouns vanish with it (Harrison, 2007). UNESCO's Global Action Plan of the International Decade of Indigenous Languages (IDIL 2022-2032) warns that such losses erode not only cultural identity but also the world's reservoir of ecological solutions, because many endangered languages classify landscapes and relations in ways that anticipate sustainability goals.

A field report from Vanuatu makes the risk concrete. Local "weather magicians" read wind shifts and leaf fall to timetable yam planting, knowledge stored in some of the archipelago's 138 small languages (Harrison et al. 2024). As those vernaculars retreat, so does the community's capacity to prototype climate adaptive agriculture (Francois et al, 2015). Because many of the key botanical terms are untranslatable, no amount of outside funding can fully reconstruct the lost design cues once a tongue falls silent.

The scale of the threat is startling because roughly half of the planet's 7,000 languages are now classified as endangered, with one disappearing every two weeks (Zimmer, 2024). Each extinction prunes the option set for future innovators, much as biodiversity loss limits pharmaceutical discovery. By valorising cross-lingual collaboration, whether through community-owned patent pools or open source translation stacks, we have to recast language preservation from cultural charity to economic infrastructure.

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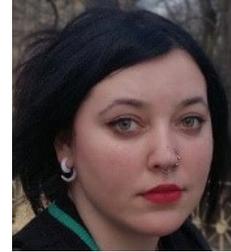
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6.

Facilitating labor market entry: An empirical study of the Montenegrin government's vocational training program for university graduates

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Facilitating labor market entry: an empirical study of the Montenegrin government's vocational training program for university graduates

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ABSTRACT

This paper presents a comparative analysis of the Montenegrin Government's vocational training program for university graduates, focusing on the years 2013, 2018, and 2024. The study examines sectoral distribution of graduates across eight institutional categories – government institutions and state companies, private companies, pre-university and higher education institutions, NGOs, political parties, international organizations, and others – to identify trends in sectoral attractiveness and graduate placement over time. The analysis underscores the continuing relevance of the program as a policy tool for facilitating youth transition into the labor market, while also revealing structural imbalances and the need for a more diversified and sustainable sectoral engagement.

Keywords: *Montenegro, Vocational and Professional training, graduates, youth employment, labor market, policy implications*

1. INTRODUCTION

The transition from higher education (HE) to the labor market represents a critical stage in the socio-economic development of any country. In

Montenegro, this transition has been systematically supported through the Montenegrin Government's vocational training program for university graduates, which has been implemented continuously since 2012. The aim of the program is to ease the market entry for young HE graduates, as well as to support both public and private sector to have better access to skilled labour force among youth, and to help them integrate that skilled labour force into their business operations. The program was designed to facilitate labor market entry for young graduates, increase their employability, and provide both public and private sector employers with access to a pool of educated but inexperienced workers, without imposing financial burdens during the professional development period.

Over the past thirteen years, the program has established itself as one of the most significant national measures in addressing graduate unemployment. By combining financial incentives, institutional coordination, and wide participation of employers, the program has created opportunities for thousands of young people to gain practical experience and transition to long-term employment. At the same time, it has offered small and medium enterprises, as well as public institutions, access to additional human resources and potential future employees.

Although the program is long-standing and wide-reaching, few studies have actually examined how sectoral patterns have evolved. While annual reports and statistical data are available, there has been little comprehensive research comparing how the distribution of program participants across different categories of employers has evolved over time. Understanding these trends helps explain which sectors are now more attractive to graduates - and how the program mirrors wider changes in the country's job market.

This study therefore aims to conduct a comparative analysis of the program in three benchmark years: 2013 (the first year of implementation), 2018 (the midpoint of the program's lifespan), and 2024 (the most recent cycle). By examining shifts across eight categories of institutions – public institutions and state-owned companies, private companies, higher education institutions, pre-university education institutions, political parties, non-governmental organizations, international organizations, and others – the research seeks to identify long-term patterns in graduates' sectoral mobility.

The central research problem addressed in this paper is the changing dynamics of sectoral participation and attractiveness within the program.

