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Web: www.ses.org.rs
E-mail: office@ses.org.rs
President of the Serbian Association of Economists
Vlahović Aleksandar
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There are almost two hundred countries (or national economies) in the world. None of them are immune to the permacrisis, as an enduring, multi-faced structural crisis, characterized by prolonged instability and insecurity across the economy, society, and nature. So, the key question is: Who owns the long term? A simple answer is: you cannot manage for the long term without a transition capable of mitigating key structural imbalances and anomalies of the economic system. The transition from the "new normal" to a "better normal" requires the establishment of new economic rules centered around well-being as the ultimate goal, along with stakeholder value, the shift from a linear model of growth to a circular one, more intense use of industrial policies for tradable sectors, and the coordination role of the state leveraged by state impact investments and automatic macroeconomic stabilizers. The so-called "green transition" is what it takes for fostering sustainability of the economy, society, and nature in the long term. Since there is no single path to successfully manage the long term, the green transition requires solutions from different perspectives.

The *Sustainability and Climate Risks* section kicks off with the paper prepared by a trio of authors, *D. Đuričin, V. Kuč,* and *I. Vuksanović Herceg*, discussing the Green Transition Action Plan for Serbia. Their main conclusion suggests that, despite a relatively good strategic fit with macro trends, the green transition could serve as a key lever for rejuvenating the economy and nurturing sustainable ties with the EU. In a complementary vein, an insightful paper, authored by *D. Lončar,* navigates the landscape of investment opportunities in Serbia through the lens of the Sustainable Development Goals (SDGs). His exploration unveils a comprehensive SDG Investor Map for Serbia, consisting of the 13 Investment Opportunity Areas (IOAs) with a potential investment volume totaling $8.3 billion over the next 5 years, and offering a roadmap for investors keen on advancing sustainable initiatives.

In the first paper in the *Growth and Development* section, *J. Tabaković* sheds light on the symbiotic relationship between macroeconomic stability and the corporate sector's performance in Serbia. Through meticulous analysis spanning a decade, she illustrates how stability serves as a catalyst for growth, fostering a conducive environment for innovation, export propensity, and expansion across diverse sectors. Particularly noteworthy is the confirmation of our economy's vitality, evidenced by the achievement of a 5% annual growth in real operating income in the corporate sector during the period 2013-2022. In the second paper in this section, a duo of authors, *S. Ranđelović* and *A. Đorđević*, delves into the essential savings-investment-growth nexus, benchmarking Serbia's performance against fast-growing economies as role models in this respect. The authors emphasize the critical role of both public and private investments in propelling

long-term economic development, advocating for strategic measures and concerted efforts to augment domestic private investments, which are essential for sustained progress.

In the *Accounting, Auditing, and Forensics* section, *D. Malinić* and *S. Vučković Milutinović* tackle the intricate challenge of measuring progress towards SDGs at the global and national levels, as well as the role of corporate reporting in facilitating their achievement. Additionally, they provide an analysis of the latest scores of the main SDG indicators, including the SDG index and the Spillover Index, for Serbia and comparable economies from Southeastern Europe. The authors emphasize the necessity for cohesive reporting frameworks to facilitate effective progress tracking and accountability.

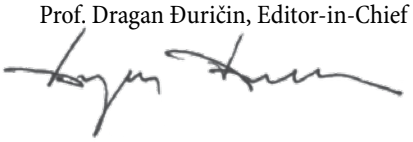
In the *Marketing* section, a team of authors, including *N. Savić*, *J. Lazarević*, *A. Jeličić*, and *F. Grujić*, offers a compelling examination of the transformative effects of the digital economy and the 4th Industrial Revolution, with a particular focus on the consumption patterns of Generation Z in Serbia, underpinned by a comprehensive survey. Their findings indicate the profound socio-economic shifts precipitated by the advent of the digital age, prompting critical reflections on the evolving dynamics of consumer behavior as well as capitalism itself.

In the *Technology Change and Innovation* section, *D. Vujović* explores the emerging frontier of Generative AI, analyzing its far-reaching implications across various sectors alongside the challenges posed by these groundbreaking technologies and solutions. Special emphasis is placed on the potential impact on the future labor force and concerns surrounding the possibility of AI singularity. The author underscores the critical importance of preparing labor re-skilling, upskilling, and retraining programs to address the evolving needs arising from the anticipated changes in the structure and skill set of the future workforce, particularly in sectors directly impacted by Generative AI tools and models.

Lastly, in the *Tourism and Hospitality Management* section, a trio of authors, *G. Petković, A. Bradić-Martinović,* and *M. Lazić,* shines a spotlight on the imperative of developing digital skills in Serbia's tourism and hospitality sector. Their findings, drawn from an empirical analysis of primary data collected from 418 respondents, highlight the urgent need for targeted interventions to bridge existing skill gaps and fortify the sector's resilience in an increasingly competitive landscape.

Thank you for joining us on this journey through diverse perspectives and inspiring research. We hope these insights spark meaningful discussions and inspire practical applications in your fields.

Prof. Dragan Đuričin, Editor-in-Chief



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Dragan Đuričin
World Academy of Art and Science

Vukašin Kuč
University of Belgrade
Faculty of Economics and Business
Department of Business Economics and Management

Iva Vuksanović Herceg
University of Belgrade
Faculty of Economics and Business
Department of Business Economics and Management

GREEN TRANSITION ACTION PLAN FOR SERBIA: A CALL FOR URGENT, SYSTEMIC, COMPREHENSIVE, AND THOUGHTFUL ACTION

Akcioni plan zelene tranzicije za Srbiju – zahtev za hitnom, sistemskom, sveobuhvatnom i promišljenom akcijom

Abstract

The dominance habit, at the core of human nature, continually pushes people into conflict with each other as well as against nature. This tendency has been exacerbated to the extreme during the period of economic neoliberalism. Since economic neoliberalism has lasted for more than four decades, a great many structural imbalances and anomalies of the economic system have emerged. Consequently, the economy, society, and the entire planet have remained in an unsustainable mode. In contrast to the exponential progress made since the start of economic liberalism, during the period of economic neoliberalism the economy and society entered regression, incapable of capitalizing on the growth potential from the last two industrial revolutions (3IR and 4IR). The economy entered a structural crisis because economic rules and policy platform brutally ignored planetary boundaries and the laws of nature as well. Precisely, without inbuilt corrective mechanisms aimed at mitigating the main fractures of the system, the economy has been floating between simultaneous destructions on the supply and demand side, and finally entered a structural, multi, and permanent crisis, simply, a "permacrisis". Furthermore, external asymmetric shocks, such as climate change, pandemics, and geopolitical disputes, have continuously deepened the fractures of the system and created new ones. In this paper, we intend to argue that when the pieces relevant for the functioning of the planet, envisioned as the "system dynamics" of three layers, cannot fit together, it is necessary to start with the reshuffling of the socio-economic layer, as the root cause of today's major planetary problems not only in the economy and society but also in the physical system and biosphere. The imperative of a new era is that economic rules should respect planetary boundaries and be compatible with the laws of nature, primarily reversibility and evolution. The aforementioned implies the necessity to initiate the transition from a "new normal", actually, abnormal, to a "better normal". Negative rebounds can only be reversed through the creation of a new context capable of internalizing negative externalities resulting from prior development. The ultimate outcome of such a radical change could be the birth of a sustainable (and inclusive) economy, both towards people and nature. The transition from an old to a new system is inevitable to steer the economy and society away from the permacrisis and put it on a sustainable trajectory. If the new economy intends to be in harmony with nature, the related transition could be named the "green transition" or the path back to a green planet as the context in which the seeds of human life were originally nurtured. Following the aforementioned logic, the paper is organized into six parts, excluding the Introduction and Conclusion. In Part 1 and Part 2, our focus will be on the root causes of structural imbalances (and anomalies) within the socio-economic system and the physical system, respectively, in the Anthropocene era. Part 3 presents a literature review of the attempts to mitigate inbuilt structural imbalances of economic neoliberalism. The intention is to address the green transition as a prerequisite for a sustainable economy and society. In Part 4, we delve into the strategic audit of Serbia's economy fact sheet at the outset of the green transition. The starting point in advocating for Serbia's return to a sustainable economy path is to provide an accurate diagnosis of the situation, addressing both macro and micro aspects, including everything in between. Part 5 offers an empirical test of attitudes towards SDGs/ESG sustainability metrics in Serbia's business community. Empirical data suggests a subtle inclination toward the environmentalization of the economy and sustainability-related disclosure. Consequently, in Part 6 we discuss the government's role in preparing the green transition action plan.

Keywords: *Serbia, economic neoliberalism, sustainable economy, green transition, SDGs, ESG, circular model of growth, heterodox policy platform, green finance, IFRS sustainability-related disclosure*

Sažetak

Potreba za dominacijom, kao osnova ljudske prirode, kontinualno gura ljude u konflikt sa drugim ljudima, kao i u odnosu na prirodu. Prethodna tendencija je pojačana do ekstremne vrednosti tokom perioda ekonomskog neoliberalizma. Od samog početka ekonomskog neoliberalizma pre više od četiri decenije, pojavljivao se veliki broj strukturnih neravnoteža i anomalija sistema. Posledično, ekonomija, društvo i planeta našli su se u nestabilnoj situaciji. Suprotno eksponencijalnom progresu koji je ostvaren tokom perioda ekonomskog liberalizma, tokom perioda ekonomskog neoliberalizma ekonomija i društvo su se našli u regresiji, lišeni mogućnosti da koriste rezultate poslednje dve industrijske revolucije (3IR i 4IR). Ekonomska pravila i ekonomske politike stvorili su strukturne neravnoteže i anomalije pošto su brutalno negirali planetarna ograničenja i zakone prirode. Bez ugrađenih korektivnih mehanizama sa ciljem da se uklone glavne pukotine sistema, ekonomija lavira između simultanih destrukcija na strani ponude i na strani tražnje, da bi konačno ušla u strukturnu, višestruku i permanentnu krizu, jednostavno u „permakrizu". Štaviše, eksterni asimetrični šokovi, kao što su klimatske promene, pandemije i geopolitički konflikti, kontinuirano produbljuju i stvaraju nove pukotine u ekonomskom sistemu. U ovom radu želimo da ukažemo na to da kada delovi neophodni za funkcionisanje planete zamišljene kao troslojni „sistem dinamika" nisu međusobno sinhronizovani, neophodno je otpočeti sa demontiranjem društveno-ekonomskog sloja kao uzroka današnjih planetarnih problema, ne samo u ekonomiji i društvu, već i u fizičkom sistemu i biosferi. Imperativ novog vremena je da ekonomska pravila i politike moraju biti kompatibilni sa planetarnim ograničenjima i zakonima prirode, primarno zakonima reverzibilnosti i evolucije. Prethodno ukazuje na neophodnost otpočinjanja tranzicije od „nove normalnosti" ka „boljoj normalnosti". Zaokret negativnog trenda jedino je moguć stvaranjem novog konteksta sposobnog da internalizuje eksterne negativne efekte prethodnog razvoja. Krajnji rezultat ovakve radikalne promene mogao bi da bude rađanje održive (i inkluzivne) ekonomije, prema ljudima i prirodi. Tranzicija od starog ka novom sistemu neophodna je kako bi se ekonomija sačuvala od permakrize, kao i da bi se trasirala putanja održivog razvoja. Da bi ekonomija bila u harmoniji sa prirodom, tranzicija koja bi trebalo to da obezbedi mogla bi se nazvati „zelena tranzicija" ili putanja prema zelenoj planeti kao okruženju u kome su se razvile klice ljudskog života. Sledeći prethodnu logiku, članak je organizovan u šest delova, pored uvoda i zaključka. U prvom i drugom delu fokus će biti na uzrocima strukturnih neravnoteža (i anomalija) u društveno-ekonomskom sistemu i planeti kao celini, respektivno, u periodu antropocen. U trećem delu dat je pregled literature koja je nastala u nastojanju da se razreše ugrađene strukturne neravnoteže ekonomskog neoliberalizma. Intencija je da se zelena tranzicija odredi kao pretpostavka održive ekonomije. U četvrtom delu nalazi se strategijska revizija ekonomskih podataka vezanih za Srbiju pre otpočinjanja zelene tranzicije. Početna tačka u zastupanju stava o neophodnosti povratka Srbije na održivu putanju razvoja je adekvatna dijagnoza stanja, makro i mikro, kao i svega između toga. Peti deo ponudiće empirijski test stavova prema SDG/ESG merilima održivosti u poslovnoj zajednici Srbije. Podaci ukazuju da postoji suptilan interes prema uvažavanju značaja zaštite životne sredine u ekonomiji i obelodanjivanju merila održivosti. Posledično, u šestom delu ćemo prodiskutovati ulogu države u pripremi akcionog plana zelene tranzicije.

Ključne reči: *Srbija, ekonomski neoliberalizam, održiva ekonomija, zelena tranzicija, merila održivosti SDG, ESG, cirkularni model rasta, heterodoksna platforma ekonomskih politika, zeleno finansiranje, IFRS standardi održivosti*

Introduction

In the period of more than four decades since the start of economic neoliberalism, the global economy (and society) has failed to achieve a state of which any economics luminary can be proud. Since the onset of the Great Recession of 2008, the global economy has navigated through tricky waters filled with conceptual headwinds. As a result, the economy and society have constantly floated from crisis to crisis, ultimately entering a state of "permacrisis". In line with previous evolution, two fundamental questions emerge. First, how did we find ourselves in this perilous intersection? Second, how can we break free from it?

According to Collins Dictionary [18], "permacrisis" was declared the word of the year in 2022. It denotes a structural, multi-faced, and permanent crisis, manifesting over an extended period of instability and insecurity, causing extremely negative trends in the economy, society, and nature. In the related economic system, there are no built-in corrective mechanisms for abating structural imbalances and anomalies of the system. The reality is only deepening and accelerating them.

The root cause of conflicts, both between people and nature and within society, lies in human nature. The deeply ingrained domination habit is evident in human behavior. In the Anthropocene epoch, humanity has waged a war on nature, which intensifies. This suicidal behavior results in a "lose-lose" game because the planet is a closed system rather than an open one. In a closed system, a zero-sum game is also unsustainable. Due to profound climate, economic, financial, biotic, and geopolitical shifts, both games are leading to a conundrum. Moreover, when the domination habit is amplified by technological breakthroughs from the last two industrial revolutions (3IR and 4IR), the planet, along with the economy and society, is dying slowly but surely.

When the economy and society are in regression, new generations cannot replicate the progress achieved by their predecessors. Not only to prosper but also to survive, humanity urgently needs the escape from the permacrisis, namely the transition to a new order [11]. These days, the world stands at the outset of a new, transformative era – the era of "green transition", a plan to fix a fractured global economy (and society), providing a means to escape the freefall of economic, financial and social discourse.

In the quest for solutions, we can begin by examining the root causes of the problem. Many esteemed economic scholars and business practitioners posit that they lie within economic neoliberalism, precisely in the key rules of market fundamentalism philosophy (liberalization, deregulation, privatization, and globalization) as well as in its reaction policies (such as inflation targeting, deregulated securitization, quantitative easing, degressive taxation, etc.), often inefficient, mostly counterproductive, and biased towards financial elite.

The negative economic consequences of structural imbalances and anomalies, both socio-economic and natural, have been exacerbated by the rules of economic neoliberalism, plunging humanity into a cyclical downfall marked by constants such as supply shortages, sticky inflation, high and growing debt, fiscal deficit, carcinogenic growth, etc. Stagflation, a common backdrop in this system, perpetuates the economy's freefall. Namely, the economy floats from crisis to crisis, influenced by a random impact of diverse driving forces (finance, economy, climate, biotic feedback loops, geopolitics, etc.). Undoubtedly, climate change as a driver holds significant weight, substantially impacting our lives, those of our children, and our children's children. Global warming, or rather global boiling, has pushed the planet to the brink of collapse. According to IMF [37], climate change not only triggers economic bust of the global economy but also widens the gap between developed and developing world[1]. Without addressing the root causes of the climate emergency, a sequential recovery might, at best, be the maximum achievement of anti-crisis programs.

1 In the developed world, a temperature rise of 2 degrees Celsius has the potential to reduce the growth rate by up to 0.5%, with a delay of 7 years, but it causes a decrease of 0.5-1.0% in the growth rate in the developing world.

A multi-crisis reality requires a multi-transition approach. Also, correcting anomalies and facilitating recovery require complex measures because climate change and an unsustainable economy are global problems. So, things have changed structurally. Moreover, addressing a complex crisis mandates collective efforts. So, finding a solution to the climate emergency, along with forging the path toward a sustainable economy, primarily based on the respect for the reversibility principle, goes beyond simple national economic interests. The mitigation needs collective and coordinated efforts, the global context change, and the implementation of a new mix of technologies enabling economic development and a way of life respecting the limits of nature. Last but not least, this initiative is not just about individual interests of a national economy, it is a call for shared prosperity. The potential of green transition to catalyze new industrialization is huge, with far-reaching dissemination effects. Every national economy, including Serbia, has a role to play in this transformative journey.

In the global economy, the general momentum is a result of the combining effects of long-term macroeconomics trends (and problems), inherent structural imbalances in the economic system, and ineffective policy responses. As the anomalies of the economic system and unconventional economic policies have been institutionalized, opinion makers named this state a "new normal". The crucial takeaway from this context is that the economy, society, and the planet have embarked on an unsustainable trajectory. Without a paradigm change in economics, both macro and micro, imbalances will continue to escalate nonlinearly in the economy, society, and the planet. The planet, which is on the verge of being 2.0 degrees Celsius warmer than it was in the late 1800s, when the market economy started leveraging the breakthroughs of industrial revolution, is already grappling with the climate emergency.

In the quest for a "better normal", one thing is certain. Adhering to neoliberal rules and policies is not feasible. A transition from an old to a new system is imperative, constituting a long-term journey. Even with the implementation of a diverse and more effective platform, it should be acknowledged that reversing ongoing trends won't be easy because the climate emergency is

not a single issue. It is intricately interconnected with many other issues. For such mega masses, un-systemic, partial and erratic responses are ineffective. Consequently, in the pursuit of solutions, actions must be guided by a comprehensive framework.

First and foremost, the purpose of the economy must undergo a change, prioritizing well-being over egoism. Simultaneously, humanity should find a sustainable path for economic development and lifestyles respecting planetary boundaries. The so-called "green transition" emerges as the gateway to this new economy and society. It entails a multi-transition from old to new system dynamics with reflections on economy, climate, biosphere, lifestyle, and geopolitics. Furthermore, the outcomes of this transformative journey must be inherently sustainable. Following this direction, the economy, society, and the planet could reach a climate-neutral inflection point by 2050, as a prerequisite for long-term sustainability. The economic transition necessitates a shift from a linear to a circular model of growth and a departure from the orthodox neoliberal policy platform colloquially named the "Washington Consensus", both deeply rooted in market fundamentalism. Instead, there should be an embrace of a heterodox economic policy platform that achieves a better balance between core economic policies and structural (or industrial) policies. This shift is essential for climate-neutral transformation of industries related to energy and land use, such as power, manufacturing, agriculture, buildings, mobility, forestry, and waste management. Moreover, it entails a change in lifestyle based on the reversibility principle, particularly in urban areas.

Each national economy bears the responsibility to actively engage in this process. From Serbia's perspective, the first step in this endeavor should involve the formulation of the Green Transition Action Plan. We suppose that this is only a tiny part of the comprehensive efforts required to integrate the green transition into the fabric of the desired socio-economic system and, by doing so, to develop its pillars, the circular (and regenerative) model of growth and the heterodox economic policy platform. We advocate for a transformative change because we want the economy, society, and the planet as whole to be as sustainable and inclusive as possible.

Structural imbalances and anomalies of economic neoliberalism

Let us begin by setting the ground, adhering to the principle that in the economy everything is contingent on the context. It is also complementary to note that technology serves as an enabler of economic progress, and the socio-economic context acts as the infrastructure.

The first industrial revolution marked the beginning of the Anthropocene as a "human-centered era". In this stage of evolution, the impact of human activities on the planet has become predominant. Unfortunately, fault lines in the design of the socio-economic context impose constraints on achieving sustainable and inclusive growth, towards both people and nature. What lacks sustainability and inclusivity will not endure.

To explain what happened in the Anthropocene, we can revisit J.W. Forrester's concept of "system dynamics" [33]. The full interconnectedness between three layers (the socio-economic system, the physical system, and the biosphere) provides a suitable concept for analyzing the sustainability of each layer as well as the sustainability of the planet as a whole.

The socio-economic context has the potential to change everything, either positively or negatively. To achieve a positive impact, there is a need for compatibility between economic rules and laws of nature. Unfortunately, in economic neoliberalism, the supremacy of individual interests over collective well-being, along with the infiltration of market fundamentalism into economic rules and policies, fundamentally contributes not only to the unsustainability of the socio-economic context, but also to the unsustainability of other layers within the system dynamics.

The socio-economic context is changeable. It depends on human choices, not on the laws of nature. The typical laws of nature are reversibility (physical system) and evolution (biosphere). An economic system that rewards greed and profit-driven logic, internalizes benefits while externalizing costs, and ignores negative externalities, monopolistic behavior, and the informal economy, is inherently self-disruptive.

The predominantly non-linear character of all layers in the system dynamics, combined with the prevailing

trend of exponentiality, further deepens the inbuilt structural imbalances of economic neoliberalism. In such circumstances, economic modeling becomes complicated and less effective. Exponentiality is particularly visible in technological progress and its impact on economic development. The fourth industrial revolution (4IR) intensifies this trend, especially through universal connectivity as a new free good. The outcome of this development is an almost endless influx of combinatorial innovations, amalgams of scientific breakthroughs from various fields of engineering, information and communication technologies, and biotech.

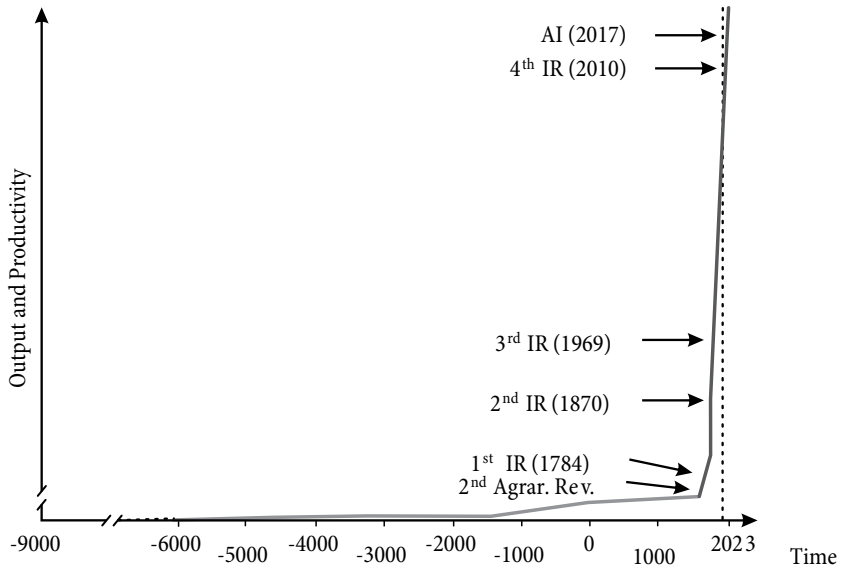
Exponentiality is particularly visible in information and communication technologies (ICT). The last breakthrough in this field is quantum computing based on so-called "qubit". Unlike a conventional bit, the crucial characteristic of a qubit is quantum parallelism, allowing it to exist in two states simultaneously (0 or 1), or in a state in between. The superposition of 0 and 1 exponentially increases the capacity and speed of supercomputers based on qubits. This also underscores the outsourcing of big data management for various business entities, enhancing the effectiveness of digitization and making the integration of artificial intelligence (AI) into business quite feasible.

AI stands out as one of the most powerful technologies within ICT. When combined with breakthroughs from physical, cyber and biological world, AI has the potential to mitigate a variety of structural imbalances from the past and facilitate new industrial development, all in line with planetary boundaries. It could be a technological prerequisite for a sustainable economy and society in the future. The exponential curve of AI, with significantly higher skewness compared to the long-term technological progress curve, offers a glimpse into the extensive possibilities of this technology (see Figure 1). AI can contribute to the productivity surge in carbon-neutral technologies and industry diversification toward sustainable development.

Exponentiality in a hyper-connected environment gives rise to hyper-volatility, hyper-acceleration, hyper-competition, and hyper-uncertainty. In an economy in which the distinction between probability and predictability has continuously been increasing, the so-called "disruptive innovations" [16], [30] pose both significant threats to incumbents and substantial opportunities for newcomers. So, the overall impact of this evolution manifests in increased volatility.

Economic neoliberalism implicitly affirms a linear model of growth. As this model disregards planetary boundaries, the theoretical platform of economic neoliberalism has lost its reality anchor. Figure 2 presents the list of the biggest contributors to global resource depletion based on 2022 data estimates. If everyone in the world lived like people of the U.S., then the global economy would require 4.9 Earths in order to satisfy the global need for resources in a year [32].

Figure 1: Exponentiality as a rule in technological development



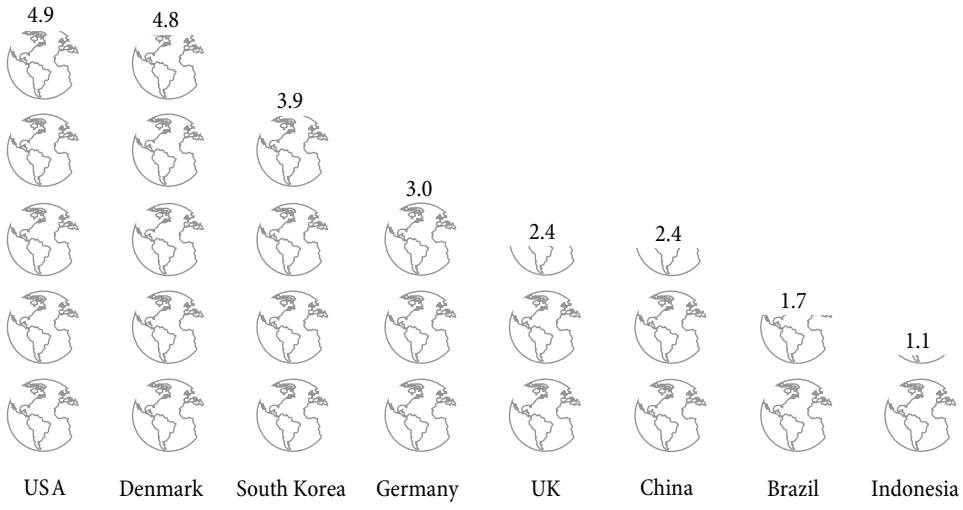
Also, the related economic policy platform lost reality anchor. The reasons for many of reaction policy measures, such as ultra-low or even negative interest rates, quantitative easing (QE), and almost endless securitization, all inspired by a bullish narrative of being "too-systemic-to-fail", remain unclear. Strictly viewed from an economic perspective, bankruptcy of economic entities which lost their capital base is reasonable measure. Moreover, unconventional and/or experimental policy measures indicate inconsistency, with one set of policies for "good times" and another set for "bad times".

Furthermore, the reaction policies to structural imbalances and anomalies are largely misguided and counterproductive. The prevalence of supply-side economic policies, ad hoc subsidies and tax breaks, as well as policies more anchored in national security and geopolitics, such as economic sanctions, is evident. Additionally, there is no coordination between monetary and fiscal policies. For instance, a significant portion of deficits (both macro and micro) has increased due to tax cuts. The global coordination of such a policy mix seems almost impossible.

For such a set of rules and policy mix, imbalances and anomalies are imminent. The key built-in structural imbalance is permanent inflationary pressure. In each economic system, due to a holistic impact on the imbalance between demand and supply, price volatility is unavoidable, namely, the price ball almost regularly goes up and comes down. Related to the previous point is the output gap. Namely, in an economy with constant inflationary pressure, real output is falling. Inflation targeting could not help. Moreover, market fundamentalism is continuously deepening market imperfections by ignoring negative external effects in the real economy and social costs of improper resource allocation in the financial sector. The output gap in the real economy and speculative bubbles in the financial sector are logical consequences of improper resource allocation. Furthermore, the output gap is further deepening the disbalance between demand and supply, further accelerating the inflationary spiral. With a high and growing share of services in GDP formation (financialization along with deindustrialization) and the resistance of wage inflation to macroeconomic policy measures, it is not sustainable to curb inflation by using only macroeconomic policy measures, predominantly monetary.

Also, income inequality speaks volumes about the nexus of neoliberal rules and policy mix distanced from rationality. Today, roughly 45% of all new income in the US goes to the "top 1%", while roughly 20% of income goes to the "top 0.1%". The concentration of income and wealth is unstoppable. According to [53, p. 9], since 2020, the richest five men in the world have doubled their wealth to about $800 billion despite the crisis. During the same period, nearly five (out of eight) billion people have become poorer. So, the most urgent priority of economic system change is a radical increase in equality.

Figure 2: Planetary boundaries: Reality anchor lost



Source: Global Footprint Network

The fact that reaction policies are a part of the problem, not a part of the solution, is particularly confirmed by monetary policy. During the last stage of economic neoliberalism, the Quantitative Theory of Money, one of the fundamental concepts in economics, faded away[2]. Such policy revision was consistent with the prevailing neoliberal orthodoxy. Monetary easing, forced by negative events like liquidity crises and credit crunches, did enormous damage to the long-term health of the real economy, both directly and indirectly through its effect on the financial sector. Financialization exploded again with a well-known sequence of inflated bubbles and bubbles burst. In this way, a downward spiral that might have triggered deflation was only postponed.

In a neoliberal state, capital markets dominate central monetary power, with the demand for money (and capital) supply fueling capital markets activism. Interestingly, new waves of securitization have always had regulatory blessing[3], despite growing indebtedness. At the end of 2022, the debt burden in the US peaked at a historical maximum of $33 T, or 1.21 times the GDP. This figure represents explicit debt only. In the same year, US credit card debt surpassed $1 T. Additionally, off-balance sheet risks are growing in the banking industry[4]. Money expansion, not related to real output growth, is increasing inflation pressure. Due to black holes in banks' balance sheets, it is unlikely that the odds of lending will increase. It is a great contradiction that the buyers of sovereign debt of the advanced economies and the champion of economic neoliberalism are emerging economies with quite different economic systems.

In such a financial system, a pendulum never stops in the middle, moving from one extreme to another, from tightening to easing, and back. With such a level of money supply, the confidence in capital markets has also been shaken.

At the end of 2021, monetary authorities recognized that further monetary easing would not take them anywhere and thus made requiem for it. In the meantime, financial intermediaries adopted a "dry powder" strategy to navigate the new uncertainties arising from inflationary pressures. Consequently, from 2021 major central banks shifted from a dovish to a hawkish monetary stance, an approach predominantly advocated by financial intermediaries. This marked a complete reversal in how the central bank operates during a crisis. To ease inflation, it now adopts measures that actually lead to economic downturns.

In line with the recent policy shift, the FED increased interest rates from 50 BEPs to 525-550 BEPs in the period 2020-2023. At the end of 2023, FED held key rates at a 22-year high. This approach began yielding results, as inflation significantly declined in 2H 2023. Given that inflation is considered structural rather than transitional, such a policy suggests a stance of "higher for longer", probably. After soft budget constraints, a new catalyst for the accumulated financial burden is debt maturity. Namely, the largest portion of U.S. debt is set to mature in 20-30 years. Also, the private credit market is tripling. So, this new phase of financialization indicates that neoliberal rules governing the organization and functioning of the economy are still influential. The problem is long-term unsustainability.

The new mantra in monetary policy involves containing inflation through hawkish policy measures. Throughout 2023, in many advanced economies (excluding Japan), the long farewell to negative-yielding debt, soft credits, and central bank balance expansion was nearly done. Headline inflation approached the target band, marking a significant shift from previous years. However, the consequence of interest rate hikes is a higher cost of capital and, consequently, increased debt. Lowering inflation through monetary measures without triggering a debt crisis and systemic financial crisis is impossible to imagine, as ultra-high interest rates are likely to lead to a surge in debt. As for a possible financial crisis, higher interest rates produce a fundamental anomaly in capital markets as the treasury curve inverts further, causing yields to fall. That volatility is in place confirms an extraordinary

2 In the post Great Recession of 2008 period, and particularly in the period 2012-21, money supply in champions of neoliberalism reached extreme levels. The US is a good example. In 2020, money supply measured by M2 went up by 27%. The expansionary monetary policy combined with an extremely low, even negative, interest rate provided only temporary relief for debt holders.

3 In the first week of January American SEC authorizes Bitcoin spot ETFs.

4 According to the BIS, there are $65 trillion in off-balance sheet derivatives in the global financial system, with the majority coming from dollar-denominated securities.

drawdown from fixed income assets. Last but not least, this shift also affects free cash flow in the real economy, prompting investors to assess a higher risk of contingency. The diverse range of reactions is fueling recession fears.

Obviously, the output gap emerges as a significant side effect of the shift from a dovish to a hawkish monetary stance. This policy shift inevitably results in a lack of growth. In the meantime, emerging economies outperform advanced ones in various aspects, particularly in industrial output and productivity growth. These economies demonstrate relatively robust growth, but they face deflationary pressures due to a demand squeeze and protectionist measures from the developed world. This duality poses a complex challenge for the global economy and a new vulnerability of economic neoliberalism, intensifying pressure on deglobalization.

Implementing a strictly hawkish monetary stance in developing economies, which are highly indebted and lack fiscal space, is nearly a mission impossible. By the end of 2023, the debt burden of poor countries buckled under $3.5 trillion, and the repayment obligations for sovereign bonds and credits in 2024 alone are anticipated to reach approximately $200 billion.

Paradoxically, today the central bank is not as powerful as it pretends to be, or as it should be. Power has gone, both in good times and in bad times. The reason behind this shift is financialization. The new balance of power between the central bank and capital markets is a consequence of mostly deregulated securitization. The primary role of the central bank in new settings is to settle deficits by using monetary expansion.

The cumulative effect of the mentioned anomalies results in triple macroeconomic imbalances. The current account deficit is the first victim of diminished competitiveness caused by structural imbalances. The fiscal deficit follows as the second in the chain of negative consequences, with third deficit in capital balance succeeding due to increased debt, both internal and external. Among the champions of neoliberalism, triple macroeconomic deficits are the rule, not an exception. It is a fundamental contradiction that the system playing the role of a "spender of last resort", both material and financial, is constantly losing material and financial resources.

Last but not least, one of the most dangerous consequences of permacrisis is deglobalization. During the permacrisis, the U.S.'s pivotal role in the world economy has diminished after the expansion of emerging economies, primarily China. Moreover, a dovish monetary stance causing inflationary pressure and currency devaluation, as it weakens the dollar or euro, strengthens offshore Chinese renminbi.

In sum, there is a good reason to conclude that neoliberal monetary policy alone may not be enough to preserve macroeconomic stability and generate sustainable growth momentum to withstand the structural imbalances the economic system is creating. Constantly ignoring the power of structural (or industrial) policies due to ideological reasons (relying on the "invisible hand" as a panacea), the architects of neoliberal capitalism, in the last stage of the crisis, had to fall back on a non-economic solution, geopolitics. The intention of geopolitics is preserving economic dominance in the shadow of national security interests. The wartime budget increase and overall militarization of the economy confirm that the relationships between economic (and military) superpowers are not in a happy place.

Protectionism with measures such as currency war, trade war, technological war, etc., in an early stage of the dominance of geopolitics over economics, evolves in further stages into more radical policy measures such as economic sanctions, proxy wars, and wars. As a new macroeconomic variable, geopolitics becomes a key driving force toward economic deglobalization and politically motivated reglobalization. Both interrelated trends tend to create inflationary pressures and other forms of macroeconomic instability.

Deglobalization and regobalization worsen the key structural imbalance of neoliberal capitalism, the output gap. Moreover, key suppliers react by downsizing production (and price rise), creating new pressure on inflation spiral. When a national economy faces different supply constraints, both inside and outside, a growing inflationary pressure on the global level is imminent.

The new globalization inspired by geopolitics is an ineffective, unsustainable, and mostly counterproductive solution. At best, this is a time-buying solution. Ultimately,

it extends a geopolitically inspired price premium for energy, metals, and food, practically pushing inflation up. With the intensification of geopolitical tensions, the price premium spreads to other products, services, and wages. On the other hand, the new globalization, through the transformation of existing supply chains and downsizing of trade and investments, fuels fears of recession. Only a small number of connector economies are winners of the ongoing global fragmentation and reconfiguration, but only in the short term.

Given that the peace dividend era for industrial production is over, in the last couple of years, war has become a subsidy for one important segment of the economy, the military industry. Recently, the fiscal rules in the EU have been adjusted to accommodate a growing military budget. A similar example is the initiative for bond issuance to finance a military budget.

In such an extremely volatile economic context shaped mostly by (geo)politics, some national economies face inflation, some disinflation. Contrary to advanced economies, which have been preoccupied with generating feeble economic growth for a long time while fighting against inflation, China's four-decade era of hyper (or double-digit) growth abruptly ended because the geopolitical measures initiated by advanced economies against China provoked demand squeeze and price decrease on the global market and in China. So, for an overheated economy, consumer price decrease on the global level is fueling deflation threats. Moreover, China will transmit deflationary pressures to other economies, either through its low-cost manufacturing export or through its new industrial strategy for the internal market ("in China, for China").

Deglobalization and reglobalization develop new criteria for the global expansion decision-making which are not in line with economic rationality. Insourcing replaces outsourcing, and friendshoring gains within geopolitical associations. These days, a $100 trillion global GDP leads to a new economic equilibrium, this time on a lower level. The global economy needs globalization that works. If globalization intends to be inclusive, it must deal with the sustainability issue. If not, it is counterproductive.

The direct consequence of the above-mentioned development is the unsustainability not only of the socio-economic system, but also of other two layers of system dynamics, namely the physical system and biodiversity. War is a major destroyer of the ecosystem and a critical contributor to warming. Precisely, the fractures from the socio-economic system, including consequences of geopolitical disputes, have been automatically transferred to the physical system and biosphere. This is a key takeaway from the last context development.

Mutual interrelationships between the drivers of permacrisis exacerbate anomalies in the economic system. For example, geopolitical fragmentation imposes limits on the free spin-offs of climate-friendly technology. In such a context, an obsession with crisis management dominates the investigation of possible progress trajectories. This context is not able to capitalize on new technological frontiers, particularly AI. Along with almost unlimited opportunities in medicine and carbon capture and storage, AI is a game-changer for the business model and strategy of business entities, individual consumption patterns, and competitive dynamics.

The return to the progress trajectory highly depends on the change in socio-economic context with high inclusivity towards technological breakthroughs. Context determines everything. Before defining solutions, the climate emergency is knocking on the door.

Climate change: The key structural imbalance from the physical system

Global warming (and climate change) is the root cause of fundamental natural structural imbalances on the planet, predominantly caused by misconceptions in the socio-economic layer (industrialization and way of life) within the system dynamics. It is an asymmetric external shock, which means that it emerged in the socio-economic system, adversely affecting the biosphere and physical system. Other major asymmetric shocks, like the microbe pandemics and geopolitical disputes, have not diverted attention away from climate change. Climate change is the most daunting challenge that requires sustainable, comprehensive, and expensive solutions. It is an emergency, actually a "climate emergency" that humanity will have to cope with for as long as it exists.

Global warming results from two primary factors. First, the impact from outer space on temperature increase can be explained by combining the effect of the changes in the Earth's position relative to the Sun, known as the "*Milankovitch's Climate Cycle*", with the impact of the Sun's turbulence on radiation levels. Second, anthropogenic contributions to global warming encompass the effect of radiative forcing due to greenhouse gas (GHG) emissions, a concept identified by Nobel Prize laureate S. Arrhenius [4], and notably popularized by Ch. Keeling [39]. The former factor dominates the latter.

Climate change and the climate emergency are associated with a nexus of risks affecting all geographies, national economies, industries, sectors, business entities, and people. Climate risks are a subject of Knightian uncertainty, whereby the probabilities of different outcomes are almost impossible to calculate. It means that climate change is so complicated that, even if the context is standardized, the approaches to assessing the risks facing different entities are unlikely to be accurate [46, p. 171].

Considering the entire history of humankind, today, the world is experiencing the highest average temperatures. The key consequences of this are extreme weather events and more frequent natural disasters, including microbe mutations. The key risk stressors triggered by extreme weather include glaciers melting and a rising sea level (3-4 mm per year), flooding, heatwaves, droughts, water loss, and the destruction of arable land (20 acres per month), etc. As extreme weather makes certain places uninhabitable, its cumulative effect is a (geo)political one, leading to a climate refugee influx.

Other negative effects are as follows. First and foremost, with the temperature increase, a significant number of living organisms would become extinct, three times as many insects, twice as many plants, and twice as many vertebrates, all contributing to massive biodiversity loss [46, p. 171][5]. In the Anthropocene era, the rate of living organism extinction is higher than in any previous stage of geological history.

Due to human actions and inactions, the ecosystem as a magical mix of different spaces interacting together is becoming unsustainable. In light of the fact that only the human population is increasing, the question arises as to what people will eat in the near future.

Biotic feedback loops due to microbe mutations and pandemics are another difficult consequence of global warming. They relate to the tremendous prevention costs to stop diseases before their outbreak happens and ex-post costs due to lockdowns and supply chains disruptions and/or slowdowns. Moreover, due to successive mutations, it is almost impossible to anticipate a rebound.

In the 1H 2023 explicit economic costs of climate change on global level peaked at $200 billion, which is almost three times higher than Serbia's GDP. Losses on a microeconomic level led to credit crunch, supply squeeze and unemployment or, put simply, the root causes of recession. They all reflected on macroeconomic losses.

An economy in stagflation, or even in freefall, approaches the point of no return. The maximum accomplishment of the anti-crisis policy based on the orthodox neoliberal platform is a synchronous slowdown. A sustainable escape from stagflation is only viable through a systemic transition, such as the green transition.

Environmental issues, particularly the depletion of material resources and climate change, and socio-economic issues, particularly inflation and income inequality, stand out as major structural imbalances of economic neoliberalism. The disruptive consequences of these fractures are impossible to ignore. To preserve sustainability of the socio-economic system and the other two layers of the system dynamics, humanity must take measures to halt their negative impact. Also, in defining solutions, respect to planetary boundaries and adherence to the laws of nature, such as reversibility and evolution, should be paramount.

Mitigation of major structural imbalances: Literature cornerstones

There is a consensus about the key root causes of structural imbalances of economic neoliberalism, related to the propositions that well-being is the first derivative of

5 At 1.5 degrees Celsius warming, coral reefs are projected to decline by an additional 70-90%, and with a warming of 2.0 degrees Celsius, they would disappear entirely. The decline of coral reefs could trigger a chain of extinctions among various living organisms within the ocean's ecosystem.

egoism[6], and that the main responsibility of business entities is to maximize shareholder value.

During industrialization, despite positive effects in terms of production and productivity increases, diversification and structural changes, human civilization messed up the planet with different forms of pollution (heating, primarily).

There is no doubt that the bottomization of the motivational system at individual level and the simplification of the mission of business entities to shareholder value creation led to a tragic consequence. The economy, society, and the planet are not sustainable at all.

To survive and prosper, the economic system should improve itself. Mitigation of the negative consequences of climate change is the desirability of a new economy. Also, a push toward the environmentalization of the economic system is critical. It is time to bring harmony between the layers of system dynamics [27, p. 12]. Regarding the roots of economic inefficiencies and global warming, as well as their cumulative effects, the new economic theory offers a very clear constellation of the planet's future. Two things are pivotal. First, the linear model of growth mindset of making so much and so fast should be replaced with a circular one of making enough by respecting planetary boundaries, along with a more complex policy platform based on two coordination mechanisms, market and state. Second, the world should mitigate the root causes of climate change instead of adapting to them.

Humanity is facing a decisive moment. The shift from dominance to coexistence vis-à-vis people and nature is a prerequisite for the green transition toward a sustainable economy, representing the terminal point on this journey. The approach to mitigating a permacrisis involves multiple layers. The concept has emerged at the intersection of various fields, diverse schools of thought, and perspectives from optimists, pessimists, and constructive skeptics, at least.

In the emerging context, the hierarchy of priorities is undergoing a shift. Mitigating the root causes of climate change and developing a sustainable economy are now on the top of the priority list, surpassing the traditional focus on shareholder value creation. These new priorities are indispensable unless we want to take the world back into caves. As both priorities are global in nature, they necessitate collective activism and ingenuity on a global scale. United in this endeavor, humanity has the potential and responsibility to maintain the sustainability of this wonderful planet.

Four organizations contributed fundamentally to understanding the limits of growth and the climate emergency. Along with the UN, three of them are non-governmental think thanks.

The publication of the first report by the Club of Rome (CoR) in 1972 [49] and the initial release of the Intergovernmental Panel on Climate Change (IPCC) report in 1990 [38], played a fundamental role in advancing our understanding of the problem and fostering a commitment to action. The inaugural CoR report presented a computer model elucidating how natural limits lead to an unsustainable growth trajectory for the global economy. Simultaneously, the first IPCC report established a new scientific foundation for comprehending the ongoing climate breakthrough, originally discussed by the CoR. The meteorological explanation was explicit about the extent of climate change and the role of human activity, the so-called anthropogenic factor, in it [46, p. 174]. This breakthrough enhanced our understanding of the predominant anthropogenic root causes of global warming, specifically, the contribution of GHG emissions resulting from human activities in the economy and social life to the warming of the Earth's surface.

The so-called "radiative forcing" is a major negative externality of one of the pillars of economic neoliberalism, a linear model of growth. GHG emissions are measured by CO2 equivalent in a metric ton. According to projections, since the first industrial revolution until today emissions have hit more than 30 trillion metric tons of CO2 equivalent.

6 First and foremost, an exogenous character of nature and technology, ignorance of natural limits ("the planet is enough"), disregard for negative external effects, wrong treatment of public goods and public companies, etc. This system of economic rules does not have built-in corrective mechanisms. Moreover, there is inconsistency in the economic policy platform in good times and bad times (or a time of crisis). The so-called "Washington Consensus" and inflation targeting are operating in good times. Unconventional and/or experimental economic policies undertaken in bad times are soft budget constraints policy, both micro and micro, "too-systemic-to-fail" policy of liquidity infusion, quantitative easing, extremely low, even negative, interest rate policy, decreasing taxation, etc.

Acceleration is particularly evident in the period 1990-2020 when emissions reached more than 50 billion metric tons of CO2 equivalent (see Figure 3).

Today, the planet is 1.3-1.5 degrees Celsius warmer than it was in pre-industrial period (the late 1800s). In the recent report the IPCC predicts that under current trends, temperatures could increase by 2.0 degrees Celsius by 2030, and by 2.1-3-5 degrees Celsius, or more, by 2100 relative to preindustrial levels [45].

The cornerstone literature consistently grapples with the question: What steps must we take to mitigate the permacrisis and address its core issue, the climate emergency? In the quest for a solution, the architects of a new economy should, first and foremost, discard the mantra associating the first derivative of well-being with egoism and, instead, embrace sustainable development goals like the UN 17 SDGs [62], as the essence of well-being and a prerequisite for the achievement of individual goals.

In 2018, the IPCC published its Special Report on Global Warming of 1.5 degrees Celsius [1]. In the last two reports published in recent years [45], the IPCC shows that climate change is accelerating, widespread and intensifying [42], [50], [3]. There is a significant convergence in standpoints in the previous studies.