Therefore, we construct main research questions:

RQ1. How has the sectoral distribution of graduate placements changed between 2013, 2018, and 2024, and what do these shifts indicate about broader structural changes in Montenegro's labour market?

RQ2. How effectively does the current structure of the vocational training program align with the needs of a modern, market-driven labour force?

Specifically, the study investigates sectors toward which graduates are increasingly oriented and why is that the case. This research contributes to the understanding of how state-supported programs can shape graduate employment pathways, and provides evidence for policymakers on where program adjustments may be needed. Finally, the findings will offer insights into the alignment between higher education outputs, employer demands, and broader socio-economic trends in Montenegro.

2. LITERATURE OVERVIEW

The transition from education to employment has been extensively examined in labor economics and sociology, often focusing on the alignment between acquired skills and labor market needs (e.g. Quintini & Martin, 2006). According to human capital theory (Becker, 1964), education boosts both productivity and employability. On the other hand, mismatch theory points to the gaps that often appear between what education provides and what the labor market expects. This was the topic of interest for Montenegrin authorities and academia, since labour market mismatch has been the focus of national strategies, plans, forums, and events. Montenegro presents a microenvironment for research of labour mismatch and market failures when it comes to the transition from university to the market.

Facing high youth unemployment, many European countries have turned to active labor market programs like internships, subsidized employment, and vocational training (OECD, 2013). Montenegrin Government's vocational training program for university graduates can be seen as part of this policy landscape, aiming to reduce early-career barriers and improve labor market outcomes. There are programs similar in intention, like EU's Youth Guarantee, that are present in Montenegro as well. Montenegro's program is different in its continuous operation and institutional reach. Internship-based labor market programs have been widely implemented globally, but systematic evaluations remain limited and this is what this paper

stands for. Evidence suggests that such programs can increase short-term employability (Kluve et al., 2019), but their long-term effects on job quality and sectoral mobility are less clear. This paper will provide useful insights for the overall HE strategic approach by combining dual HE that is to be presented into the Law on Higher Education, microcredentials learning modules, and other national and EU HE initiatives.

Studies have shown that public sector employment remains highly attractive to graduates in many post-socialist countries, primarily due to perceptions of job stability and social security benefits (Verick, 2009).

Conversely, interest in private or non-governmental sectors may indicate changing values, labor market openness, or evolving career aspirations. However, it is a policy design that may shape the interests of young graduates and may make some sectors more attractive than others.

Rather than looking only at short-term employment, tracking where participants end up in the long run gives a clearer picture of how programs affect the labor market, especially in Montenegro, where data shows overemployment in the public sector. While existing literature provides useful frameworks for understanding graduate transitions and state interventions, few studies have systematically examined the sectoral trajectories of graduates over an extended period. This paper addresses that gap by offering a comparative analysis of sectoral distribution across three key years of Montenegrin Government's vocational training program for university graduates.

3. METHODOLOGY OF THE RESEARCH

The study was conducted at the population level, meaning that all participants in the program who were matched with employers in the selected years were included.

For the purpose of this research, only secondary data sources were used. The information provided by relevant institutions was selected, processed, and categorized by us. Based on this process, specific calculations were made to enable comparisons between the three time points – starting program point - 2013, escalation point (program became mature) - 2018, and the most recent point - 2024. This approach aims to capture graduates' flow over time and to impose good longitudinal analysis.

The research was structured as descriptive and comparative, intending to illustrate the patterns in the transition of graduates across industries and employer categories over the eleven years of program execution. The target population included all program participants who were paired with employers in the following years: 2013 – the first year of program implementation, 2018 – the mid-point of the program and 2024 – the most recent available data.

The analysis was based on eight main categories of employers where participants carried out their professional development. We don't categorise employers according to the Chamber of Commerce's sector categorisations or sector commissions categorisations, but we put them into eight categories according to the institution's type, in a way that allows us to differentiate and capture career pathways of graduates. The categories are shown in the table below. Hence, institutions categorization in this analysis is based on functional grouping model of organizations according to their role in socio-economic system and institutional formalization degree. Categories were created with aim to capture the whole spectrum of actors participating in the program and differentiating according to the ownership type, mission, regulatory framework and organizational structure. This categorization ensures consistency in longitudinal analysis through the observed years and enables identifying trends in youth employment according to institution type, not according to individual employers.