In 2022, fifty years after the first issue, the CoR published a new release of Limits and Beyond: 50 years on from The Limits to Growth, what did we learn and what's next? [7]. Recent studies have bolstered initial pessimism regarding the future trajectory of the world under the "as is" scenario, grounded in two fundamental components: the linear model of growth and the orthodox economic policy platform. Without ambitious and comprehensive mitigation efforts, global warming is poised to exceed the critical threshold of 1.5 degrees Celsius, leading to an irreversible loss of ecosystems, or an extended period of crisis after crisis, triggered by a series of catastrophic events [11, p. 1].

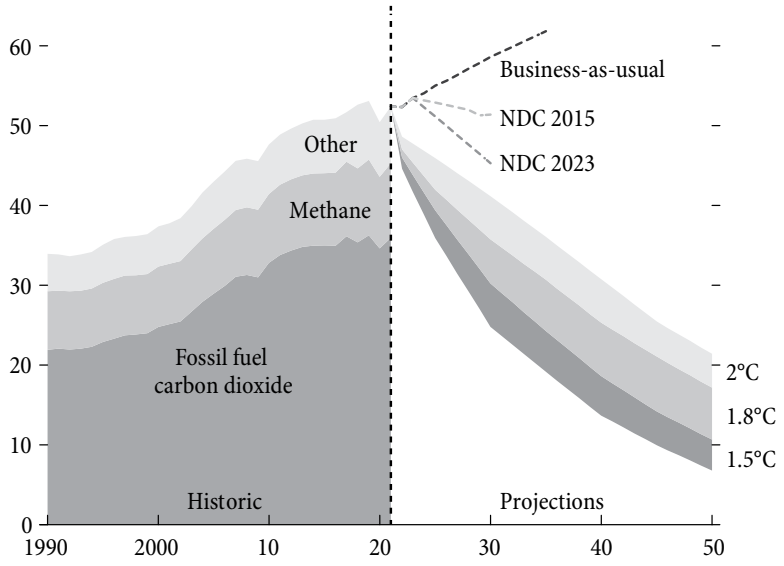
As highlighted in both CoR and IPCC reports, the anthropogenic factor is estimated to be dominant in climate change, responsible for approximately two-thirds of global warming. The remaining one-third of this collective effect is mainly attributed to Milankovitch's effect [8]. Milankovitch's effect explains why global warming was notably higher, ranging from two to three times, in specific regions of the northern hemisphere, such as the Arctic and Siberia, compared to the global annual average.

The intention of successive UN COP conferences on climate ([59], [60], [61]) is to develop a long-term systemic approach to achieving the objectives of a carbon-neutral and nature-positive world by 2050 while providing a feasible, secure and inclusive access to energy, water and food [23].

Anyhow, the last climate summit COP 28 focused on reviving and safeguarding nature, attempted to build momentum to accelerate energy efficiency measures,

Figure 3: Yearly GHG emissions, period: 1990-2050

(Billions of tons of carbon dioxide emissions equivalence)



Source: IPCC; Black, Parry and Zhunussova (2023); and IMF staff estimates

scale the deployment of renewable energy, and address feasible energy sources in line with energy demand. The summit made significant progress in securing funds for the green transition and unlocking investment for a nature-positive future, e.g. reforestation. Unfortunately, there is no unity about strategic elements of the agreement such as the perspective of coal, as it was expected [31], [22], [20].

The standpoint that businesses exist to serve stakeholders, and not just shareholders, gained more attention with the World Economic Forum (WEF) campaign regarding sustainable value creation and the related performance measurement system based on ESG (environment, social and governance) criteria [65]. The WEF defined 21 indices for comprehensive performance measurement system that are Paris-aligned and in accordance with the latest climate tensions. ESG approach was popularized by certain opinion-makers like [13], as well as by [19]. The ESG conceptual framework has undoubtedly contributed to the expansion of information base that enables a more comprehensive analysis of the business, financial, and environmental profiles of companies [44, p. 78]. At the same time, it has been demonstrated ESG criteria can motivate business agents to behave in an environmentally responsible manner [21], [15].

The related performance measurement system associated with the aforementioned concept has exploded with many details in recent years. The proliferation of metrics was huge because there was no single definition of ESG [66], [10]. However, the critical set of measures remained unclear [5]. Without universal standards, sustainability metrics are tremendously flawed. To avoid the previous issue, in 2020, following a six-month consultation process with over 200 companies, the WEF published a refined set of 21 core and 34 expanded metrics and disclosures to measure the efficiency of stakeholder capitalism, actually SDG criteria, for sustainable business performance in its report Towards Common Metrics and Consistent Reporting of Sustainable Value Creation [65].

These days, ESG metrics have evolved into standards that advocate for the environmentalization of business activities, foster positive relationships with employees and communities, and endorse effective governance structures. They are microeconomic performance measures complementary with SDG macroeconomic performance measures. Two years ago, major investors, representing over a third of total assets under management globally, endorsed the "Principles for Responsible Investment", emphasizing the greater use of ESG goals for investment selection [54].

Environment and income inequality are the biggest challenges in designing a new growth model and related economic policy platform. Another crucial aspect in relation to income inequality is executive remuneration [52], [17], [41]. In the global political economy and regulation framework under the impact of neoliberal orthodoxies, as expected, the first response to the climate emergency was "free-market environmentalism" or market-driven climate governance [9], [47]. The initial premise posited that the market mechanism could act as a corrective force for the climate emergency. Consequently, national economies were free to pursue mitigation policies without impeding the value creation interests of all business entities, including high-emitting sectors, even if this practically meant no reduction in GHG emissions. Under the Kyoto Protocol, market-based flexibility mechanisms, such as international emissions trading [64], [43], were introduced. Developed economies could exceed internationally agreed emission limits by purchasing "carbon credits" from developing economies that emitted less than their targeted amount of CO2 equivalent. So, global carbon trading became a fast growing market, involving green credits and related financial instruments with a total volume exceeding $300 billion worldwide [46].

The variant of the same approach is a self-regulating initiative proposing the disclosure of climate change risks. Classifying climate risks as a dynamic material risk, Mazzucato & Collington [46] eloquently suggest open joint stock companies to disclose the climate risks they face from both the physical impacts of climate change and the transition to lower emissions, with the same rigor as financial information disclosure. Since the early 2010s, the Climate Disclosure Standards Board (CDSB) has become a forceful advocate of this approach [2]. The ultimate result of this approach is IFRS Standard S/1 and S/2 [57].

Unfortunately, market-driven climate governance and self-regulating climate disclosure are not enough to

mitigate the climate emergency. Despite expectations, the data show that the planetary impact of human activities has only become worse. The mitigation will only be successful when gas emissions are properly constrained through a systemic intervention, including not only market shaping macroeconomic policies, but also structural policies and properly designed impact investments. Even more, the development of new technologies that reduce the demand for fossil fuels and capture emissions would be essential to preventing the climate emergency [46]. The key breakthroughs, from renewable energy to carbon sequestration, have been driven by structural policies and state impact investments.

The global economy, full of inbuilt structural imbalances, operates within planetary boundaries and experiences complete interconnectedness. The mitigation of structural imbalances and anomalies requires the internalization of negative external effects. So, the depletion of resources, pollution and global warming will have a crucial impact on the transition towards a new growth model and the related economic policy platform. In designing new settings, we need a new balance between coordination mechanisms. Consequently, new macroeconomic management should be disposed to two coordination mechanisms, the "invisible hand" of the market and the "visible hand" of the state. The market is playing the role of the catalyst of technological breakthroughs. Government, via macroeconomic policies as well as structural policies, is the coordinator of future investments. We have already extensively discussed the previous issues in [26], [27], [28], [29], [34].

Green finance is the hard core of climate action. In 2022, McKinsey published a report that estimated the most alarming capital spending for high-emitting sectors across sixty-nine countries [48], concluding that the green transition would cost $275 trillion by 2050 [6].

When allocating capital for the purpose of green transition, business entities should prioritize R&D over CAPEX and/or external growth beyond the existing structural portfolio over internal growth.

Due to the high risks associated with the green transition, opinions are divided on how to finance the development and implementation of new technologies. A conventional way is to use bond issuance, actually "green bonds" and "green credits". In time of crisis, green bonds yield curve can easily fall. As for green credits, the higher risk is pushing the cost of capital. If the crisis continues, green bonds can fall further and interest rate on green credits can grow more. In short, in using conventional financial instruments for green finance, only "V-shaped" recovery based on new industrialization matters.

The green transition poses a fundamental trilemma for policymakers, requiring a delicate balance between achieving climate and sustainability standards in new industrialization, preserving fiscal sustainability, and keeping inflation under control. To mitigate the climate emergency and achieve other targets, some of the world's leading voices of the new economics, such as S. Brunnhuber [12], suggest bold steps like green quantitative easing (or green QE).

Sustainability is not a side effect or a consequence of regulatory pressure. It is a substance explaining who we are and what we stand for as humans. Consequently, the sustainability-related disclosures explain how the sustainability policy fits the accounting standards. In June 2023, IFRS released two sustainability-related disclosure standards IFRS S1 (IFRS Sustainability Disclosure Standard S1: General Requirements for Disclosure of Sustainability-Related Financial Information) [35] and IFRS S2 (IFRS Sustainability Disclosure Standard S2 – Climate-Related Disclosures) [36].

These standards are also supposed to apply to non-for-profit and public entities from the period commencing on or after January 1, 2024, including GPFS prepared in accordance with GAAP (IFRS S1).

Serbia's economy fact sheets

Serbia is a landlocked, underdeveloped, open economy, which, for a long period, has been excommunicated, either explicitly or implicitly, from the EU mainstream. This nexus of weak points portraying Serbia's geopolitical position also impacts its macroeconomic fact sheet.

In terms of level of economic development, this ultra-small economy participating roughly with 0.14% in global GDP creation, in terms of economic development lags significantly behind the near environment (the EU,

other economies in Emerging Europe and the western republics of the former Yugoslavia). The key vulnerability is the output gap [29, p. 21], coupled with an inadequate output structure, including an energy mix heavily reliant on fossil fuels. During the breakup of the former Yugoslavia in the 1990s, Serbia lost 55% of pre-transitional GDP in constant prices. It was the biggest contraction in Europe since WWII.

Another key constraint hindering accelerated catch-up with the EU relates to natural deposit and labor force limits. Concerning natural deposits, exceptions are arable land and deposits of some metals and minerals. Namely, Serbia boasts more proven reserves of copper and lithium than any other country in the region. However, some fossil fuel deposits, such as coal, lack strategic value.

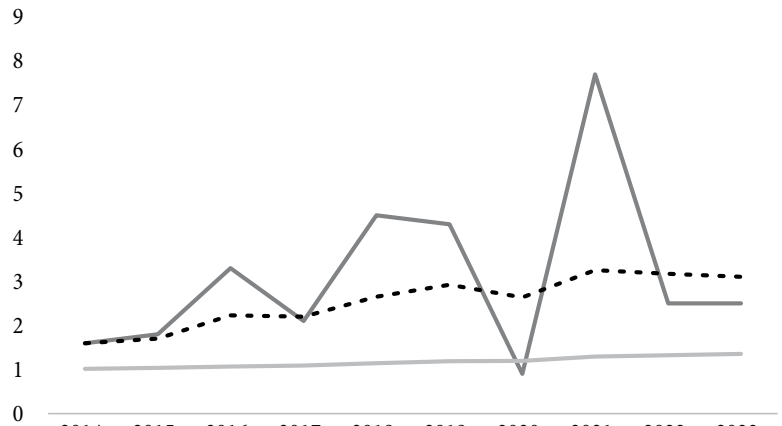
When it comes to the labor force, there are both negative and positive trends. On the negative side, the birth rate has dramatically fallen over the last 40 years, and population aging has become particularly pronounced [40]. After anti-depopulation measures were imposed three years ago, the total fertility rate has significantly grown, but stays still low (1.63). Additionally, the emigration of youngsters, especially those with a college education, remains at a high level, although it is easing. A concerning issue is the concentration of people in cities, which is excessively high. With inadequate infrastructure and lack of social services, villages are mostly uninhabitable, particularly in the southeast part of the country. On a positive note, Serbia is doing well in terms of new employment. The unemployment rate is at a historic low reaching 9.0% at the end of 2023. Also, in the recent period, government impact investments in both physical and digital infrastructure, along with FDI acceleration, have positively affected new employment and slightly reversed the outflow of economic immigrants.

From an economic policy perspective, there are several positive signals indicating the effective implementation of industrial policies focused on infrastructure and tradable sectors, fostering new employment and growth. Prudential monetary policy also matters. However, despite these constructive efforts, persistent and robust inflationary pressures, along with recession fears coming from the global economy, exacerbate the threat of a double-dip crisis.

In 2023, growth was in positive territory. In December, the economy grew by 0.3% MoM, surpassing the estimated 0.2% growth rate. The main contribution comes from industrial production, which rose by 0.4% MoM. The YoY growth rate reached 2.5%. This growth rate is below the compound annual growth rate (CAGR) for the period 2014-23. The CAGR for the analyzed period was slightly above 3% (see Figure 4).

Such growth is deemed insufficient, not only because, by definition, sustainable growth, among other things, requires a CAGR of around mid-single digits (or 5-6%), but also because this is a nominal growth rate with inflated earnings. According to R. Rajan [55, pp. 47-48], at the

Figure 4: Serbia's CAGR = 3.1%, period: 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Growth [%]	1.6	1.8	3.3	2.1	4.5	4.3	0.9	7.7	2.5	2.5
Tot al Value	1.016	1.034	1.068	1.091	1.140	1.189	1.200	1.292	1.324	1.357
CAGR [%]	1.600	1.700	2.231	2.198	2.654	2.927	2.635	3.255	3.170	3.103

end of the first industrial revolution, fast-growing early developers during the 1850s and 1870s achieved annual growth rates of 1.3-1.8%. At the end of second industrial revolution, late developers during the 1950s and 1970s grew at multiples of these rates. For instance, Japan grew at a rate of around 8.0% per year in the period 1950-73, setting an aspirational level for the developing world. After the third industrial revolution started in the late 1980s and during the fourth industrial revolution, which started almost immediately after that, China even exceeded the previously defined aspirational rate, entering the double-digit area over an extended period. However, due to the permacrisis, in the last period China struggled to achieve a 5% growth rate.

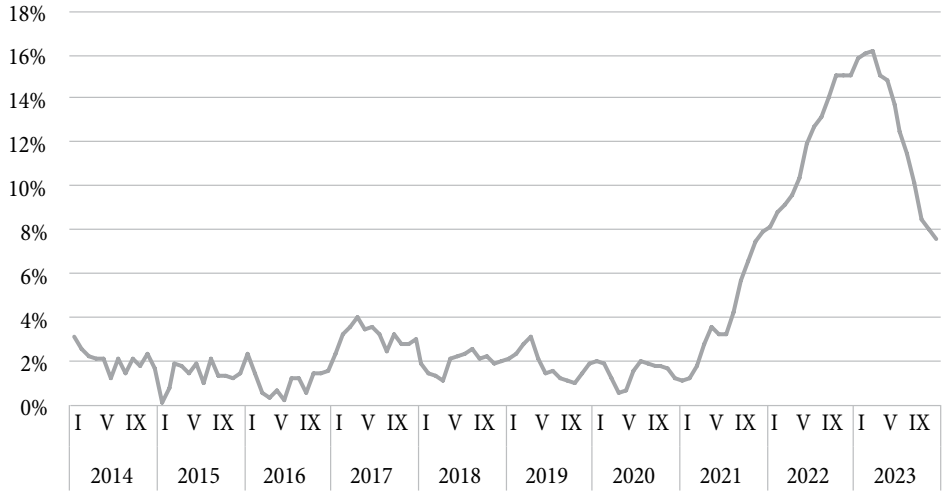
While growth in Serbia is a positive thing, it falls short. Due to the output gap, for Serbia to catch up with the EU average, a 7% real CAGR is needed in the next twenty years. This represents the bottom line for economic sustainability.

Being in positive territory in terms of growth in the permacrisis is an encouraging fact, but we can feel the presence of the so-called "growth illusion" because high inflation has boosted earnings. Among economic fundamentals, inflation is the worst issue (see Figure 5). Headline inflation of 16.2% at the end of 1Q 2023 reached the highest level since 2014.

Inflation has structural roots. The supply side, particularly import, fundamentally determined the inflation story in Serbia. Moreover, in the last three years, input prices edged higher due to the impact of two episodes of exogenous price increase, the lockdown triggered by the COVID-19 pandemic and the geopolitical price premium. With the rapidly increasing energy and food prices, inflation has soared. In such a setting, keeping inflation under control is almost mission impossible, considering that service inflation is hard to bring down. The most difficult factor in anti-inflation strategy is the government's efforts to maintain social cohesion by minimizing the impact of high inflation on living standards. Unfortunately, this highly socially acceptable measure has resulted in the wage inflation cycle. Figure 6 shows nominal and real net wages growth in the period from October 2022 to October 2023.

Actually, since the end of 2021, the NBS has remained at the hawkish monetary stance camp with the primary aim of hitting the inflation bullseye. Consequently, the NBS has been completely committed to raising the key interest rate as a monetary policy pivot, along with the reserve requirement ratio increase, expecting that both pivots would lead to a non-inflationary environment. Also, the monetary power expects that the shift from a dovish to a hawkish monetary policy will result in hard lending and a partial compression of the central bank's balance sheet. Simultaneously, the NBS continues with a dinarization strategy with the aim of decreasing exposure to reserve currencies. Looking for a targeted inflation level, the NBS indicates that a headline inflation MoM level of 0.3%, or below, will be achievable.

Figure 5: Inflation in Serbia, period: 2014-23



Source: NBS data base

Another pivot of the anti-inflation strategy is well-known fixed FX rate. The NBS has primarily paid attention to variable that it can control, namely, FX. An almost fixed FX regime, instead of floating one, is a way to minimize the impact of structural imbalances from the past and geopolitical price premium on inflation[7].

Despite a tightened monetary policy and fixed FX, at the end of 2023 inflation was still above the target. Headline inflation decelerated less than expected landing in December at 7.6% YoY. In the same month, core inflation of 6.5% YoY hit its lowest since the beginning of 2H 2023. Average annual inflation in 2023 was 12.1%. The previous confirmed that inflation fell, but still remains stubbornly sticky. Namely, inflation remains uncomfortably above the NBS target. Expectedly, the decrease in import prices, with an almost fixed FX regime, had a significant impact on inflation deceleration.

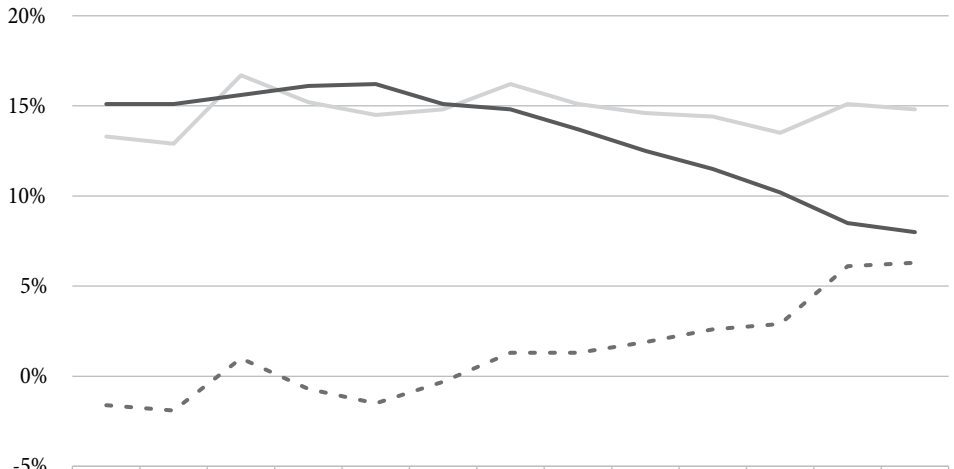
Keeping the FX rate unchanged, in combination with an ultra-high policy rate, and agile liquidity management (both macro and micro), constituted the key monetary policy measures. By implementing such a policy mix, the NBS has achieved partial success in the short run, preserving macroeconomic stability, particularly the stability of the financial system, even without reaching the inflation target. Specifically, the financial system has been functioning smoothly despite inflation decreasing slowly. The reason is the inflow of FDI.

The NBS predicts that inflation will continue to fall toward the policy target by the beginning of 2H 2024. In such a case, the actual growth rate will be above potential, namely a recession threat will be avoided. The final and perhaps the trickiest question is how the NBS will respond if inflation stays above the target band (3-3.5%). In this geography, the current policy stance could be derailed by many external asymmetric shocks, primarily geopolitics. Additionally, internal political turmoil, coupled with growing inflation fears, could contribute to a "no landing" scenario, meaning stagflation.

In sum, structural imbalances, particularly the output gap, high service inflation, real wages growth, along with low to stagnant total productivity increase, may trigger a textbook price spiral. It is too early to declare victory over inflation. The NBS should not lower its guard and should persist with hikes because the mission is not accomplished. Namely, the NBS is not yet ready to pivot towards monetary easing. When the NBS does not entertain a hope for recent rate cuts, soft lending is unlikely to be expected.

7 In mid-January 2024, the oil price experienced a one-day change of 2.03% (or one standard deviation) due to the escalation of the war in the Middle East, particularly in Yemen.

Figure 6: Wages and inflation, period: October 2022 - October 2023



	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Avg-23	Sep-23	Oct-23	Nov-23
Net wage growth YoY - Nominal	13.3%	12.9%	16.7%	15.2%	14.5%	14.8%	16.2%	15.1%	14.6%	14.4%	13.5%	15.1%	14.8%
Inflation rate YoY	15.1%	15.1%	15.6%	16.1%	16.2%	15.1%	14.8%	13.7%	12.5%	11.5%	10.2%	8.5%	8.0%
Net wage growth YoY - Real	-1.6%	-1.9%	1.0%	-0.7%	-1.5%	-0.3%	1.3%	1.3%	1.9%	2.6%	2.9%	6.1%	6.3%

Source: Authors' calculations

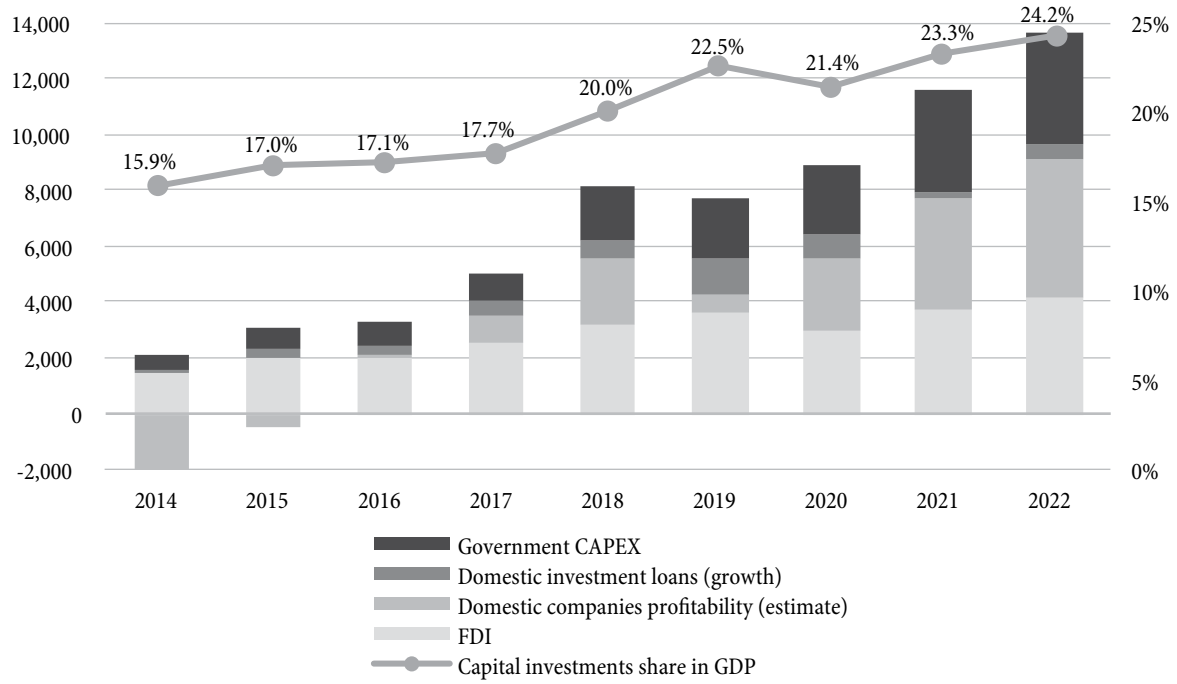
Currently, the benchmark rate of 650 BEPs is higher than the Eurozone rate (400 BEPs), the BOE rate (525 BEPs), and the FED rates (525-550 BEPs). The key policy rates suggest that the NBS remains perhaps too optimistic. It is highly expected that the NBS will push back against the expectations of the real economy for rate cuts (and soft lending).