Employer category	Career orientation
Public institutions and state-owned companies	Public administration and governance
Private companies	Corporate and business sector
Higher education institutions	Academic and research affiliation
Pre-university education institutions	Educational and pedagogical pathway
Political parties	Political and civic engagement pathway
Non-governmental organizations	Civil society and social development pathway
International organizations	Global and multilateral engagement pathway
Other (sports clubs, religious organizations, specific institutions)	Cultural, community and specialized institutions pathway

Table 1. Categorisation of employers and graduates' career pathways

Building on both international and local perspectives, our study explores how policy choices and institutional settings affect where graduates end up working. Hence, policy design may influence the graduates' preferences and shape the share of public-private sector dominance when it comes to graduates, young and skilled labour force. Successful employment programs combine clear objectives with institutional partnerships, monitoring and understanding of local labour market conditions (Gueron, 1990).

Three main analytical techniques were applied in data processing and interpretation:

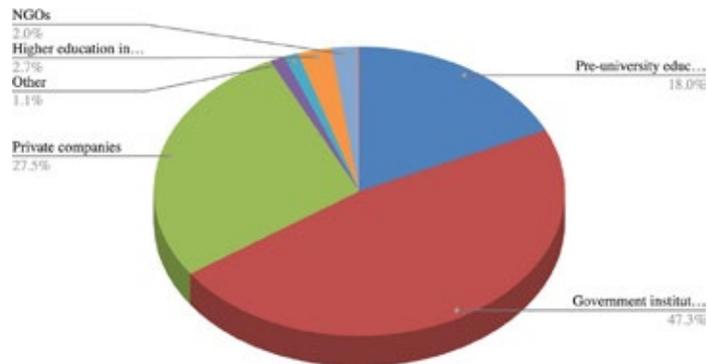
- Descriptive analysis – overview of the basic characteristics of participants and employers for each observed year,
- Comparative analysis – comparison between 2013, 2018, and 2024 to identify changes in the representation of sectors,
- Trend and correlation analysis – focused on identifying sectors that show growth, stagnation, or decline in attractiveness for participants during the eleven-year period.

The primary objective is to determine sectoral shifts in the attractiveness and availability of the program over time, i.e., to identify which categories of employers have become the key providers of professional training and employment opportunities for graduates.

Data were analyzed only in aggregated form, ensuring full anonymity of participants, without compromising the identity of program beneficiaries or institutions.

4. RESULTS AND DISCUSSIONS

In the following section, we firstly show the dispersion across sectors in each of three observed years, and later we compare the trends and point out important implications for decision makers and program designers. It also provides insights for program evaluation and further trends analysis. The graph below shows how many people took part in the program in 2013, which was the first year of the program. It gives a picture of how graduates were spread out across fields, which can be used as a baseline for comparing with future years.



Graph 1. Individuals within the Montenegrin Government's vocational training program for university graduates (2013)

The 2013 dataset provides a baseline for understanding the early structure of the vocational training program and reveals a highly public-sector-driven model. Nearly half of all participants were placed in government institutions and state-owned enterprises, confirming the traditional dominance of the public sector in Montenegro's employment landscape. The stability and capacity of state institutions enabled such wide participation, reflecting the traditional perception of the state as the primary employer in Montenegro.

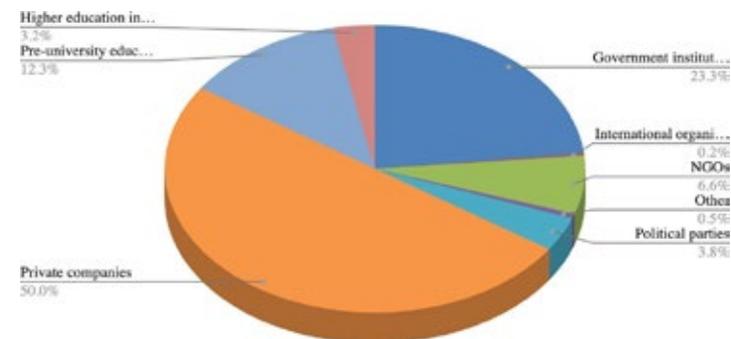
Private companies absorbed just over a quarter of participants, indicating the early emergence of the private sector as a complementary but still secondary actor in graduate integration. Educational institutions, primarily pre-university, accounted for roughly one-fifth of placements, highlighting the consistent demand for graduates in teaching and pedagogical roles.

The remaining categories (NGOs, political parties, international organisations, and "other") collectively formed only a marginal share of placements. Although numerically small, their inclusion demonstrates that the program was designed with broad institutional diversity, even if such diversity had not yet materialised in practice.

The 2013 data confirms that the program was predominantly public-sector oriented, with the private sector on the rise and education acting as a steady domain of placement.

The following graph illustrates the distribution of graduates across sectors in 2018, highlighting key trends in sectoral engagement five years after

the program's launch. This snapshot enables a comparative perspective on how preferences and opportunities have evolved since 2013.



Graph 2. Individuals within the Montenegrin Government's vocational training program for university graduates (2018)

In 2018, a total of 3,174 graduates participated in the program, and the data reveal a decisive structural shift: the private sector overtook the public sector for the first time, becoming the dominant provider of training opportunities.

Private companies absorbed half of all participants, signalling the consolidation of the private sector as the primary entry point for young graduates. This change reflects both the gradual strengthening of Montenegro's private economy and a broader rebalancing away from traditional public-sector dependence.

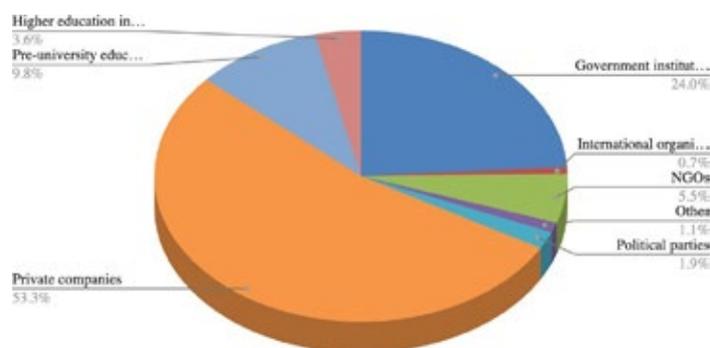
The share of graduates placed in public institutions and state-owned companies fell to 23%, less than half of its 2013 level. This sharp decline indicates a systemic transition in which the state no longer serves as the primary employer for graduates entering the labour market.

Education-related institutions remained a steady but reduced pathway, with pre-university institutions engaging 12,3% of graduates and higher education institutions around 3%, suggesting stable but limited absorptive capacities in the education sector.

Civil society actors expanded their role: NGOs increased their share to 7%, and political parties to 4%, demonstrating broader diversification and the program's growing outreach into non-state sectors. International organisations and "other" institutions remained marginal, together accounting for less than 1%, indicating persistent barriers to the involvement of global or specialised organisations.

Overall, the 2018 results mark a turning point: the program shifted from being public-sector-driven to private-sector-led, accompanied by a visible expansion of opportunities within civil society. These patterns provided the foundations for the 2024 landscape, in which the private sector firmly established itself as the central pillar of graduate placements.

The following graph presents the distribution of graduates across sectors in 2024, offering the most recent insight into the program's outcomes. This data allows for a direct comparison with 2013 and 2018, providing a clear picture of long-term trends and shifts in sectoral attractiveness for graduates.



Graph 2. Individuals within the Montenegrin Government's vocational training program for university graduates (2024)

In 2024, the program placed 2,236 graduates across different sectors, further consolidating the structural shift observed since 2018.