One more aspect to consider. If the NBS intends to keep on trucking with the fixed FX rate, it should align Serbia's inflation with that of the Eurozone. Significant gaps in inflation and key policy rates suggest that in 2024, the "higher for longer" scenario, or even a higher policy rate, will not show divergence. Namely, the NBS should be prepared not only to continue with monetary tightening but also to tighten further if needed, without hesitation. Therefore, "high for longer" or "rates cut" outlooks will not be relevant until there is harmonization of Serbia's inflation with the EU's inflation.

In an inflationary economy with the output gap, despite a prudential monetary policy, growth is typically restricted to a low or, eventually, moderate level. Such an economy can avoid falling into technical recession if the following three conditions are met. First, an economy needs to be agile in terms of investments, both private and state. Investment activism helps the economy migrate slowly but steadily away from downside threats. Second, the government must keep the budget (both at the state level and at the level of local governments) under balance in order to keep necessary strengths for fiscal spending. A hard budget constraint acts as a barrier to derailing the positive results of an investment boom created by state impact investments and FDI. Last but not least, maintaining external liquidity is a prerequisite for the previous two conditions. Serbia's debt-to-GDP ratio of 52% at the end of 2023 confirms the government's ability to sustain external and internal liquidity without major constraints. A closer look at macroeconomic fundamentals reveals that Serbia's policymakers are fully aware of these conditions. Multilateral financial organizations and credit rating agencies confirm these achievements.

In the recent period, the share of investment in GDP formation stabilized at 25%. The structure of investments is well-balanced (see Figure 7). FDI plays a crucial role in maintaining liquidity, both internally and externally. The government has effectively provided stimuli for FDI, contributing to economic growth, technological improvements, the expansion of tradable sector, and jobs creation. The latter goal is extremely important in an

Figure 7: Magnitude and structure of capital investments, period: 2014-2022



Source: Authors' calculation based on NBS, Macroeconomic Developments in Serbia, January 2024, p. 6

environment marked by high and persistent unemployment and related political tensions. Moreover, fueling the money via M2 injects liquidity into the economy.

In theory, a tightening monetary policy stance hits sustainable economic growth. Interestingly, in 2023 growth was above potential. Based on the previous, it is reasonable to predict that the NBS in 2024 could maneuver between three scenarios: (i) rate pause, as a central scenario (650 BEPs), (ii) hawkish stance scenario (> 650 BEPs), and (iii) dovish stance scenario (< 650 BEPs). In all scenarios, to maintain NPL ratio at a controllable level (currently NPL ratio is 3.5%), the NBS should avoid any possibility of soft lending.

The crucial problem with the fixed FX rate policy combined with the hawkish benchmark interest rate is that such a policy mix sinks exports, particularly those held by domestic companies. However, the dominance of FDI in export mitigates the weight of this factor. All things considered, Serbia's mixed economic picture is unlikely to quash growth prospects. Despite a sharp rise of the cost of capital, Serbia did not spiral into debt crisis. With the share of debt in GDP of 52%, external liquidity has eased. In contrast to the situation in the middle of 2014, when default seemed almost imminent, throughout the entire period of fiscal consolidation, which ended successfully in 2018, Serbia never missed a Eurobond interest payment. At the end of 2023, the fiscal gap reached 2.2%, indicating an encouraging trend of improvement in public finance. This is a crucial input for the current country's credit rating, which is one step below investment grade. To be honest, the current tax burden has an ambivalent effect, negative for private investments and positive for public investments.

Despite tighter monetary policy, fixed FX rate and fiscal discipline, another crucial factor for sustainable and inclusive growth is business confidence. It is complementary with the ongoing anti-inflation policy based on mentioned pivots. The high level of FDI, including a better structure of investments as well as lenders activism in financing impact state investments, confirms a relatively high level of business confidence. Despite a sharp rise in the cost of capital, Serbia has managed to avoid recession and steer clear of a debt spiral. Obviously, it has successfully averted a crisis by boosting business confidence. However, it may face challenges in doing so again, for instance, if FDI from Germany fails to meet expectations. Various factors, not least geopolitics, might still disrupt encouraging macroeconomic fundamentals. One of them is election mania fueled by many irrationalities inside the political class.

In sum, during 2023 Serbia's economy remained relatively viable and resilient as major structural and (geo) political problems were contained. A moderate increase in FDI, the agility of impact investments and a dynamic housing market are clear signals of the aforementioned. The general impression is that the economy is gradually recovering, despite the permacrisis.

The forecasted growth rate of 3.5% for 2024 is achievable but falls short of ensuring a sustainable economic future. Serbia must improve trust in its economic strategy by moving beyond crisis management and related growth rate target. To achieve convergence with the EU, Serbia needs CAGR = 7% in real terms in the next twenty years, which is not achievable without massive capital investments and new industrialization. An alternative scenario involves massive stimuli, both monetary and fiscal, but this would increase relatively high financial leverage to an unsustainable level. Namely, without structural policies and impact investments dedicated to new industrialization within the framework of the green transition, due to vicious circle (interest rates rising and falling and inflation fluctuating), the economy is likely to be caught in sluggish growth trajectory, leading to a slow closure of the output gap.

Overall, some macroeconomic data signal recession calls, while others do not. The conflicting signals of high investment agility in state impact investments and FDI agility on one hand, and the flattening of domestic investors on the other, create uncertainty. Mega projects like EXPO are welcomed. No doubt, along with the NBS, the Treasury Department has more work to do to keep macro balances at a sustainable level. A new set of fiscal pivots in the form of automatic macroeconomic stabilizers, coordinating the green transition as a core structural policy in the future, should be defined. Normally, the impact of industrial policies on tradable sectors should continue.

Caution is in order. A balanced budget (and fiscal space), which Serbia did not have in the last two years, is

a necessary condition for sustainable growth [56]. These days, a sufficient condition is related to intelligent and sizeable investments in the green transition. Since Serbia has a development gap, not only its prosperity but also its very survival depends on new industrialization. To accelerate this process, EU accession can play a catalytic role. Unfortunately, the EU is under dilemma of "to enlarge, or not to enlarge: that is the question". Moreover, stagflation megatrend in the EU over the medium term could and should push inflation higher and growth lower. To escape this conundrum, Serbia should find something attractive enough to run the economy in a sustainable and inclusive way, toward both people and nature. In this stage of history, "all roads lead to Rome" (actually, to the green transition).

Industrialization based on FDI and mega projects is a sound strategy in the medium term, but it does not ensure the sustainability of macro balances in the longer term. Macro deficits increase indebtedness, reduce reinvestments and the speed of growth, ultimately leading the economy into the middle-income trap. The key challenge to escape this trap lies in how the economy charts the path of technological development. This involves not only being a beneficiary of leapfrogging but also, and primarily, being an active participant in the development of frontier technologies through *in situ* research and development. Industrial policies in ICT and BIO 4 spheres represent steps in the right direction.

Last but not least, in a politically polarized country like Serbia, there is a wide gap between people's general feelings about the economy and official economic figures. One indicative perception is the carbon footprint. Serbia has relatively high emissions of the CO2 equivalent p.c. The key sources of emissions within the country include consumer electricity, heating, mining, industry, transport, and agriculture. Although the production of renewable energy has increased in recent years, the majority of energy production still comes from coal (68%). In addition, the country contributes significantly to GHG emissions through the production of copper, steel, and aluminum. The scale of the Serbia's carbon footprint and the urgency of shrinking it to a tolerable level should be translated into meaningful action. The green transition action plan for Serbia is a crucial part of the collective effort to save the planet.

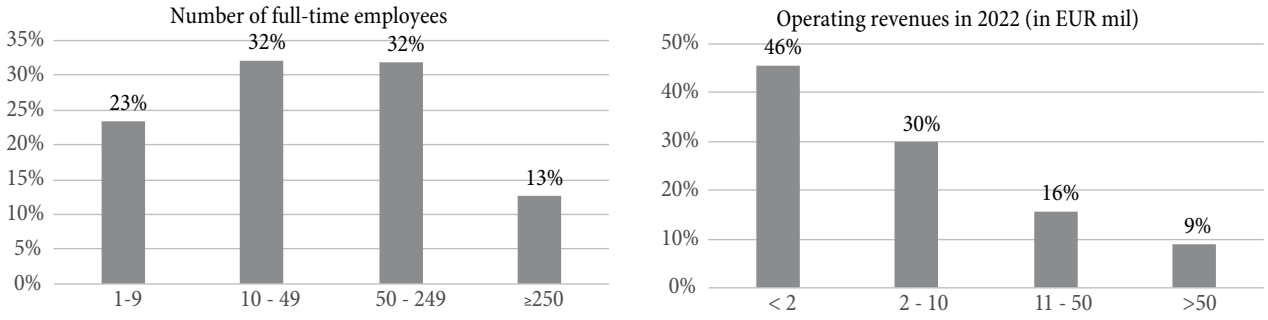
Before Serbia enters the green transition, we should lend weight to attitudes towards Paris-aligned and climate emergency metrics, or SDGs/ESG nexus of sustainability metrics, and related sustainability-related disclosure.

Attitudes towards the SDGs in Serbia's business community

The empirical research aimed to examine the extent to which companies in Serbia adhere to sustainability goals and the progress they have made in sustainability reporting. Given the nature of the research topic, opinions and attitudes of top management representatives and company owners were assessed[8]. The study was conducted on a sample of 261 companies. About 41% of respondents were (co)owners, 61% had more than 10 years of managerial experience, and two-thirds were male. The majority of analyzed companies operate in the manufacturing

8 The data collection was carried out through a questionnaire distributed from July to October 2023, with coordination provided by the Serbian Chamber of Commerce – Chamber of Commerce of Belgrade.

Figure 8: Company size: number of employees and operating revenues in 2022



Source: Authors' calculations

industry (38%), retail and wholesale (8%), construction (7%), agriculture (6%), etc.

The observed companies have an average age of 24 years. In terms of company size, small and medium-sized enterprises dominate. Figure 8 illustrates the number of full-time employees and operating revenues for the observed companies.

The majority of the observed companies are export-oriented (about two-thirds). We assumed that the implementation of sustainable practices in these companies is more advanced, considering that many of them are already obligated to adhere to certain standards imposed by international supply chains to which they belong. One of our objectives was to assess the disparity in the representation of sustainability goals between observing companies (mainly companies from the tradable sector) and those solely operating in the domestic market. The IFRS sustainability-related disclosure standards will firstly impact the operations of companies in tradable sectors, particularly exporters.

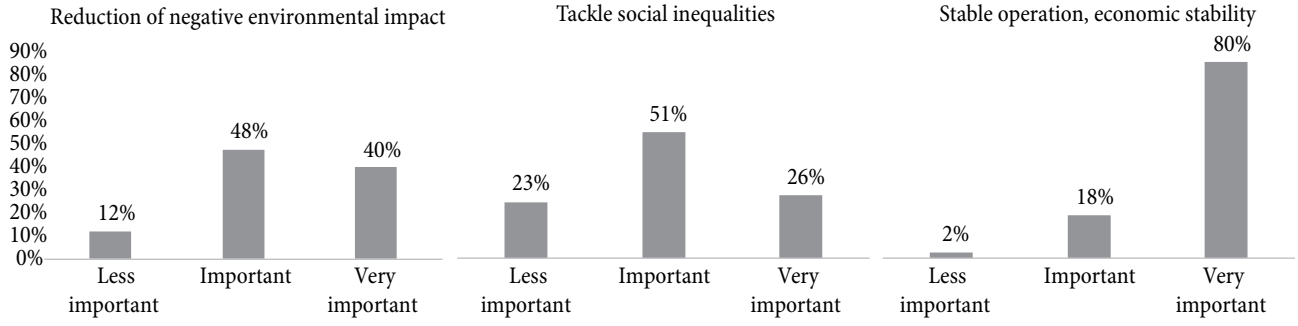
When it comes to the extent to which sustainability goals are present in the practices of domestic companies, the findings seem encouraging at first glance. About 60% of companies had specific goals or strategies for the next year to improve their environmental and sustainability performance. However, some of these companies have established goals without specifying particular targets or activities for improving sustainability performance in the next year.

When asked about their sustainability goals in general, the vast majority (80%) prioritize economic stability as the most important goal. In second place are environmental goals, specifically reducing the negative impact on the environment, with 40% of surveyed managers considering it very important. The goals related to the social community are comparatively less emphasized, as only 26% of respondents consider addressing social inequalities highly important (see Figure 9).

These results are in line with well-known Carroll's pyramid model of corporate social responsibility [14]. According to this model, the primary responsibility of top management is to ensure financial stability and profitable operations in the long run (economic responsibility), which is particularly pronounced in a context of crisis. Corporate social responsibility is built upon the premise of an economically sound and sustainable business. To be able to contribute to others, a company must first ensure its survival. Second, companies must ensure regulatory compliance and run their businesses by the laws (legal responsibility). The third one is ethical responsibility, that is, the obligation to do what is right, just, and fair, while being a good corporate citizen and contributing resources to the community is in the last place (philanthropic responsibility). The first two types of responsibilities are required, the third is expected, and the last one is desired by society.

We start with SDGs testing. We asked the managers which goals from the UN Agenda 2030 [62] their companies contribute to with their specific actions/targets in the next year. The following four SDGs stand out in particular: (i) decent work and economic growth, (ii) industry, innovation, and infrastructure, (iii) reducing energy use, affordable and clean energy, and quality education (see Figure 10). This is quite consistent with the previous results regarding general sustainability goals and Carroll's pyramid model. The first two SDGs correspond to economic stability or

Figure 9: Sustainability weight in the sample of companies



Source: Authors' calculations

economic sustainability, the third one aligns with the reduction of negative environmental impact, while quality education represents a societal goal.

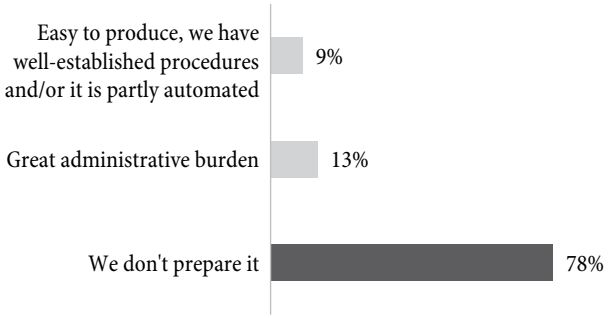
The SDGs represent a set of global goals established for comprehensive societal development, primarily used at a macro level, guiding countries and organizations in setting priorities and policies to achieve sustainable development on a global scale. On the other hand, ESGs refer to specific criteria employed to evaluate the sustainability and ethical impact of individual companies or organizations, particularly within an investment context. The incorporation of ESG considerations will contribute significantly to the overarching goal of achieving the SDGs.

Although the majority of analyzed companies have set sustainability goals and activities, sustainability reporting is very limited and underdeveloped. More precisely, 78% of companies do not prepare a sustainability report at all, 13% do prepare it but consider it a significant administrative burden, while only 9% of companies have established the necessary procedures and automated the sustainability reporting process (Figure 11). When it comes to companies that have automated sustainability reporting, 83% of them are exporters, which is in line with our expectations, and more than half of them are large enterprises.

Sustainability-related disclosure raises numerous organizational issues. The responsibility for sustainability reporting can vary depending on the size and structure of the organization. In many cases, the role of overseeing sustainability reporting is assigned to a dedicated sustainability or corporate responsibility department, particularly in larger organizations. However, in smaller companies, the responsibility may fall on the shoulders of specific individuals, departments, or cross-functional teams. The development of sustainability reporting has led to the emergence of a new executive position – Chief Sustainability Officer (CSO). In companies that do not have this position, the CFO often assumes a leading role in sustainable reporting, considering the inherent connection between financial data and ESG as well as the CFO's key role in providing financial support to sustainable programs and investments.

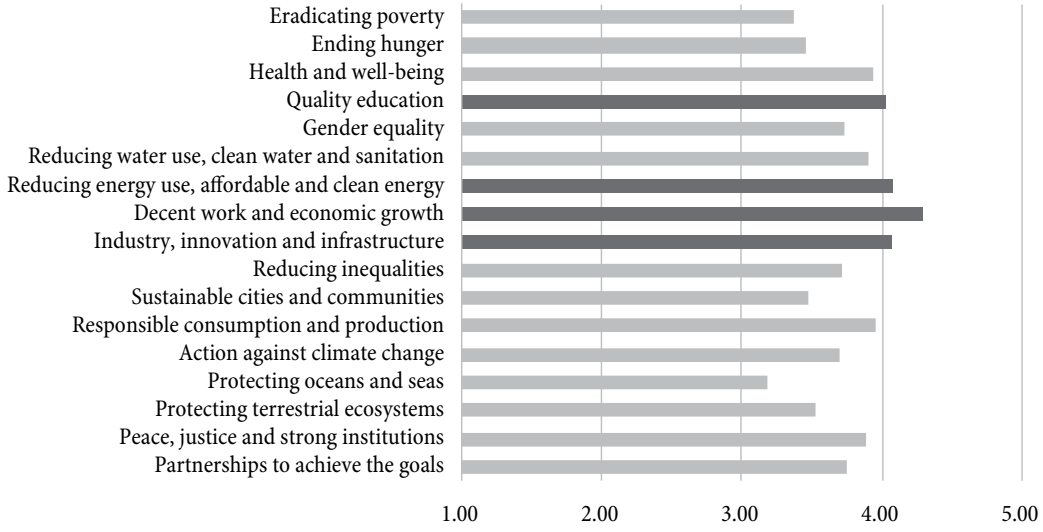
Our empirical results show that only 10 out of 261 analyzed companies have a specially formed organizational

Figure 11: Do you prepare a sustainability report and if so, to what extent do you find it difficult to prepare one?



Source: Authors' calculations

Figure 10: Sustainability goals of Serbian companies and the UN Agenda 2030



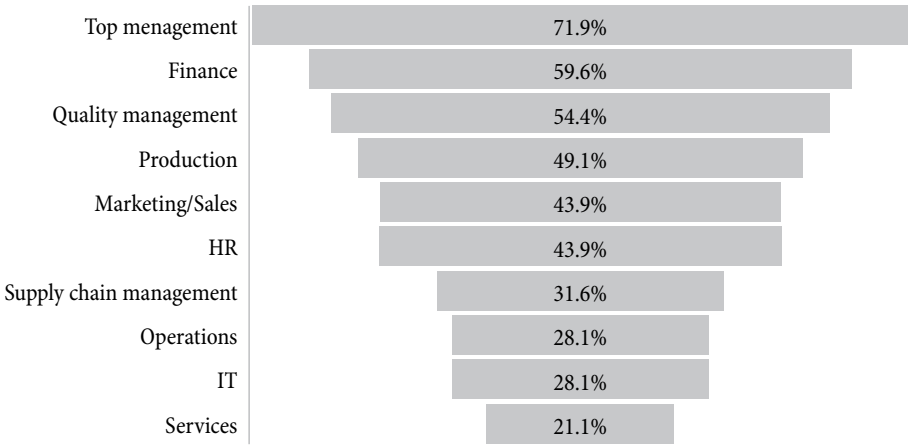
Note: 1 – least important, 3 – important, 5 – very important
Source: Authors' calculations

unit responsible for sustainable reporting under designations such as Corporate Responsibility, Global Group Sustainability, ESG, etc. Notably, these are predominantly large and export-oriented companies. Conversely, within the broader spectrum, the preparation of sustainability reports is often added as an additional responsibility to top management (usually CFO) or other departments (most frequently communication and public relations). According to [25], the main barriers to sustainability reporting are identified as data collection challenges and a lack of suitable support from managers and leaders.

The analysis shows that numerous functions are involved in the process of collecting the data needed for the report. Apart from top management, crucial data primarily originates from sectors such as finance, quality management, production, marketing, sales, and others (see Figure 12). Regardless of the specific organizational structure, clear accountability, coordination, and collaboration across departments are essential to ensure accurate and comprehensive sustainability reporting.

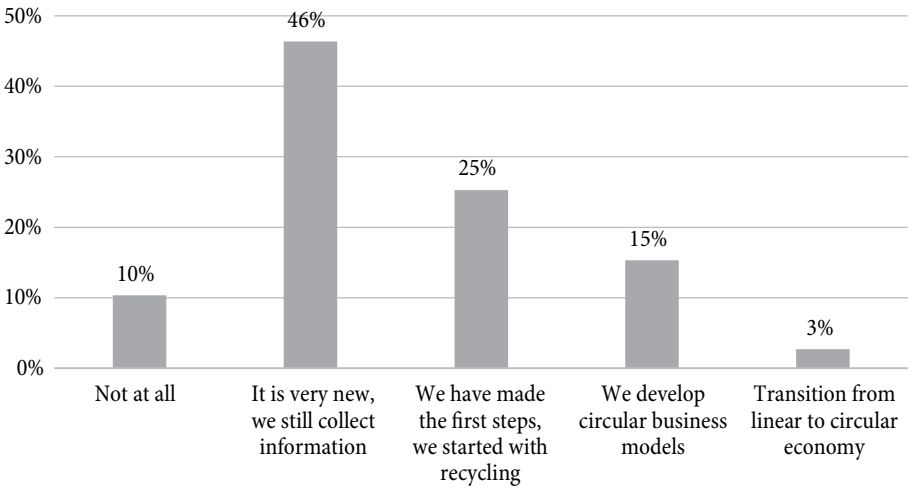
When it comes to the implementation of the circular economy in Serbia, for the majority of companies, this still represents a new concept. They are either in the information-gathering process (46%) or consider it unrealistic to expect implementation in the next five years (10%). On the other hand, 44% are in some phase of the green transition process. More specifically, 25% have taken initial steps and started recycling, 15% are developing circular business models, and only 3% have fully transitioned to a circular economy (Figure 13). The current situation indicates the necessity

Figure 12: Functions that provide information for a sustainability report



Note: Percentage of the total number of companies that prepare the sustainability report (57 companies)
Source: Authors' calculations

Figure 13: How realistic is the implementation of the circular economy in your company in the next 5 years?



Source: Authors' calculations

of systemic support from the government through the development of an appropriate Green Transition Action Plan as well as securing funds for its financing.

One of the current challenges facing managers is sustainability-related disclosure is the AI. To gauge the perspectives of our managers on this matter, we inquired about the realistic prospects for the implementation of AI in the next five years (see Figure 14). The findings indicate that the use of AI tools is present to varying degrees in only 15% of the analyzed companies in Serbia. Conversely, 36% have neither used AI nor deem it necessary, while 49% of managers perceive AI as a novel concept, actively engaging in information gathering and exploring potential applications. The strategic adoption of AI technologies can enhance various aspects of a company's operations, providing a competitive advantage in today's dynamic business environment. Companies that overlook these trends face weak prospects for survival.