The private sector continued to strengthen its leading position, absorbing 53.3% of all participants—the highest share recorded to date. This confirms the private sector as the primary entry point for graduates. It reflects the expansion of SMEs and service industries in Montenegro, and also indicates that the programme has succeeded in encouraging private employers to engage in early career development.

The public sector-government institutions and state-owned companies accounted for 24%, a stable yet clearly secondary role compared to earlier cycles. This stabilization suggests that the steep decline observed between 2013 and 2018 was not a temporary fluctuation, but a long-term adjustment in the structure of graduate absorption.

Education-related institutions (pre-university and higher education combined) absorbed roughly 13,4% of graduates, continuing their trend as a steady but diminishing segment of placements. This decline may indicate reduced hiring capacity or changing career preferences among graduates.

NGOs hosted 5,5% of participants, maintaining their position as a small but relevant sector for graduates interested in civic engagement and donor-funded work. International organisations, though representing only 0,7%, remained symbolically important due to their high-value professional exposure. Political parties (1,9%) and the "other" category (1,1%) continued to offer niche but diverse opportunities.

Overall, the 2024 results confirm a labour market increasingly driven by private-sector absorption, with the public sector functioning as a secondary but stable partner. The following table shows the trend of graduate placements across different employer categories for the years 2013, 2018, and 2024, along with an explanation of the observed trends.

Employer category	2013	2018	2024	Trend Explanation
Public institutions and state-owned companies	47,3%	23,4%	24%	Sharp decline after 2013, then stabilizes - indicating a move away from public sector reliance.
Private companies	27,5%	50%	53,3%	Steady increase; now the dominant employment sector for graduates.
Pre-university education institutions	18%	12,3%	9,8%	Gradual decline; education remains relevant but less central.
Higher education institutions	2,7%	3,3%	3,6%	Stable but limited; constrained by low absorptive capacity.
NGOs	2%	6,6%	5,5%	Growth in 2018, slight drop in 2024; rising but fluctuating engagement in civil society.
International organizations	0,2%	0,2%	0,7%	Marginal but growing; niche sector with strategic value.
Political parties	1,2%	3,8%	1,9%	Peaked in 2018; reflects varying interest in political engagement.
Other (sports, clubs, religious organizations, specific institutions)	1,2%	0,5%	1,1%	Small and stable share; reflects inclusiveness rather than mainstream career path.

Table 2. The trend of graduate placements across different employer categories

The private sector dominates, employing more than half of all participants, suggesting an important structural shift compared to earlier years when the public sector played a stronger role.

The public sector, while still significant at one-quarter of the total, no longer holds the primary position. Education-related institutions remain a relevant channel, absorbing close to 14% of graduates. NGOs and political parties together represent about 7,4% of placements, indicating a persistent - though smaller - stream of interest in civic and political engagement. International organisations, while numerically minor, provide symbolically important opportunities. Osterman's findings support this interpretation: only organizations with developed internal labor markets and well-structured HR functions tend to adopt new programs (Osterman, 1995).

The 2024 data highlights a clear rebalancing of graduate career entry points compared to the programme's early years. The comparative data reveal significant shifts in the sectoral distribution of graduates participating in Montenegrin Government's vocational training program for university graduates.

The analysis reflects a clear long-term trend away from public sector dependency, suggesting greater diversification of opportunities in other sectors. These findings are in line with Verick's argument that public sector employment remains highly attractive to graduates in many post-socialist countries, but it is no longer the most dominant and wanted sector in Montenegro.

The private sector's share indicates it has become the primary driver of graduate absorption, highlighting its increasing role in Montenegro's labor market and signaling to decision makers that policies must further strengthen private sector-graduate linkages.

Pre-university education institutions decline shows that while education remains a steady employer, it has become relatively less attractive or accessible to graduates over time, possibly reflecting structural changes in the education sector or saturation of available positions.

NGOs and international organisations remain marginal employers but show different dynamics. These figures indicate gradual but insufficient integration of graduates into international or civil society work environments, an area where targeted policies could foster growth.