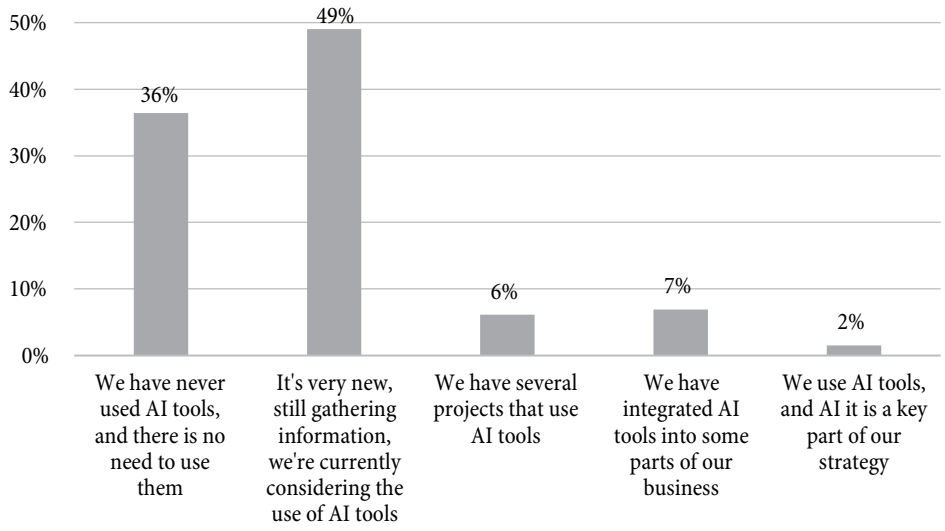
The Green Transition Action Plan for Serbia

As the global economic context could not support sustainable development, mostly due to the structural imbalances and negative consequences of global warming, for the architects of the new economy, two key topics are in the spotlight: green transition and sustainable development. The changing context transforms everything, and an elevated context necessitates more elevating users of this context. Serbia should actively participate in this process. It is the collective responsibility of each national economy.

Evidence from empirical tests of sustainability-related disclosure indicates that attitudes within Serbia's business community towards the SDGs/ESG have a thin crust. These attitudes reflect how the economy intends to lead. It is necessary to improve understanding of what the green transition entails and what it does not. The catalytic impact of the state in this process is imminent. To survive and prosper, Serbia should be extremely agile towards the green transition in 2024 and beyond, aiming to capitalize on momentum for change. The negative consequences of GHG emissions are far too high. If Serbia postpones their mitigation, it will not only lose momentum in addressing the climate emergency but also miss the opportunity to embark on new industrialization as the primary path to convergence with the developed world. Pursuing the green transition could be the most effective way to accelerate accession to the EU, realize ambitions to be a regional heavyweight, and face the future with confidence.

Embarking on this astonishing venture with depth and speed is a prerequisite not only for recovery but also for ensuring sustainable development in Serbia for years to come. The approach of aligning every transformation in Serbia with other national economies and within planetary boundaries will be increasingly welcomed by climate enthusiasts, opinion makers (and decision makers) worldwide. Due to the climate emergency, the philosophy

Figure 14: How realistic is the implementation of artificial intelligence in your company in the next 5 years?



Source: Authors' calculations

of individualism and the supremacy of particular interests over collective ones is no longer welcomed, neither here nor anywhere else.

Serbia as an underdeveloped economy should engage in such an interplay, primarily because prevailing attitudes from the relevant world have changed. Everywhere, achieving sustainable results requires a switch to a circular growth model and a heterodox economic policy platform. This necessity underscores the importance of defining the Green Transition Action Plan for Serbia. This fundamental step aims to ramp up the sustainability of the economy and society. The plan, grounded in quite new ambitions, will outline decarbonization targets, the development of a portfolio of green technologies, the implementation of new financing models, along with updated investment evaluation criteria, and the recruitment of most qualified individuals to execute it. The plan should be submitted for accreditation to multilateral financiers and institutions, with the EU Commission being a primary recipient.

The plan should establish a framework for the implementation of sustainability-related disclosure, encompassing both macro (SDGs) and micro (ESG) levels. It will serve as a symbol of the country's commitment and innovative drive towards sustainable development, grounded in new industrialization. Moreover, the best way to combat stagflation, escape a double-dip crisis, and avoid the middle-income trap is through offensive investments in green infrastructure, green investments, both private and public, spanning various industries, and necessitating adjustments at the policy level in tradable sectors and public utilities.

In the Green Transition Action Plan, as in any transition plan, there is a lack of explanatory details. Therefore, the architects of the plan should draw insights from structural economics, behavioral economics (and finance), and best practices observed in Asian economies, e.g., AI interface with other transformative technologies such as Industry 4.0, quantum computing, biotechnology, and 5G/6G, etc. Industry 4.0, for instance, offers numerous opportunities and solutions in the realm of climate and nature actions, including CO2 capture. Similarly, the application of AI holds promising potential in new industrialization.

To fulfill the earlier mentioned ambitions, the plan also needs prioritization vis-à-vis the latest COP 28 initiatives. The summary document of COP 28 [61] outlines four pillars of climate action: (i) energy transition, (ii) climate finance, (iii) human factors, lives, and livelihoods, and (iv) full inclusivity. This could serve as a framework for the Green Transition Action Plan for Serbia.

i. Energy transition. Energy transition should be the primary focus of climate action. The first step in this endeavor is to enhance energy efficiency. To align with global trends, Serbia should aim to double the average annual rate of energy efficiency improvements from around 2% today to over 4% every year until 2030. Additionally, the development of energy-efficient buildings, incorporating technologies such as smart HVAC systems, energy-efficient lighting, and advanced insulation materials, will contribute significantly to overall energy efficiency improvements.

Nevertheless, a key lever in energy transition is the growing role of sustainable (and clean) energy sources in the energy mix. Nuclear energy, green hydrogen, solar, and wind power are crucial components for substituting fossil fuels and based on that, driving new industrialization. To implement the sustainability manifesto, Serbia may not have the capacity to integrate all new technologies simultaneously. The COP 28 Declaration to Triple Nuclear Energy, which aims to triple global nuclear energy capacity by 2050, is not relevant for Serbia. Instead, it should concentrate on a small number of new technologies such as hydro, solar, wind, and green hydrogen.

Serbia faces challenges in its current energy supply, marked not only by a dynamic energy deficit but also, and predominantly, by its dependency on fossil fuels. The government must escape in reasonable time from energy production based on fossil fuels, as something foolish enough, to successfully execute the green transition. Timing is crucial. A global dilemma has surfaced: phasing out or phasing down fossil fuels. While the phase-out of fossil fuels is inevitable in the long run, major producers of oil and gas like OPEC+ strongly oppose short-term and possibly mid-term cuts. Developing countries resist ending the use of fossil fuels, prioritizing energy access over energy transition. Moreover, early retirement of coal requires public finance support, which is almost unfeasible due to high

indebtedness. Serbia will follow that path but recognizes that fossil fuel reduction should be a gradual process, especially given that coal currently constitutes 68% of its energy production. The government should prioritize green transition in the energy sector through industrial policies. The primary leverage involves state impact investments in green energy infrastructure, such as a grid capable of capturing surplus energy from renewable sources, a pipeline for green hydrogen, facilities for carbon capture/storage, high voltage transmission lines, charging stations for electric vehicles, and more. Complementary policy tools include transfers (compensation for price increases due to carbon pricing schemes) and competitiveness measures (unilateral carbon tax on energy-intensive production such as iron, steel, aluminum, cement, etc.).

ii. Climate finance. The question of where funds for the green transition will come from lies at the heart of climate action. The answer involves a carefully calibrated mix of key financing instruments, namely revenue-based instruments (carbon taxes, resource pricing, tax incentives, excises, etc.), and expenditure-based instruments (carbon reduction subsidies, green credits, green bonds, etc.).

Another important issue is emission trading standards. In the realm of carbon taxes, the current average of $53 per ton of CO2 equivalent falls short of avoiding the 2 degrees Celsius threshold. A minimum carbon pricing fit for purpose should be higher, exceeding $90. In terms of resource pricing, adjustments are also necessary, particularly in fuel excises on fossil fuels, which currently contribute to 1-1.5% of GDP. The most important incentive is the permit price within a carbon-trading scheme.

The primary purpose of subsidies is to encourage the innovation and deployment of climate-neutral technologies. Given their significant fiscal costs, subsidies are particularly targeted towards urgent needs such as "feed-in subsidies", "guaranteed prices", etc. Also, they can be implemented to allocate the effects of price increases downward and upward in energy-intensive businesses.

Retained earnings from the private sector alone are not enough to create a critical mass of funds for climate finance. While Serbia's banking system has core strengths, such as the NBS's monetary reserves and deposits in commercial banking, the capital base is not adequate to finance the green transition. Key lenders in this context could be international players, either independently or via a syndicate of banks.

Despite the high risk, green projects have not exhibited spectacular profitability. In the release of green credit, foreign banks, multilateral financial organizations, and sovereign wealth funds primarily focus on the country's credit rating. With Serbia's credit rating one step below investment grade, it is considered permissible. Furthermore, foreign lenders effectively obtain seniority over domestic creditors. Consequently, green credits tend to be more permissive than they should be based on the specific profitability of the financed green projects. Complementing this, a net-zero commitment for evaluating investments in the process of green credit selection, as well as in the underwriting of green bonds, is also welcomed.

As we have already outlined, developing nuclear energy in Serbia is deemed impossible, even in the long run. However, co-financing joint ventures, for instance, with Hungary, is a feasible idea.

Green bonds hold the potential to attract institutional investors (primarily insurance companies) as financiers of green projects. While this may not be an attractive source of investment for private investors, given the underdeveloped secondary market in Serbia, depositors keeping money in banks stand to gain a real upside from investments in green state bonds.

For strategic green projects, the EU could and should serve as the anchor investor. The involvement of U.S. investment banks is also welcomed. With their determination, knowledge, and interest, coupled with Serbia's critical resources this could be a perfect match for green joint ventures.

Green QE represents an innovative model of green financing. This model could be implemented in mega green transition projects capable of creating Pareto superior, with unconstrained positive external effects for consumers and multiple positive external effects for investors.

iii. Human factors, lives and livelihood. The key is to make information accessible, relatable, and actionable. Fostering a sense of responsibility and showcasing the benefits of sustainable living can encourage individuals, businesses,

and communities to embrace a more environmentally conscious lifestyle.

Redirecting AI solutions toward the green transition makes sense and can help avoid massive layoffs from conventional industries in the future.

iv. Full inclusivity. Full inclusivity requires that the green transition should be fast tracking, orderly, and equitable. In this way, Serbia could contribute to the acceleration of the implementation of SDG/ESG goals.

The set-up of emission trading standards is also a part of that process, particularly in energy-intensive and hard-to-abate sectors. It primarily involves setting a minimum share of renewable use for power generation (at least more than 10%), a minimum share of electric vehicles in the vehicle fleet of business entities and institutions, and average carbon emissions per kilowatt-hour across power generation plants or per ton of steel, cement, aluminum, etc.

Sustainability standards are particularly important in the banking industry, especially concerning the so-called "financed emissions". The production of green credits and the underwriting of green bonds emissions are impossible without the implementation of green investment standards in the evaluation and selection of green projects.

In this area, massive but easy-to-implement initiatives are also appreciated. Planting trees that temporarily store carbon is an effective measure to conserve nature. According to the UN-REDD Programme [63], deforestation and forest degradation account for approximately 11% of carbon emissions, surpassing the entire global transportation sector and ranking second only to the energy sector.

Another prerequisite for a successful green transition is to educate and raise awareness about the importance of sustainability through education programs (at schools, universities, and business levels), as well as on online platforms and through corporate initiatives within corporate social responsibility, etc.

Fostering the green transition through international cooperation requires collaboration on various levels. Encouragement for participating in international agreements and treaties is critical. Among the many agreements introduced by COP 28, Serbia should select and join documents of primary importance for its green transition plan. Our view is that key priorities include the following documents.

i. Global Renewable and Energy Efficiency Pledge. This document stipulates that signatories commit to working together to triple the world's installed renewable energy generation capacity to at least 11.000 GW. The document proposes the collaboration with the International Renewable Energy Agency (IRENA) and the so-called High-Level Champions in areas of advanced electrification, renewables-ready grids, and clean energy deployment.

ii. Global Cooling Pledge. This document focuses on collaboration towards reducing sectorial emissions by at least 68% relative to 2022 levels by 2050.

iii. Certification Schemes. This document treats renewable energy and low-carbon hydrogen and hydrogen derivatives.

iv. Oil and Gas Decarbonization Charter. The document commits to achieving net-zero operations by 2050, ending routine flaring by 2030, and achieving near-zero upstream methane emissions.

v. Industrial Transition Accelerator. This document regulates decarbonization across heavy-emitting sectors, including energy, industry, and transportation. In the industry segment, the document aims to focus on cement and concrete by sharing best practices, working on joint policies and standards, and supporting innovation from the circular economy area (carbon capture and storage, for instance).

A rapid green transition is key to keeping the goal of 1.5/2.0 degrees Celsius within reach. In this process, green energy transition capable of maintaining energy security and new "go green" industrialization play a central role.

Conclusion

From the Great Recession of 2008 until today, despite the combined effect of the last two industrial revolutions (3IR and 4IR), humanity has lived in an era of wasted opportunities. The reason for this lies in a fractured socio-economic system and an enduring permacrisis as its consequence, both generating and deepening structural imbalances and anomalies of the economic system and continuously ruining the prospects for sustainable development. The

previous inconveniences are also ruining the economic system's capacity to respond to external asymmetric shocks and black swan events that continue to intensify.

According to the World Bank forecasts [67], the global economy will grow by 2.4% in 2024 and 2.7% in 2025, which is much slower than the growth experienced in the beginning of economic neoliberalism more than four decades ago. Efforts to restore sustainability thresholds face an insurmountable challenge. From the perspective of developing economies, if global growth fails to meet mid-single-digit growth (CAGR = 5-6%), catching up with the developed world seems almost impossible. Moreover, for some parts of the developing world, GDP growth rates in 2024 are anticipated to be lower than those recorded at the onset of the COVID-19 pandemic. Fast-growing emerging economies are in a more vulnerable situation due to overheating and a disinflation threat. Anyhow, global feeble growth threatens to undercut many of the sustainable macroeconomic goals outlined by the UN 17 SDGs, making it harder to finance the green transition, and implement sustainability-related metrics (ESG) within a comprehensive measurement system of microeconomic performance.

In the new normal two major challenges facing humankind are unsustainable economic development and climate change. The green transition offers a solution to both challenges simultaneously. By prioritizing the respect of planetary boundaries and the laws of nature, the green transition fosters cooperation for a shared tomorrow, establishing a new economic equilibrium between the factor prices and factor incomes on a global level.

Market fundamentalism has created a fractured, highly fluid system where different stakeholders (national economies, big tech, big corporations, big banks, etc.) compete with different values, objectives, measures, and strategies. Such a context could not support sustainable economic development. Context changes everything. In the search for a solution, returning to economic neoliberalism as a theoretical background of the pre-permacrisis era is not an option. To create new context, we need a paradigm change. From an economic perspective, the key outcomes of rebuilding trust could be a circular model of growth and a heterodox economic policy platform capable of finding solutions for the major problems of economic neoliberalism.

Escaping the new normal and creating a better normal requires a new context that stimulates creative thinking, capable of incorporating the latest advances from science and technology to address at least three global imperatives. First, addressing the climate and nature crises. Second, fulfilling broken promises of the Paris Agreement regarding the lasting protection of the planet and its natural resources. Third, reversing the trend from new globalization, or forced deglobalization, to the globalization as we once knew it.

Despite a universal diagnosis of root causes and universal targets, the realization of necessary achievements at the individual country level is unlikely to occur solely through the implementation of a universal blueprint. Instead, individual countries, including Serbia, will need to craft a specific green transition action plan. This plan will enable Serbia to navigate a sustainable future, seeking a new equilibrium by minimizing trade-offs and maximizing synergies from new resource allocation what seems to be the failure of the orthodox neoliberal approach.

The design of a new economic framework entails moving beyond conventional anti-crisis measures towards actionable structural reforms and translating viable ideas into tangible actions. The ultimate goal is to build a more promising setup (or a better normal) inspired by sustainable and inclusive development for all. Rather than saving the neoliberal variant of capitalism at any cost, even through geopolitics, the mission of the green transition is to save the economy, society, and the planet as a whole, as well as to ensure the development of a more progressive model of capitalism. By transforming the socio-economic system, the green transition aims to secure human existence.

Despite relatively good strategic fit with the situation, Serbia's economy should follow the green transition path. Prosperous national economies are not those that developed in a sustainable way simply by growing with extraordinary growth rates at the expense of global commons. Wealthy nations are sustainable because their economies have grown steadily through innovative practices over an extended period. They achieve high-quality growth, one that respects planetary boundaries, the laws of nature,

the health of living organisms, and human well-being. Achieving this should be a collective responsibility for the common future of all nations, and Serbia is no exception to this rule. Such an orientation could be a key leverage for fostering sustainable relationships with the EU as an environment we are approaching to.

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Dragan Đuričin

is a fellow of the World Academy of Art and Science as well as a founder and board member of the Serbian Chapter of the Club of Rome. He is a professor of Strategic Management, Project Management, Enterprise Risk Management, Economics of Strategy, and Strategic Financial Management. He is editor in chief of the Serbian scientific journal Economics of Enterprise. He is president of the Serbian Association of Corporate Directors. He wrote dozens of books in the fields of strategic management, project management, systemic transition, and risk management. He was a visiting professor at the University of Venice as well as a fellow of the Fulbright Foundation. He was a member of corporate governance bodies in dozen multinationals and reputable Serbian corporations, including Tarkett, Molson Coors, Danube Foods Group, Addiko Bank. He worked at Deloitte for 24 years, occupying C-level positions, including the chairman of Deloitte Pannon Adria and chairman of Deloitte Serbia. He served as chairperson of the Supervisory board of Dedinje Cardiovascular Institute. Currently, he is a member of corporate governance bodies of Metalac, Messer Tehnogas and Komercijalna banka – NLB Group. He was a founder and executive chairman of Kopaonik Business Forum. He was president of the Serbian Association of Economists for fifteen years. He was a member of the Economic Council of the Government of the Republic of Serbia. He was engaged in the preparation of several transitional laws, particularly the privatization law as well as the fiscal consolidation program known as "Avramovich's Program". His constant preoccupation is economics of transition. His current interests include a paradigm shift in Economics and Industry 4.0 impact on financing of the "net-zero" transition and circular and regenerative economy.

Vukašin Kuč

is an associate professor at the University of Belgrade – Faculty of Economics and Business, where he completed all three levels of academic studies. He has a bachelor's degree in Management, a master's degree in Accounting, Auditing and Business Finance, and a PhD degree in Business Management. He lectures *Strategic Management and Value Based Management* in undergraduate studies, *Business Strategy* and *Corporate Governance* in master's studies, and *Economics of Strategy* in doctoral studies. Also, he teaches three courses on international study programs that are implemented in cooperation with the London School of Economics and Political Science. He has been a researcher in numerous domestic and international scientific projects as well as consulting projects in the field of company valuation, restructuring, etc. He is an author and/or co-author of textbooks and scientific papers in the field of business strategy, value management, capital structure, business and financial restructuring, etc. He is a member of the Strategic Management Society. He is a co-founder and a member of the management board of the Serbian Association for the Sharing Economy.

Iva Vuksanović Herceg

is an associate professor at the University of Belgrade – Faculty of Economics and Business. She teaches undergraduate courses Strategic Management and Risk management, graduate course Strategic Finance, and PhD course Economics of Strategy. She received her PhD degree from the Faculty of Economics, University of Belgrade. Her primary fields of interests refer to enterprise risk management, value-based management, Industry 4.0, industrial policy and economics of transition, in general. She wrote more than 60 papers related to the previous topics. Iva Vuksanović Herceg managed both domestic research project dealing with new economic policy platform and competitiveness of the real sector in Serbia funded by the Ministry of Education, Science and Technological Development as well as EU funded international research project on building capacity and skills for managing social and technological innovation project in the youth population. She is Visiting Scholar at the Faculty of Economics and Business University in Zagreb. She is a member of the Supervisory board of the Foundation of Young Talents of the City of Belgrade.

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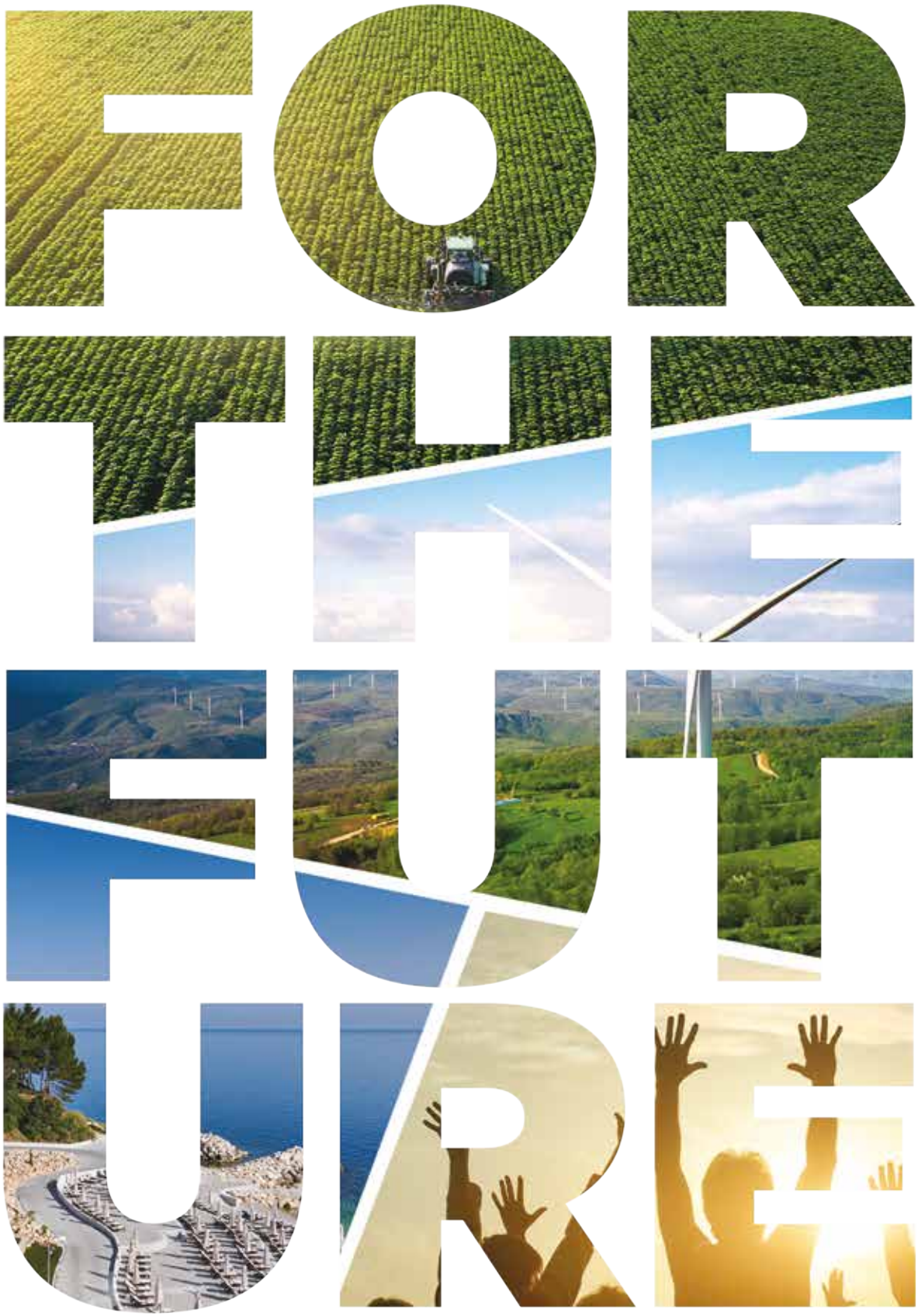

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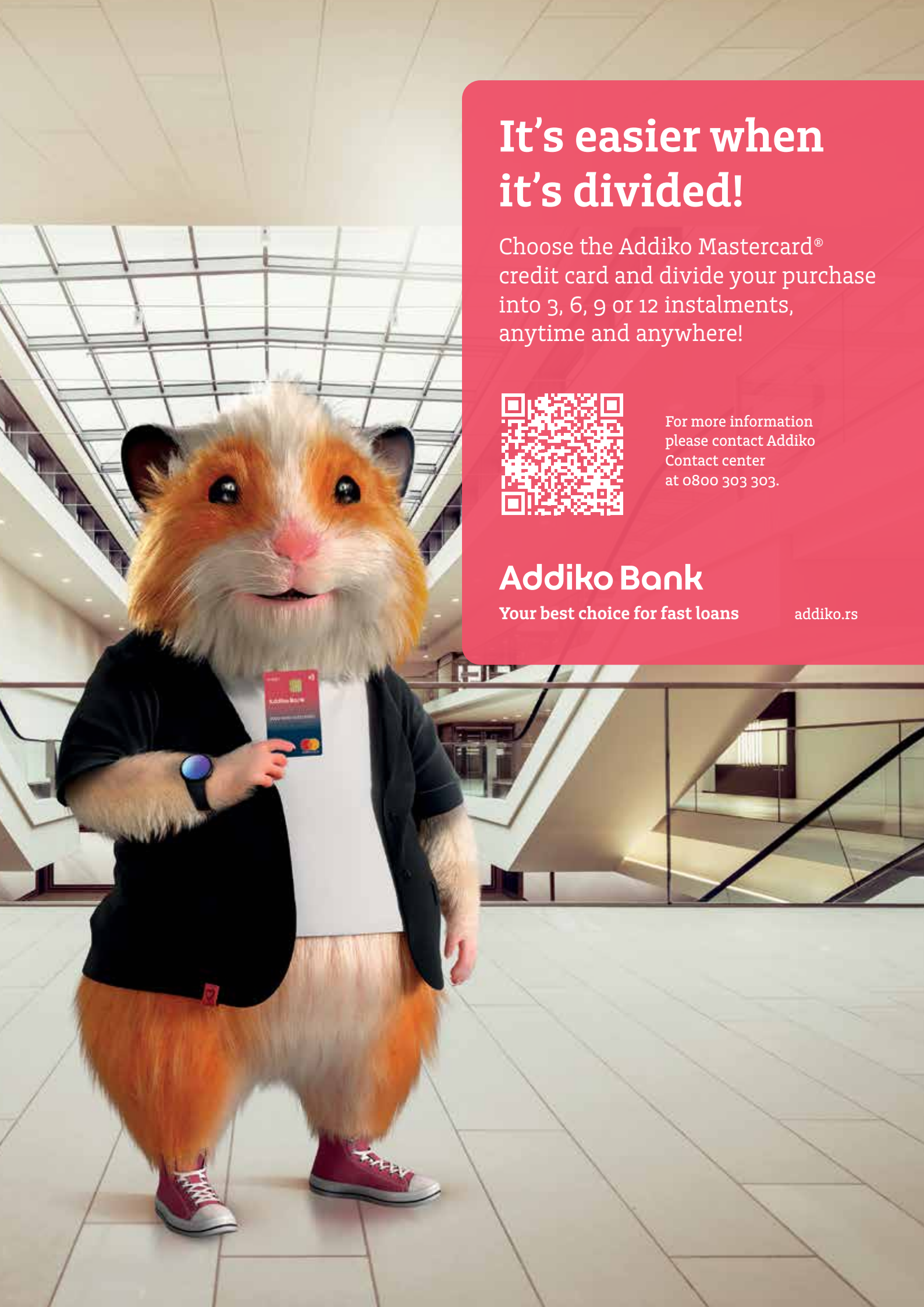
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Jorgovanka Tabaković
Governor
National Bank of Serbia

CONTRIBUTION OF MACROECONOMIC STABILITY TO THE CORPORATE SECTOR'S PERFORMANCE: THE CASE OF SERBIA

Doprinos makroekonomske stabilnosti poslovanju privrede – primer Srbije

Abstract

The paper analyses the results of the Serbian corporate sector in the period 2013-2022, starting with groups of companies classified by their activity, size, residency of the owner and market orientation. The paper concludes that all groups of companies benefitted from stability and that they used the opportunities created on this account. In the observed ten-year period, the Serbian corporate sector recorded growth in real operating income and operating profit of 5% (8.2% in the period since 2019) and 8.5% on average per annum. Employment rose at the annual trend rate of 3.9%, and export propensity also increased, on average by 2.5 structural points a year. Simultaneously, the average annual trend rate of real GDP growth measured 2.9%, which together supports the assessment of the importance of exports for economic growth. Wage movements also indicate the multiplicative impact of economic growth on the increase in household earnings from work – both in terms of average wage growth and employment gains. If we take a step forward and split the ten-year period into two five-year periods, we can see that the total calculated financial costs on account of interest rates and exchange rate gains/losses decreased by EUR 6.9 bn, making up 37% of the total increase in corporate net profit. This is not merely about the positive impact on corporate money flows, but also about how important they are for financial potential to be more efficiently translated into expansion and/or modernisation of existing and construction of new capacities in a stable and predictable business environment. This is only one part of the direct importance of price stability and relative stability of the exchange rate for successful business performance, growth, and employment.

Keywords: *operating profit, profitability, financial result, stability*

Sažetak

U radu analiziram rezultate srpske privrede za period 2013-2022. godina, a polazeći od grupa preduzeća razvrstanih prema delatnosti, veličini, rezidentnosti vlasnika i tržišnoj orijentaciji. Zaključujem da su sve grupe preduzeća imale konstantan podsticaj od stabilnosti, i da su preduzeća stvorene šanse i koristila. Po tom osnovu, u posmatranom desetogodišnjem periodu srpska privreda zabeležila je rast realnih poslovnih prihoda i poslovnog dobitka od 5% (8,2% u periodu od 2019.) i 8,5% prosečno godišnje. Zaposlenost je rasla po prosečnoj godišnjoj trend stopi od 3,9%, a povećavana je i sklonost ka izvozu prosečno godišnje za 2,5 strukturnih poena. U istom periodu prosečna godišnja trend stopa realnog rasta bruto domaćeg proizvoda iznosila je 2,9%, što zajedno govori u prilog oceni značaja izvoza rastu naše privrede. I kretanje zarada ukazuje na multiplikativni uticaj privrednog rasta na rast primanja stanovništva iz radnog odnosa – kako po osnovu rasta prosečnih zarada, tako i po osnovu rasta zaposlenosti. Ako idemo korak dalje i desetogodišnji period posmatramo kao odnos dva petogodišnja perioda, vidimo da su ukupno obračunati finansijski troškovi po osnovu kamata i kursnih razlika, posmatrano između dva petogodišta, smanjeni za 6,9 milijardi evra, što čini 37% ukupnog povećanja neto dobiti preduzeća. Pritom, ne radi se samo o pozitivnom uticaju na novčane tokove privrede, nego i o njihovom značaju, da se, u stabilnom i predvidivom poslovnom ambijentu, finansijski potencijal efikasnije pretoči u proširenje i/ili modernizaciju postojećih i izgradnju novih kapaciteta. To je samo deo direktnog značaja stabilnosti cena i relativne stabilnosti deviznog kursa za uspešnost poslovanja privrede, rast i zaposlenost.

Ključne reči: *poslovni prihodi, profitabilnost, finansijski rezultat, stabilnost*

Introduction

"Investment is a flighty bird that needs to be controlled," said Sir John Richard Hicks. In other words, encouraging and keeping investments requires macroeconomic stability and certainty of business that comes along with it. This case study of Serbia is yet another confirmation of that.

Both theory and practice are unanimous in the assessment that macroeconomic policies are an important lever of sustainable economic growth. By implementing a sound economic policy, its makers send a clear message to the private sector. The extent to which they are able to ensure a sufficiently long period of sustainable results will condition the private sector's confidence in them, which will have a feedback effect on investments, economic growth, and the living standards [3, p. 17]. Simultaneously, it is important for policy makers to have good mechanisms for evaluating the effects of the measures taken, for which there are numerous tools, including the analysis of financial results and the position of its economy, i.e. the entities it is made of. Information from companies' financial statements is a product of market and institutional conditions in which they operate, which makes the analysis of this information by economic policy makers important not only for structural policies, but also for non-selective policies because it takes into account the heterogeneity of the economy [1, pp. 1-4], in order to get a more comprehensive picture of the scope and effects of the measures they bring and implement.

There is also the question of looking at the effects of the interaction of different economic policies in order to achieve a full synergistic effect on the performance of business entities and achieve different economic goals. The approach gains additional importance in the face of multiple challenges, especially if managing them requires complex responses that should overcome potentially conflicting goals. Thus, changes in the conditions of external financing from global markets, against the current backdrop of mutual intertwining, are quickly transmitted, especially to small and open economies. For example, if the tightening of global financial conditions causes a flight of capital to advanced countries and a consequent depreciation of the exchange rate of the local currency in a developing country with an overheated market, inflation will rise under the influence of the exchange rate pass-through effect on domestic prices. The tightening of monetary policy, as an expected response aimed at curbing inflation, has a further negative effect on production [4, p. 5].

An excellent example of conflicting goals are current challenges on a global scale. For example, difficulties in redesigning global production and transport chains whose functioning has been impaired by sudden changes in market and logistics circumstances, along with the prolonged effects of the pandemic, are having a negative impact on both economic growth and inflation. Furthermore, geopolitical tensions, which also have an economic background and are rapidly gaining intensity, make the distribution of the effects of globalisation considerably more complicated, clouding globalisation prospects. As part of the monetary policy response, leading central banks relatively quickly replaced the multi-year unconventional monetary easing with aggressive tightening. Now the question of the measure of the response has been opened – response to bring inflation back to target levels in a sustainable manner, with the least possible effect on economic growth. These are all conditions that are transmitted from global markets to all economies, and they can make business difficult, especially so in small and open economies. That is why the individual responses of policy makers are a true indicator of the ability to navigate domestic economies through numerous challenges. They are also an indicator of what their response will be to the new global context, namely, the challenges of an uncertain future.

This paper analyses the trends of business activity, operating financial results and the financial position of companies in Serbia in the period from 2013 to 2022. Since it is a relatively long period of time, the analysis also contains structural indicators, i.e. trends in the economy were analysed depending on the company's activity, size, residency of the owner and market orientation, as well as according to several criteria for classifying companies. At the same time, the operating results in different periods within the ten-year period were analysed, especially the character of deviations from long-term trends in the period since the beginning of the pandemic. All analyses were done using data from the financial statements of non-

financial entities collected by the Serbian Business Registers Agency (see Appendix), and the approach in classifying companies focused on their specificities in production and access to commodity and financial markets.

Lastly, the analysis placed special emphasis on the effects of monetary and fiscal policy measures, given that they are the two pillars of a stable business environment. As the two basic economic functions of the state, monetary and fiscal policy play a key role in ensuring economic stability and confidence in policy makers. Both policies have privileged powers to redistribute economic resources in society [5, p. 42]. Still, the effects of these policies will depend on confidence in the state [5, p. 45], which is created by adopting adequate and timely decisions and implementing them consistently over a longer period. All results obtained by analysing company data in Serbia in the observed ten-year period confirm the existence of confidence in policy makers.

Ten years of robust growth in business activity

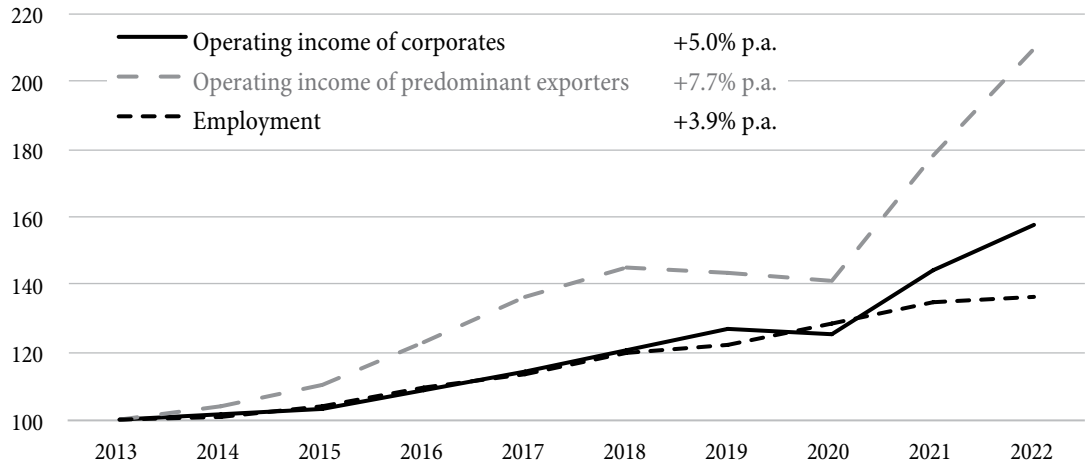
In the period 2013-2022, the Serbian economy recorded robust growth in business activity and productivity.

The business expansion of the Serbian economy is unequivocally confirmed by the growth in operating income, which in that period increased at an average annual trend rate of 8.2% or cumulatively by 115.5%. Deflated by the implicit GDP deflator, as a measure of the aggregate price growth, operating income in that period grew at an average annual rate of 5.0%, which is a cumulative increase of 57.9% (compared to the base year 2013).

Observed by five-year periods, the trend rate of growth of real operating income accelerated in the second part of the period – from 3.5% (2013-2017) to 6.9% (2018-2022). In other words, in the second five years of the observed period, three quarters of the cumulative increase in real operating income of the Serbian economy was realised. The importance of the achieved growth is reinforced by the fact that such result was attained even though the Serbian economy, as well as the global economy in this period, was burdened with the negative effects of the pandemic and the escalating geopolitical and geoeconomic tensions. This was only temporarily reflected as slower growth of operating income (quite expectedly in the pandemic year of 2020) but was quickly offset in the last two years of the observed period, thanks to the economic policy measures taken to mitigate the negative effects of numerous global macroeconomic shocks (Figure 1). Even with the tightened monetary policy in 2022, the tendencies in the movement of cash flows, liquidity and solvency remained favourable, so also did and their effect on the business activity, which is opposite to theoretical expectations [10, p. 26].

Owing to the increase in business activity, during the observed period the Serbian economy recorded constant growth in employment, at an average annual trend rate of 3.9%. In the same period, real operating income per employee, as an indicator of productivity, increased at an average annual rate of 1.1% or cumulatively by 15.8%.

Figure 1: Dynamics of real operating income and employment, 2013 = 100



Source: Business Registers Agency and author's calculation

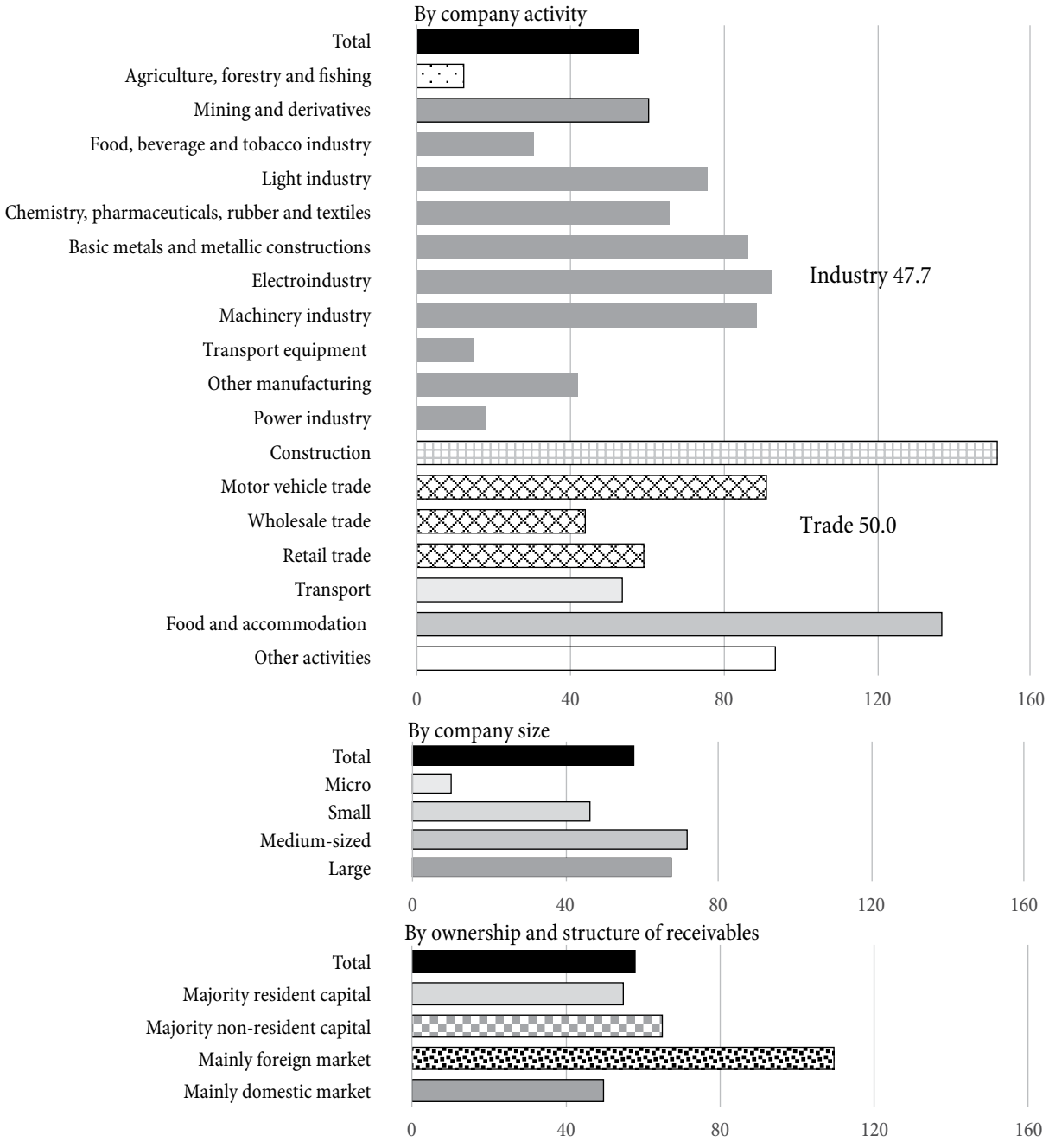
Such outcome would not have been possible without the numerous measures of state support to companies, both for their operations and employment.

The fact that in the observed period growth was widely dispersed and driven by exports and investments also shows that the diffusion of growth in business activity was complete. Such conclusion is indicated by the analyses of corporate performance, which, for the purposes of this paper, were done taking into account different criteria for grouping companies:[1] 1) core activity, 2) company size, 3) residency of the owner, and 4) market orientation. Data aggregated in this manner confirm that the rising tendency of business activity in the period 2013-2022 was present in all observed groups of companies.

According to the first criterion, the very insight into the dynamics of operating income by activity, where the

1 See Appendix for all classification groups.

Figure 2: Cumulative growth of real operating income by activity 2013-2022, in %



Source: Business Registers Agency and author's calculation

most dynamic growth is recorded in construction, at an average annual rate of 12.7% in real terms (151.2% for the entire period), confirms that investments significantly encouraged growth of business activity. In addition to construction, above-average growth was achieved by companies from numerous other groups of activities (Figure 2), which, along with the fact that none of the activity groups recorded a decreasing trend, demonstrates that growth of operating income was also strongly diversified.

If we look at the structural trends according to company size, the average real growth of operating income in the period 2013-2022 was the fastest in the group of medium-sized enterprises (6.0%). Large enterprises recorded average real growth of operating income of 5.5% per annum, small enterprises 4.4% and micro-enterprises 0.9%. The importance of company size for analysing the impact of economic policy was pointed out by Gertler and Gilchrist even back in 1994 [8, pp. 338-339].

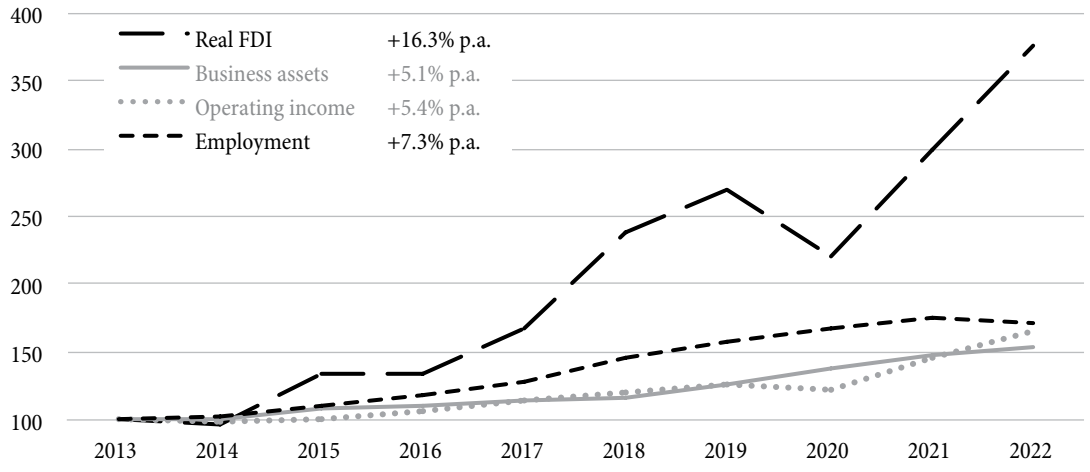
Observed according to the residency of capital owners, average real growth of operating income in the period 2013-2022 was high both in companies in majority resident ownership (4.8%) and in those in majority non-resident ownership (5.4%). This difference is almost completely lost when the power industry is excluded from the analysis.

A contribution to the increase in investment potential also came from FDI inflow, which in the observed period amounted to EUR 28.5 bn, more than half of which pertaining to investments in equity capital without reinvested earnings. The liabilities of the international investment position also increased on this account as direct investments more than doubled and amounted to EUR 50.2 bn at end-2022, of which EUR 30.1 bn (60%) in equity capital without reinvested earnings.

The business assets of companies in majority resident and non-resident ownership also recorded high growth in the observed period (Figure 3 and Figure 4), whereby, based on the strong inflow of direct investments, companies in majority non-resident ownership increased their participation in the business assets of the economy – from 23.7% at end-2013 to 27.6% at end-2022. The business assets of these companies recorded an average annual growth of 5.1%, while the business assets of the economy as a whole grew at an average annual rate of 3.3%.

Thanks to high investments in new as well as existing capacities in the observed ten-year period, the contribution of companies in majority non-resident ownership to the cumulative growth of real operating income of the economy amounted to 34%, and the contribution to employment growth exceeded 35% (120,500 new jobs, of which more than a half in the last and most challenging three years of the observed period). In addition to the direct effect, also significant is the indirect impact of increased household income from rising wages and employment on higher demand for products and services in the domestic market, as well as on the payment of tax obligations. This is where the synergistic effect is reflected, i.e. the positive feedback effect of growth on total investments, public finances, and stepped-up investments in infrastructure.