Political parties had a small yet notable share in 2013 (1,2%), rising to 3,8% in 2018, before decreasing to 1,9% in 2024. The "Other" category has remained negligible across all three years.

The data indicate a structural transformation of graduate employment trajectories, as shown below.

- The decrease in government dominance and the increase in private sector leadership in hiring graduates show a clear shift toward market-driven labor integration, which is in keeping with the overall modernization of the economy.
- The shrinking role of educational institutions suggests a need to evaluate policies on the long-term sustainability of employment opportunities in teaching and academia.
- The weak presence of NGOs and international organisations reveals untapped potential for diversifying graduate engagement, particularly in areas of civil society and EU integration processes.

For the wider public, the data make it clear that career prospects are shifting toward the private sector, driven by growing demand for flexibility and skills that fit real business needs. For decision makers, the results point to the need for stronger links between the public and private sectors, more innovative graduate programs, and an education system that keeps pace with the fast-changing job market. This long-term trend indicates a gradual rebalancing of employment pathways, reflecting broader economic changes such as the expansion of SMEs, the maturation of market institutions, and reduced reliance on the state as the primary employer. These results collectively point toward a system increasingly driven by market forces and reduced structural dominance of the state, showing that Montenegro is a developing country facing a transition from the employment attractiveness of the post-socialist public sector dominance (Verick, 2009) to the market-driven economy. However, the persistently low representation of international organisations and the fluctuating yet limited presence of NGOs indicate areas where the program is not yet fully aligned with emerging labour-market segments, particularly those connected to EU-related work, civil society, and global institutions. The steady but small absorptive capacity of education and academia further demonstrates structural limitations that remain unchanged. Thus, the findings highlight both positive alignment (in relation to private-sector engagement) and persistent gaps in sectors with strategic developmental importance.

5. RESEARCH LIMITATIONS

Despite providing valuable insights into sectoral trends in the Montenegrin Government's vocational training program for university graduates, this study is subject to several important limitations that must be acknowledged.

First is the temporal scope. The analysis is restricted to three specific years: 2013, 2018, and 2024. While these represent the inaugural year, a midpoint, and the most recent year of the program, they do not capture the full trajectory of the initiative over its eleven-year history. Excluding the intervening years may overlook fluctuations or anomalies that could provide a more nuanced understanding of long-term trends.

Sectoral categorisation is also a limitation. The eight broad institutional categories used in the analysis may mask important internal heterogeneity. For example, "private companies" include firms of vastly different sizes, industries, and organizational capacities. Similarly, "government institutions and state companies" encompass a wide spectrum of entities with diverse recruitment practices. This aggregation limits the granularity of the conclusions and risks oversimplifying complex employment dynamics. There is the problem of subsectors not being analysed, so we can't capture the data on some subsectors or companies being more attractive than others. We also don't point out some large employers that absorb large numbers of graduates and shape the proportion in this way. Hence, more in-depth analysis is needed to capture these influences.

The observed sectoral shifts across the three years are interpreted primarily as reflections of graduate preferences. However, other variables may play an equally or more decisive role. Changes in sectoral absorption could stem from external institutional factors such as government hiring freezes, private sector growth, donor funding cycles, or policy reforms rather than shifts in graduate aspirations alone. Without incorporating these contextual variables, the conclusions risk overstating the role of student preference.

The study employs a purely quantitative, descriptive-comparative methodology. While effective for identifying statistical patterns, it does not capture the subjective motivations, perceptions, or decision-making processes of graduates. The absence of qualitative data limits the ability to fully understand why certain sectors attract more graduates or how graduates evaluate their professional development experiences. Therefore, the qualitative analysis can shift focus to causal mechanisms and reasons over results and outputs. It can contribute by identifying the role of supply

(employers) quality, market growth, etc., as independent variables that shape graduates' orientation and preferences.

The analysis measures only the distribution of graduates at the point of placement within the program. It does not follow participants longitudinally to determine whether placements led to permanent employment, career advancement, or skill development. As such, the findings provide a snapshot of initial placement patterns but do not assess the long-term effectiveness of the program in fostering sustainable employment.