Figure 3: Dynamics of real FDI to Serbia, operating income, assets and employment of companies in majority non-resident ownership, 2013 = 100



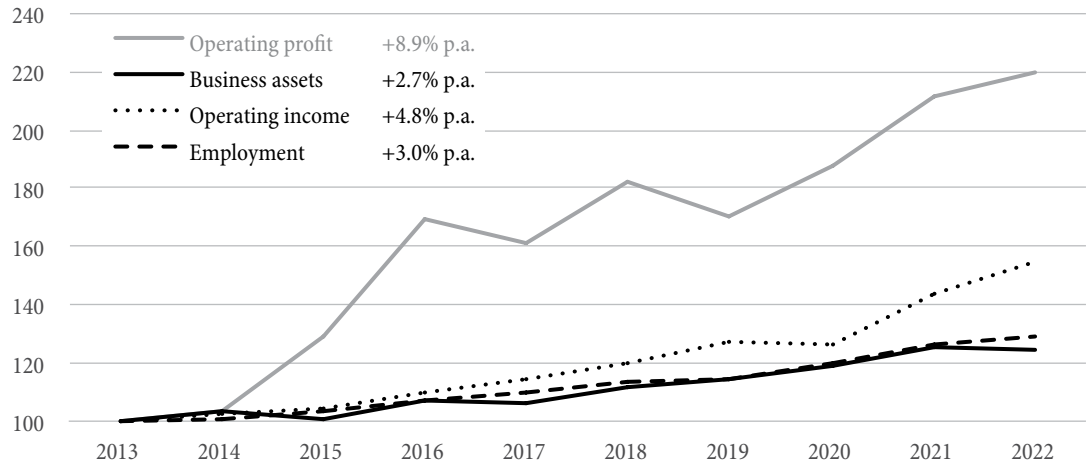
Source: Business Registers Agency and author's calculation

At the same time, companies in majority resident ownership have remained the pillar of the Serbian economy – accounting for 72.4% of employed assets, 68.4% of operating income, 73.2% of capital and 77.5% of total employment.

Real operating income of this group of companies rose at an average annual trend rate of 4.8% (Figure 4). This growth significantly facilitated the process of structural adjustment of these companies, so in this period employment increased at an average annual rate of 3%, with increased efficiency of asset utilisation – turnover of business assets went up from 0.62 in 2013 to 1.05 in 2022, and of working capital from 1.59 to 1.87, respectively. Thanks to this, the operating profit in this group of companies rose faster than in the total corporate sector – at the rate of 8.9% vs. 8.5% on average per annum.

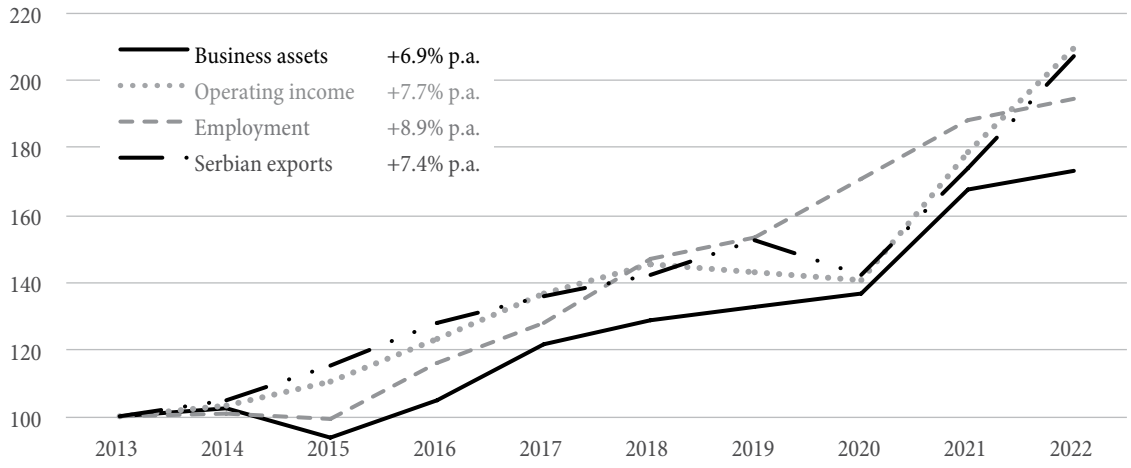
Also, the business assets of companies which sell a major part of their products and services in foreign markets are growing in importance – from 12.3% at end-2013 to 16.2% at end-2022. Such trends are the result of investment in the expansion of business capacities, and of the prevalent tendency where domestic companies are increasingly integrating in the international division of labour. These movements confirm the strength of our economy to structurally adjust and respond to market challenges through greater diversification of export markets. These companies have also recorded a faster real growth of operating income since 2013 compared to those selling their products domestically (on average 7.7% vs. 4.6%, respectively). Consequently, the contribution of this group of companies to the cumulative growth in real

Figure 4: Dynamics of operating income, assets, profit and employment of companies in majority resident ownership, 2013 = 100



Source: Business Registers Agency and author's calculation

Figure 5: Dynamics of Serbian exports and real operating income, assets and employment of predominantly export-oriented companies, 2013 = 100



Source: Serbian Business Registers Agency and author's calculation

operating income of corporates equalled 30.2%, and to the rise in employment – 41.2% (around 141.5 thousand of new jobs). Also, the movement in their business activities corresponds quite well to the movement of goods and services exports for the whole of Serbia (Figure 5).

The growing propensity to export is indicated by macroeconomic data as well – the share of goods and services exports in the Serbian GDP increased from 38.3% in 2013 to 63.0% in 2022, or by an average of 2.5 structural points annually. In the same period the average annual trend rate of real GDP growth measured 2.9%, speaking in favour of the importance of exports for the growth of our economy in the period observed.

Going one step further and observing the movements in five-year periods (2013-2017 vs. 2018-2022), in this latter period, due to the pandemic effects, growth slowed in food and accommodation, though real operating income in this sector reached the 2019 pre-pandemic level already in 2022. With the strengthening of geopolitical tensions and weakening of global growth prospects, and thereby also the external demand for investment assets, growth slackened in the machinery industry too. Conversely, real operating income in construction, just like in most other sectors, picked up in 2018-2022 compared to 2013-2017, and the sector's share in corporate operating income rose from 5.5% in 2013 to 8.7% in 2022. The accelerated growth of construction indicates that the domestic economy not only preserved, but also increased its investment potential.

Finally, while the observed period is also marked by highly adverse economic repercussions of the pandemic and geopolitical developments, the effects of undertaken economic policy measures in Serbia made it possible, in an extremely challenging business environment of 2019-2022, to not only preserve but also accelerate the growth in real operating income – to 8.2% vs. 5% throughout the period observed.

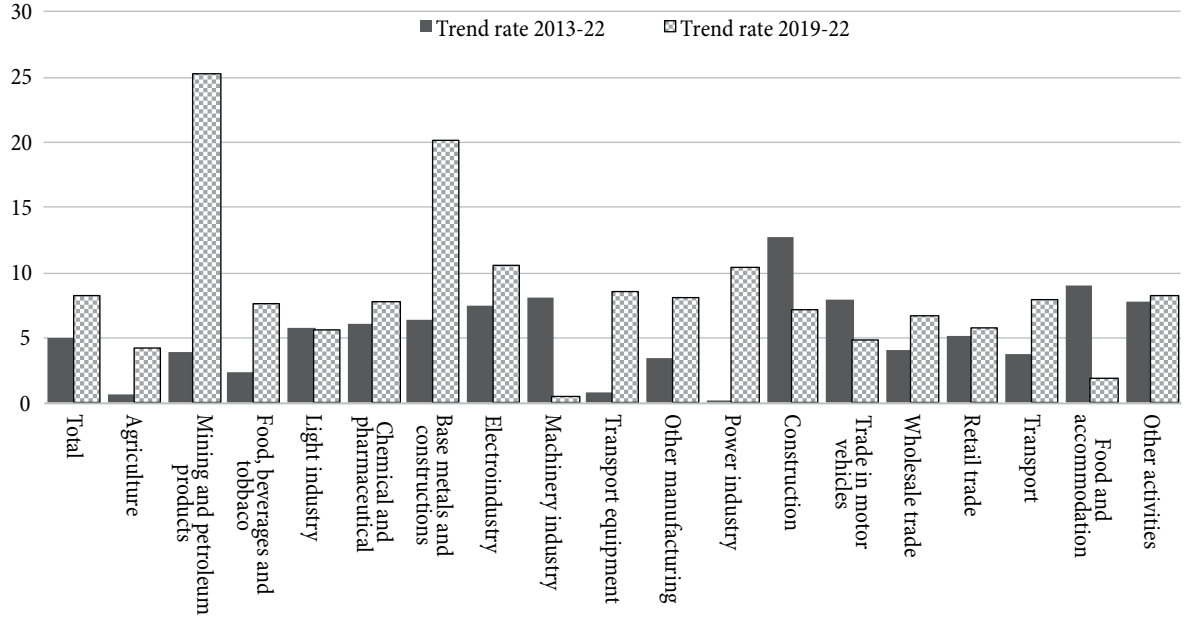
Sector-wise, positive growth rates in this period as well (2019-2022) were recorded across all groups, although with varying dynamics (Figure 6).

In terms of owner residency, the rise in operating income is sharper than the period average, both in majority non-resident owned (10%) and majority resident owned (7.5%) companies.

Looking at company size, large enterprises recorded a significant acceleration in operating income growth – from 5.5% to 13.7%. Micro, small and medium-sized enterprises posted a rise in operating income of 3.8%, compared to the trend rate of 4.5% annually throughout the period.

Predominantly export-oriented companies continue to record faster average growth in operating income than companies largely focused on the domestic market (14.8% on average annually vs. 7.7%, respectively).

Figure 6: Average rise in real operating income by sector, 2013-2022 and 2019-2022



Source: Serbian Business Registers Agency and author's calculation

Interestingly, in this period, in the group of predominantly export-oriented companies, majority resident owned companies experienced more dynamic growth in operating income compared to majority non-resident owned companies (16.1% vs. 13.9%, respectively). The contribution of the group of companies that are mainly export-oriented to the rise in operating income of corporates from 2019 to 2022 amounted to 34.3%, though their share in operating income in the base year (2019) stood at 18.0%.

Prior data point to numerous conclusions regarding the dynamics of business activity of the Serbian corporate sector in the period 2013-2022 and in the sub-periods observed:

- *First,* the rise in real operating income of 5% on average annually over a ten-year period suggests a substantial increase in corporate business activity. The trend growth rate of real operating income stepping up from 3.5% in 2013-2017 to 6.9% in 2018-2022 speaks of the sustainability of this result.
- *Second*, the growth is widely dispersed when observed by sector, while changes in the structure of production may be associated with the changes in the structure of demand, including the changes in price position.
- *Third*, medium-sized enterprises have recorded robust growth, as well as an increased sensitivity to the change in market circumstances, while large enterprises proved significant in production sectors and trade. Small enterprises have also posted a high average growth rate.
- *Fourth*, majority non-resident owned companies have used their comparative advantages in the foreign market, while in parallel, the competitiveness of majority resident owned companies has strengthened as well.
- *Fifth*, the rise in real operating income, especially in the foreign market, unambiguously shows that the growth of the Serbian economy correlates with the growth in competitiveness and export propensity, underlying which are the growth of investments in the expansion and modernisation of capacities, as well as the transfer of technology and introduction of new business models. The data that the share of goods and services in the Serbian GDP rose on average by 2.5 structural points per annum, while the average annual trend rate of real GDP growth measured 2.9%, clearly speaks in favour of the significance of exports for the growth of our economy.
- *Sixth*, thanks to the timely and generous policy response, even in the most challenging period plagued by the adverse impact of the pandemic and the heightening of geopolitical and geoeconomic tensions (2019–2022), not only that the rise in operating income was maintained, but was also stepped up to 8.2% (compared to 5% over a ten-year period).
- *Seventh conclusion*, bringing together all the above, is that the rise in operating income is an important factor of reducing unit costs in production, boosting profitability and strengthening the financial position of the domestic economy, which confirms its sustainability.

Higher operating profit: A reflection of corporate inventiveness and stable conditions

A long period of macroeconomic and financial stability opened up the possibilities for corporates to direct their human and financial capacities toward regular business activities. That they have truly used those possibilities is proven by corporate financial statements.

Specifically, the share of operating in total corporate income rose from 94.5% to 97.1% since 2013, evidencing that our corporates are now more focused on business results. On the other hand, under the impact of the same factors, the share of operating in total expenses increased from 89.6% to 96.3%, i.e. non-operating expenses have been on a decline. Both data corroborate the fact that our corporate sector has increasingly focused on business results, as confirmed by other analyses as well.

The data showing that since 2013 the average annual real rise in operating income (5.0%) surpassed the average annual real rise in operating expenses (4.7%) suggest a decrease in unit costs in production. This result can be associated with the effects of the economy of scale and modernisation of capacities owing to the rising

investments and to a lesser degree to the terms of trade, given a relatively long time period in question. The impact of investments on the reduction of corporate unit costs is also suggested by the changes in the composition of operating expenses, i.e. a decrease in the share of variable expenses – from 84.3% in 2013 to 83.5% in 2022. A closer look shows that the decrease in the share of variable expenses stems to a lesser degree from higher depreciation and more from the rise in employee income. Specifically, the share of wages in corporate operating expenses went up from 11.6% in 2013 to 13.1% in 2022, indicating that economic growth had a multiplier effect on the rise in employee income – both in terms of the rise in average wages and employment.

Sector-wise, the dynamics of operating expenses largely depends on the relative dynamics of operating income, while other influences arise from the specificity of a particular activity, including the effects of changes in the domestic and global market. Observed by sector, the below-average growth in real operating expenses was seen in agriculture, power industry, production of transport equipment and food, beverages and tobacco. On the other hand, a relatively swift growth in real operating expenses was recorded in construction, food and accommodation, other activities, trade in motor vehicles, machinery industry and electroindustry.

As for the composition of operating income, majority resident owned companies have seen a relatively more stable share of variable expenses in total operating expenses. At the same time, the wage dynamics is similar in both groups of companies, except that allocations for this purpose in majority resident owned companies are higher, when observed relative to total operating expenses.

As a result of movements analysed above, in the period 2013-2022 the Serbian corporate sector saw a real rise in operating profit of 8.5% on average per annum. In 2022, operating profit turned out 2.2 times higher than in the base year (2013), making up 6.3% of operating income.

Sector-wise, the most vibrant growth in operating profit was recorded in construction (at the annual trend rate of 32.6%), motor vehicles trade (16.1%), production of chemicals and pharmaceuticals (14.9%), machinery industry (14.1%), light industry (11.4%) and retail trade (10.9%). Of course, a part of this dynamics stemmed also from the low base in some sectors in the initial years of the period observed.

Observed by company size, the fastest growth in operating profit was posted by medium-sized enterprises (13.5%), while the average ratio of operating profit and income in the period from 2013 to 2022 was the most favourable in small enterprises (5.6%).

Looking at the upward trend of operating profit by company ownership, it goes deeper into positive territory in companies that are majority resident owned (8.9% vs. 7.7% on average, respectively). This among other things reflects a lower base, but surely suggests there is a tendency of gradual narrowing of the difference in corporate business results according to the majority owner residency, observed relative to operating income. This confirms that foreign direct investments, as well as the development of business cooperation between domestic companies and companies included in international value chains, have had strong diffusion effects on business models and practices of companies in majority ownership of residents.

Observing companies by market orientation, a faster rise in operating profit is recorded in companies which predominantly sell their products in foreign markets (18.4% vs. 6.5% on average per annum). The share of operating profit in operating income is higher among companies which are predominant exporters and in 2022 that share stood at 7.3% relative to 6.4%. In this case as well, the narrowing of the difference between the two can be associated with the positive effects of the process of a wider integration of our economy into global economic flows.

Based on the above analyses, several conclusions regarding the period 2013-2022 can be made:

- *First,* the rise in real operating income outpaced the dynamics of real operating expenses, which directly manifested as the growing operating profit of corporates. This confirms that the robust growth in business activity is also financially viable.
- *Second*, the share of operating expenses in total corporate expenses climbed to over 96%, making non-operating expenses less and less important for the total financial result of the corporate sector,

which is an expected effect of macroeconomic and financial stability.

- *Third*, the importance of variable expenses within operating expenses has weakened, mainly as a result of 1) increase in salaries and other employee income, which boosts the living standards of the population, and 2) depreciation, as a result of increased investments, also serving as a basis for future investments.
- *Fourth*, the rise in the salaries' share in operating expenses of corporates from 11.6% in 2013 to 13.1% in 2022, in combination with other ratios, suggests that economic growth had a multiplier effect on the growth of employee income – both in terms of the rise in average wages and employment.
- *Fifth*, the tendency of gradual narrowing of the difference between operating profit of companies by the majority owner residency, when compared to operating income, confirms that FDIs and the development of business cooperation of domestic companies with those integrated in international value chains have had a strong diffusion effect on business models and practices of majority resident owned companies.
- *Sixth*, high operating profit to operating income throughout the period was realised by companies which to a larger degree sell their products in foreign markets, but this difference is gradually decreasing, indicating that the export sector is strongly integrated in the Serbian economy as a whole.

Profitability growth underpinned by more favourable results from financial activities

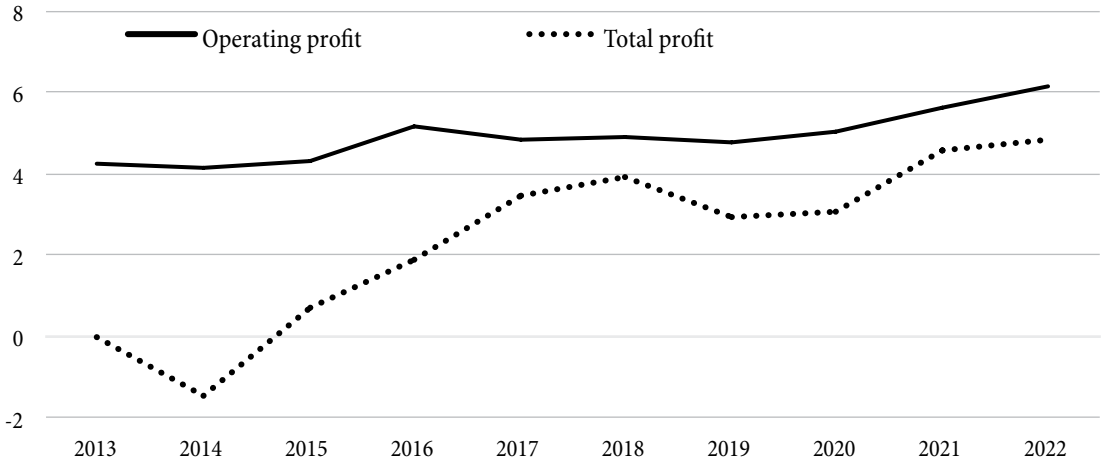
In the period from 2013 to 2022 real net profit of corporates increased at an average annual trend rate of 8.3%, while real net loss decreased at a rate of 7.4%. Concurrently, total corporate income rose at an average annual trend rate of 4.6%. Owing to this, total net profit of corporates relative to total income rose from 0.0% in 2013 to 4.8% in 2022.

The share of operating profit in total income also increased, from 4.3% to 6.1%, respectively (Figure 7).

Apart from this, the rise in operating and financial result in the last three years of the period observed, marked by the negative effects of the pandemic and heightened geopolitical tensions, supports the fact that the resilience of the Serbian economy has been preserved. This was achieved thanks to the fact that, on the eve of the pandemic, Serbia significantly improved its macroeconomic indicators – the commitment to fiscal consolidation was confirmed, the budget was balanced for the third year in a row, inflation was around 2%, the unemployment rate was below 10%, and growth was in positive territory (4, 0 percent) [6, p. 6]. During the first year of the pandemic Serbia's economy performed better than expected and kept going based on the public sector as a stable core of economic activity as well as the private sector in infrastructure, construction, agriculture, energy, ICT, food processing, financial services, e-commerce and digital logistics [7, p. 129].

All this together confirms also the theoretical and empirical conclusions that the total profitability growth of

Figure 7: Total net profit and operating profit, in %, total income = 100



Source: Serbian Business Registers Agency and author's calculation

corporates is supported significantly not only by the higher operating profit, but also by the stability of macroeconomic and financial conditions. Still, in order to quantify this conclusion, i.e. to specify in more detail the contribution of key factors to the change in corporate net profit, we have observed changes in the level of operating profit and financial expenses (interest and exchange rate gains/losses) in the period 2018-2022 relative to the preceding five-year period (Figure 8). With this, the analysis of the effects of monetary policy measures on the movement of financial costs of the economy, which the NBS regularly conducts [11, p. 40], has been enriched by inclusion of sector, size of the corporation, owner's residency and market orientation.

As indicated by the data analysis, in the second five-year period, the corporate sector cumulatively increased its net profit by EUR 18.6 bn – owing primarily to a more favourable business sub-balance, which contributed EUR 10.3 bn (55.6% of the net profit increase).

Based on calculated interest expenses, the corporate sector saved an additional EUR 2.4 bn, which accounted for a 13.8% increase in net profit.

Calculated exchange rate losses fell by EUR 4.5 bn, accounting for 24.2% of the increase in total net profit.

Total calculated minor financial costs based on interest and exchange rate gains/losses amounted to EUR 6.9 bn or 37% of the total increase in net profit, if we compare two five-year periods.

If we look at the cumulative profit arising from a reduction in interest expenses and exchange rate losses in relation to total income in 2022, it amounted to 6.1% (a 2.1% reduction in interest expenses and a 4.0% reduction in exchange rate losses) at the level of the entire corporate sector.

Such quantified effect unequivocally confirms the importance of price stability and relative exchange rate stability for the success of our corporate sector and, by extension, for growth and employment. It is not only about the positive impact on corporate sector cash flows, which generate additional own funds for investments, but also about their importance for the provision of additional external financial support. Moreover, based on the predictability of the business environment, the financial potential of the corporate sector can be more efficiently translated into the expansion and/or modernisation of existing and the construction of new capacities.

Figure 8 shows the distribution of these effects by activity, company size, owner residency and dominant orientation in sales markets.

In terms of the sources of profit by activity, the contribution of the financial costs reduction to a more favourable corporate financial result is a general phenomenon. The extent to which this was used to expand business activity in some areas was also determined by market circumstances.

In terms of company size, all groups recorded positive effects on net profit based on a reduction in interest expenses and exchange rate losses, which suggests overall profit. The biggest relative winner were micro-enterprises, where this reduction equalled 11.2% of the income recorded in 2022. Both small and large enterprises trended at an average level, with a profit of 6.1% and 6.0% of total income recorded in 2022. This indicator for medium-sized enterprises stood at 4.9%.

In terms of owner residency, relatively bigger winners were companies in majority resident ownership, where this reduction equalled 6.3% of total income in 2022, vs. 5.7% of total income in case of companies in majority non-resident ownership.