Policy and institutional dynamics are also to be considered. Long-term improvements in employment outcomes depend not only on program design but on the ability to adapt to shifting labour market dynamics. (Gueron, 1990) The study does not systematically account for macroeconomic changes, policy reforms, or institutional restructuring that may have influenced sectoral opportunities between 2013 and 2024. For instance, fiscal constraints, reforms in public administration, or the expansion of private industries may have disproportionately shaped sectoral absorptive capacities. Ignoring these factors reduces the explanatory power of the findings.

6. CONCLUSION

By comparing data from 2013, 2018, and 2024, the paper explores how the program has connected graduates with different parts of Montenegro's labor market. The analysis includes eight types of institutions and tracks how placements changed, offering insight into how the program has developed and how relevant it remains today.

The data show that private companies have remained the main employers throughout the period, although their share has varied with broader economic and social trends. Government institutions and state companies, dominant in 2013, saw a sharp drop by 2018 but began to recover slightly by 2024. NGOs and political parties kept a relatively small but steady presence, while international organizations continued to attract only a few participants, a sign that international integration still poses a challenge for young professionals in Montenegro.

Overall, the findings confirm that the program still plays an important role in helping graduates move from university into the labor market. The

sectoral shifts observed in Montenegro, from public-sector dominance in 2013 to private-sector leadership in 2018 and 2024, reflect broader global patterns documented in meta-analyses of youth employment programs. As Kluge et al. (2019) note, youth employment initiatives tend to produce small but positive effects, with success strongly dependent on program design and the structure of local labor markets. The findings suggest that the vocational training program has partially adapted to the realities of a modern, market-driven labour force. Its evolution toward greater private-sector engagement aligns with ongoing economic changes and helps diversify early-career opportunities for graduates. However, the persistent marginal role in some sectors shows that the program still does not fully reflect the breadth of opportunities in a contemporary, diversified labour market. To improve alignment, policymakers should strengthen partnerships with underrepresented sectors, address structural barriers in education, and tailor program mechanisms to better match emerging market needs.

For policymakers, this brings some recommendations:

- Strengthening links with underrepresented sectors and analyzing sectors and subsectors that are largely present to capture the quality of the program. Findings show there are significantly underrepresented sectors that are unused as sources of job opportunities, despite presenting important career pathways for young professionals.
- Valuable oscillations of sector participation match with macroeconomic changes and not with program-design changes; we recommend that policy should target long-term stability and predictability in order to decrease dependence on short-term financial incentives.
- Align program design with the actual absorptive capacity of the private sector. Develop formal cooperation mechanisms with the business community to improve both the sustainability and quality of private-sector placements.
- Redesign cooperation with education institutions to address declining participation. The long-term decline suggests a need for targeted policy action to ensure that the education sector remains a viable career pathway for graduates.
- Implement systematic quality monitoring by combining quantitative data with qualitative insights. Without qualitative evidence, policymakers cannot fully understand employer motivations, participant expectations,

or the long-term effects of sectoral placements.

The program continues to play an important role in helping young people enter the job market, but its future success will depend on how well it keeps pace with changes in Montenegro's economy and how strongly it encourages stable, meaningful careers for graduates. Previous research also shows that the effectiveness of training programs depends not only on participation itself, but also on participant characteristics and the structural conditions of the labour market. Gritz (1993) finds that training increases the likelihood of employment transitions but does not uniformly improve long-term job stability, suggesting that program effects vary across groups and contexts. This supports the need to examine sector-specific outcomes within the observed program.

A promising avenue for future research is examining the relationship between the sector in which graduates complete vocational training and their subsequent employment outcomes. While this study highlights clear structural shifts in sectoral absorption, it does not assess whether placements in specific sectors lead to higher employability, greater job stability, or improved career progression. Understanding these dynamics would provide policymakers with evidence on which sectors generate the strongest long-term returns for graduates, and how the program can be strategically optimised to support sustainable employment pathways.

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