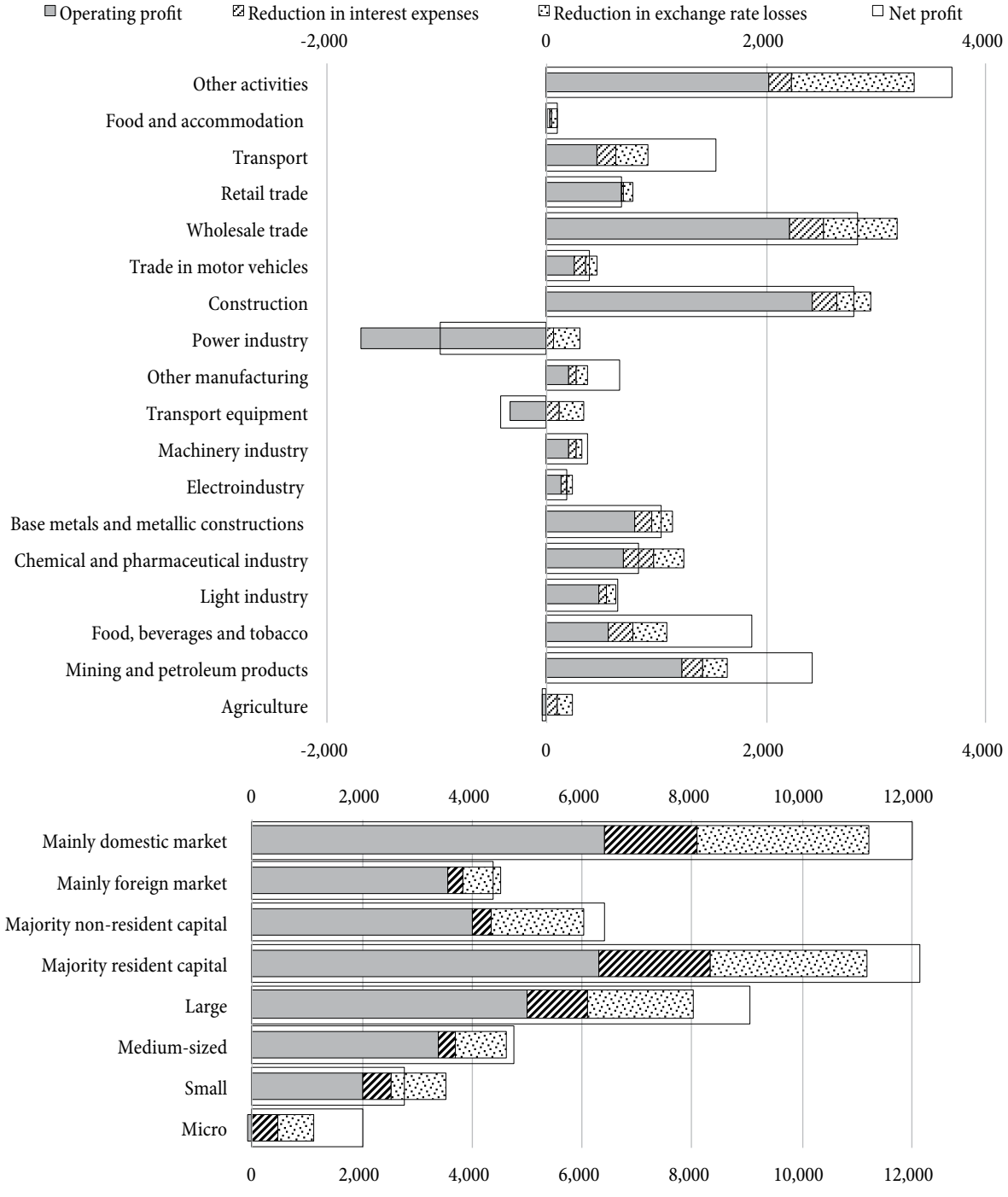
In terms of market orientation, the most striking relative winners were companies selling their products mainly in the domestic market – in their case, the effects of the reduction in interest expenses and exchange rate losses amounted to 6.2% of the operating income recorded in 2022, vs. 4.0% in case of companies that are predominant exporters.

The analysis points to several conclusions:

- *First*, the Serbian corporate sector as a whole, as well as in certain segments, recorded a significant increase in total profit, driven mainly by an increase in operating profit, confirming the sustainability of the growth model.
- *Second*, a strong contribution to initiating and preserving the growth of business activity in the profitability zone came from a significant reduction in financial expenses based on interest and exchange rate gains/losses.

- *Third*, total calculated minor financial costs arising from interest and exchange rate gains/losses amounted to EUR 6.9 bn or 37% of the total increase in net profit if we compare two five-year periods (2018–2022 vs. 2013–2017), which leads us to the conclusion that price stability and relative stability of the exchange rate are a general good beneficial to the corporate sector's performance, and hence to economic growth and employment.
- *Fourth*, a positive synergistic effect was realised through the strengthening of the domestic economy's resilience to external shocks, as demonstrated in the period of the pandemic and mounting geopolitical tensions.

Figure 8: Sources of changes in the financial result in 2018-2022 compared to 2013-2017



Source: Serbian Business Registers Agency and author's calculation

Financial position of the corporate sector

The corporate sector's success in the short run is inextricably linked to its financial position, given that it ensures internal conditions for further financing of production, while maintaining success in the long run contributes to the strengthening of this position and the availability of adequate external financial sources.

We shall here place an emphasis on turnover indicators, i.e. the corporate sector's readiness to use available funds as efficiently as possible at a given level of business activity and liquidity. What do the data tell us?

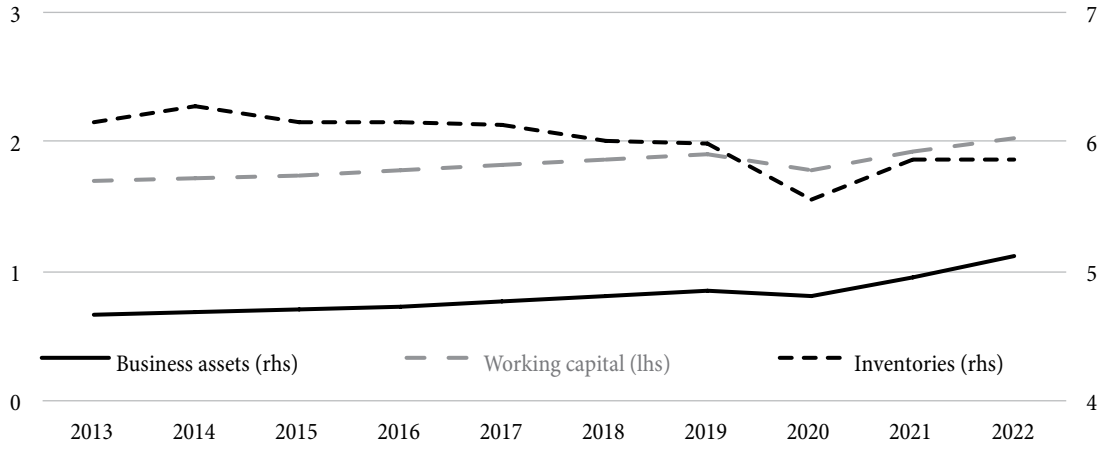
In 2013-2022, Serbian companies were more efficient in using the available funds, as also confirmed by the asset turnover ratio, which rose from 0.68 in 2013 to 1.12 in 2022. In 2022, corporate operating income exceeded business assets by 12%.

As the working capital turnover ratio also increased, circulating assets turned over in less than six months on average in 2022, while in 2013 it took seven months. The working capital structure showed the tendency of a rising share of inventories (from 27.8% in 2013 to 35.2% in 2022), and a decrease in receivables.

The turnover of total corporate inventories was relatively stable – full turnover was achieved in less than two months, while the later years of the period observed also saw an increased tendency to hold inventories, in response to global supply chain disruptions (Figure 9).

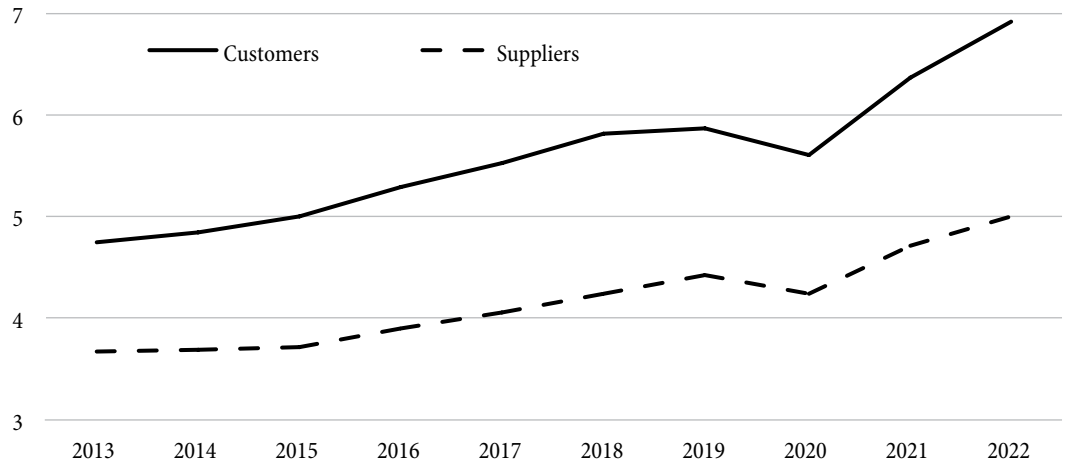
The Serbian corporate sector was constantly enhancing the efficiency of the collection of its receivables based on sale. In 2013-2022, the customer turnover ratio increased from 4.7 to 6.8, i.e. the average collection period decreased from 77 to 53 days (Figure 10). Observed by groups of activities, the most pronounced tendency of customer

Figure 9: Turnover ratio of business assets, working capital and inventories



Source: Serbian Business Registers Agency and author's calculation

Figure 10: Turnover ratio of customers and suppliers



Source: Serbian Business Registers Agency and author's calculation

turnover growth was seen in mining and production of petroleum products, trade in motor vehicles, the power industry and retail trade.

In parallel with a more efficient collection of receivables, the timeliness in the settlement of liabilities based on the procurement of production inputs also increased. In other words, on the liabilities side, the turnover of suppliers also went up – from 3.7 in 2013 to 5.0 in 2022 (the average payment period declined from 99 to 73 days).

A more timely collection of business receivables and settlement of liabilities is also indicated by the diminished importance of spontaneous financing in short-term sources – from 42.9% in 2013 to 40.0% in 2022.

All this suggests that our corporate sector is being increasingly integrated into the world corporate sector, not only through exports, but also through the business policy pursued in relation to suppliers and customers.

The coefficient of own financing was also on the rise until late-2019, reflecting the growth in profitability of the domestic corporate sector over a longer period, which impacted an increase in the share of capital in balance sheet liabilities. However, over the next three years, the coefficient was reduced, which was partly an expected business reaction to the supply of relatively more favourable loans under the government guarantee scheme, introduced to mitigate the fallout from the pandemic. In other words, a significant contribution to alleviating the consequences of the pandemic and geopolitical tensions on the corporate sector balance came from government guarantee schemes, given that through them, the most vulnerable segments of the corporate sector were given access to relatively favourable long-term sources of funding, which ensured the preservation of not only the capacities, but also the operation of these entities. As a result, the corporate sector was able to maintain the trend of decreasing importance of short-term credit sources, whose share in short-term sources declined from 32.4% in 2013 to 29.1% in 2022.

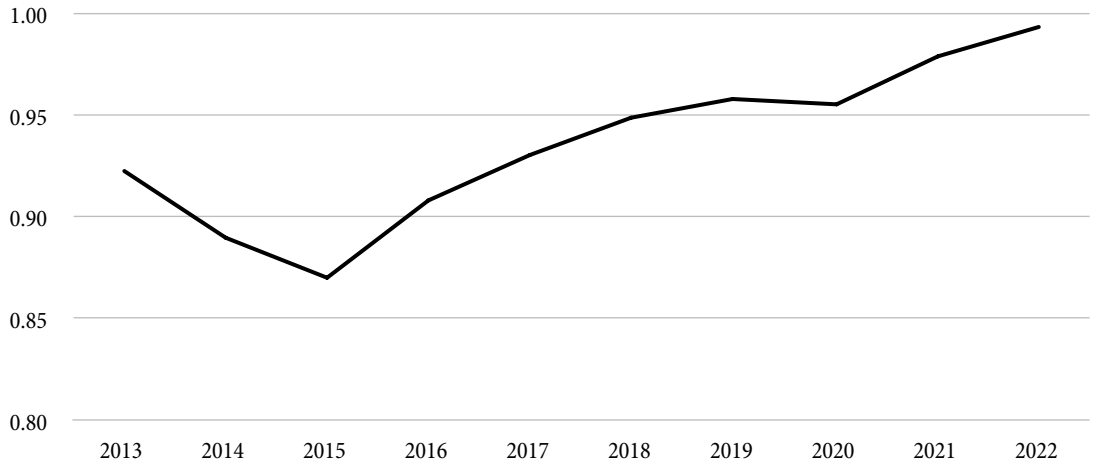
Corporate liquidity also showed a clear tendency of growth. This was a synergistic result of financially sustainable sources of growth in the corporate sector's business activity and macroeconomic and financial stability, which also contributed to strengthening the economy's resilience to external shocks. Looking at the ratio of working capital and short-term liabilities, the general liquidity ratio increased from 0.92 in 2013 to 0.99 in 2022 (Figure 11). The impact of liquidity and borrowing costs on investments was pointed out by Priit Jeenes in an extensive analysis at the level of firms in the USA [9].

Analysis of cash flows from business activities, investments and financing

Other indicators of the corporate sector's performance also suggest that the synergy of profitability growth in corporate operations and macroeconomic stability is an important prerequisite for a positive outlook of the overall economy.

One of such indicators is the net cash inflow from business activities, which in the observed period grew at a real average annual trend rate of 18.5%.

Figure 11: General liquidity ratio



Source: Serbian Business Registers Agency and author's calculation

The growth tendency was recorded in all groups of activities (Table 1). Growth was the most intensive in construction, the machinery industry, retail trade, and production of chemical, pharmaceutical, rubber and plastic products. Above-average growth dynamics were recorded by medium-sized enterprises, companies in majority resident ownership, as well as those that export the bulk of their output.

In absolute terms, the net inflow of cash increased almost fivefold in the observed ten years – from RSD 315 bn in 2013 to RSD 1,547 bn in 2022.

Also, interest payments, which declined in real terms by 52.2% in 2022 relative to 2013, were one of the factors that enabled greater reliance on loans for production-expanding and investing purposes, while also opening up space for wage and employment growth, including a more timely settlement of liabilities.

Structural trends within the sample, if we compare two five-year periods, indicate that the real growth in monetary outlays for the expansion and modernisation of capacities was recorded in all groups of activities, notably in transport, the power industry, machinery production and construction. In the same period, a significant net inflow based on loans was recorded in other activities, the power industry, transport and construction, i.e. mainly in the groups of activities that registered the largest payments based on fixed investments.

Table 1: Calculation of net cash inflow from business activity, in RSD bn

	2013-17	2018-22
Total	**425**	**899**
According to activity group		
Agriculture, forestry and fishery	17	18
Mining and petroleum products	42	94
Food, beverages and tobacco	25	63
Light industry	17	32
Chemical and pharm. industry, rubber and plastic	31	52
Base metals and metallic constructions	3	26
Electroindustry	8	14
Machinery industry	4	13
Transport equipment	17	10
Other manufacturing	20	34
Power industry	62	59
Construction	16	80
Trade in motor vehicles	2	10
Wholesale trade	48	110
Retail trade	15	38
Transport	14	56
Food and accommodation	1	5
Other activities	82	184
According to company size		
Micro	-35	6
Small	106	173
Medium-sized	86	205
Large	269	515

Source: Serbian Business Registers Agency and author's calculation

In terms of the residency of the owners of companies covered by the sample, if we compare two five-year periods, higher growth of payments based on fixed investments was recorded by companies in majority non-resident ownership (although total investments were higher in companies in majority resident ownership), but credit support was directed mainly to companies in majority resident ownership (Table 2).

Overall in 2018–2022, payments for the procurement of new intangible assets, property, plant, equipment and biological assets increased by 55.8% compared to the preceding five-year period. Reduced to 2013 prices, that increase amounted to RSD 205 bn. In the same period, the net inflow based on loans increased, in comparable prices, by almost the same amount, i.e. RSD 208 bn (Table 2). The fact that the corporate sector's cash payments for interest decreased despite the increase in net loan proceeds also speaks in favour of the importance of macroeconomic stability.

Considerably higher net cash inflows reflect rising operating income, improved productivity, and the positive effects of the economy of scale. At the same time, they form a basis for stepping up investment and strengthening the companies' financial position, which, coupled with macroeconomic stability, reinforces the medium-term outlook of the Serbian economy.

Final considerations

"We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper, as whether value is governed by utility or cost of production", said Alfred Marshall. For many phenomena, questions can be raised as to what came first. This is why it is important to have the results of analyses that will unequivocally confirm what contributed to what. It is

Table 2: Payments for investments and net inflows from loans, in RSD bn

	Outflows for the purchase of intangible and tangible assets		Net inflow from long-term loans		Net inflow from short-term loans		Net inflow from loans	
	2013-17	2018-22	2013-17	2018-22	2013-17	2018-22	2013-17	2018-22
Total	**367**	**572**	**34**	**181**	**-26**	**35**	**8**	**216**
According to activity group								
Agriculture, forestry and fishery	15	16	4	9	0	1	4	10
Mining and petroleum products	41	64	-0	8	-1	4	-1	12
Food, beverages and tobacco	29	33	10	11	-7	1	3	12
Light industry	14	16	4	5	0	-1	4	4
Chemical and pharm. industry, rubber and plastic	24	40	4	13	1	-5	5	9
Base metals and metallic constructions	13	19	8	4	5	5	13	9
Electroindustry	5	8	1	6	-0	1	1	6
Machinery industry	5	9	2	3	-0	1	2	4
Transport equipment	12	19	-4	1	-0	5	-4	6
Other manufacturing	14	16	2	8	-3	-1	-1	7
Power industry	37	75	-8	17	0	17	-8	35
Construction	19	35	2	26	-3	-11	-1	15
Trade in motor vehicles	2	3	-0	1	-0	0	-0	1
Wholesale trade	24	30	7	16	1	-6	8	10
Retail trade	20	25	-2	4	1	2	-1	6
Transport	28	67	5	16	-1	19	4	35
Food and accommodation	3	5	0	1	-0	2	-0	3
Other activities	63	91	1	30	-19	0	-17	30
According to owner residency								
Majority resident capital	219	309	19	118	-14	12	4	130
Majority non-resident capital	146	262	16	63	-13	23	3	85

Source: Serbian Business Registers Agency and author's calculation

precisely with the aim of quantifying the contribution of macroeconomic stability to the corporate sector's performance in the period 2013-2022 that I have analysed in this paper the trends in business activity, financial results and the financial position of companies in Serbia.

The vitality of our economy is unequivocally confirmed by the stable growth of business activity and its sources – the 5% annual growth of real operating income in the period 2013-2022 was achieved thanks to the multiplier effect of a strong increase in investments and exports. This is evidenced by the buoyant business activity of companies operating in the sectors that are dependent on investment demand (such as construction and machinery industries with the annual growth of 12.7% and 8.2%, respectively) and companies that export most of their products to international markets (with the average annual growth of 7.7%). The business assets of companies in this period increased at the average annual rate of 3.3%.

Such a model of growth, based on stable business conditions and the inventiveness of Serbian companies, was not given to us, but was rather gradually and systematically established. It is good and predictable policies, policy coordination, and sound and stable macroeconomic conditions that have made Serbia a desirable investment destination and an environment in which both resident and non-resident investors are increasingly implementing long-term business plans.

At the same time, FDI inflow (EUR 28.5 bn in the observed ten-year period) financially supported the modernisation and expansion of capacities and the strengthening of the competitiveness of the domestic companies, not only directly but also indirectly through the spread of new technological know-how and business practices to the economy as a whole. The results of companies owned by residents clearly show that the pitfalls of the dual economy were successfully dodged, as these companies recorded growth in operating income (4.8% per year), but also better resource efficiency – average annual growth in asset turnover and productivity of 5.2% and 1.8%, respectively.

The structural adjustment in the ten-year period was undeniably supported by the necessary financial

preconditions – trimmed financial expenses of the corporate sector and increased availability of financial resources. We should look no further than the directly measurable effects of reduced interest expenses and exchange rate losses, which clearly show that Serbian companies recorded considerably lower costs in respect of financing activities during this period. To be quite specific, in the period 2018-2022, these costs were lower by EUR 6.9 bn or 37% of the total increase in net profit, if we compare two five-year periods (2018-2022 and 2013-2017), which leads us to the conclusion that price stability and relative stability of the exchange rate are a general good beneficial to the corporate sector's performance, and hence to economic growth and employment. Also, interest payments, which declined in real terms by 52.2% in 2022 relative to 2013, are one of the factors that enabled greater reliance on loans for production-expanding and investing purposes.

Business growth and increased investment in capacity expansion and modernisation, along with productivity gains, reduced unit operating costs and improved competitiveness laid the groundwork for an 8.5% real annual increase in operating profit, whereby its share in total income climbed from 4.3% in 2013 to 6.1% in 2022. Thanks to the increase in operating profit and the reduction of financial costs, the net profit of the corporate sector increased significantly – from 0% in 2013 to 4.8% of total income in 2022.

In parallel with the increase in profitability, and as a result of higher liquidity and rising net cash inflow from business activities, the corporate sector's timeliness in the settlement of liabilities improved, leading to a significantly stepped-up turnover of customers and suppliers.

Along with positive trends in cash flows, higher profitability also contributes to the strengthening of the corporate sector's financial performance, confirming the sustainability of the companies' business models, as well as of the macroeconomic growth model. And this is where we get back to the scissors issue and the causality dilemma. A comprehensive analysis of companies' financial statements shows that in the period from 2013 the Serbian corporate sector knew how to use the benefits of stable macroeconomic conditions, and consequently contribute to them. Predictable inflation, a relatively stable dinar exchange rate and financial stability are reflected directly in financial statements through lower financial costs, and indirectly through the growth of business activity, higher efficiency of the use of available resources and stronger competitiveness. The positive synergy of macroeconomic and business decisions created buffers that were used in response to numerous external challenges, so that stable growth prospects have been preserved. This is confirmed by the results achieved at the level of both the national economy and companies, which were and remain geared towards the same goal – growing business and raising the citizens' living standards on sustainable grounds.

The conclusion is that in an adequate macroeconomic environment companies can use their specificities, which partly stem from their activity, size, owner residency and market orientation, as a comparative advantage.

It is only reasonable to expect that as our economy's growth prospects strengthen in the coming period, so will our macroeconomic stability, as well as the activity and efficiency of companies, spilling over, through higher employment and wages, to the sustainable further rise in the population's living standards.

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Appendix

Source of data and the methodology of the analysis

Data

As the aim of this paper is to examine the situation and changes in the financial position and performance of the Serbian corporate sector, the data used are those from financial statements collected by the Serbian Business Registers Agency because they are deemed the most appropriate in terms of coverage and consistency.

The analysis includes companies' financial statements starting from 2013 and ending with 2022. Since the form of financial reporting changed in the period under review, the financial statement items were mapped so as to ensure their comparability in that period. While data are aggregated by various criteria, the link with original data by company has been maintained.

Coverage

At the annual level, almost one hundred thousand business entities that submitted data to the SBRA are covered, while the analysis includes all financial statements submitted by non-financial sector entities. However, there is a difference in relation to the statistical coverage within macroeconomic aggregates, especially, for instance, in case of agriculture.

Data classification and aggregation

For the purposes of the analysis, all entities are grouped according to several target classification criteria that are applied to the balance or flows in the year for which the financial statements were submitted, namely: 1) registered activity, 2) size of the company, 3) residency of the owner and 4) export orientation.

Companies are classified in the following activity groups:

1 Agriculture, forestry and fishery;
2 Mining, coal and petroleum products;
3 Manufacture of food, beverages and tobacco products;
4 Light industry – manufacture of textile, wearing apparel, leather and related products, wood and products of wood, including furniture, as well as paper and paper products;
5 Manufacture of chemicals and chemical products, pharmaceutical preparations, rubber and plastic products;
6 Manufacture of base metals and metallic products;
7 Manufacture of computers, electronic and optical products, as well as electrical equipment;
8 Manufacture and installation of machinery and equipment;
9 Manufacture of motor vehicles and other transport equipment;

10 Other branches of manufacturing (printing and service activities related to printing, manufacture of non-metallic mineral products, other manufacturing activities, water supply and sewerage, waste collection, treatment and disposal);
11 Electricity, gas, steam and air conditioning supply;
12 Construction;
13 Retail and wholesale trade in motor vehicles and motorcycles, and their repairs;
14 Wholesale trade;
15 Retail trade;
16 Transport and warehousing;
17 Food and accommodation services; and
18 Other unmentioned economic activities.

The classification *according to activity (sector)* was carried out starting from the code of core activity, as cited in the financial statement. Considering that core activity is subject to change, in different years the same company can be found in different activities. That is why the definition of the activity was carried out in such a way that, with an acceptable number of observed groups, the production and market specificities of the companies included in them were captured.

According to size, business entities were classified into standard groups, namely: micro, small, medium-sized and large enterprises, in line with the value indicators envisaged by the Accounting Law (Article 6).

According to the residency of the owner of capital, business entities were classified in the following groups, applying appropriate criteria: 1) companies in majority resident ownership (exclusively domestic capital, domestic capital over 90% and domestic capital over 50%) and 2) companies in majority non-resident ownership (exclusively foreign capital, foreign capital over 90% and foreign capital over 50%).

According to export orientation, business entities were classified in the following groups: 1) companies that mainly export (exclusively export, export over 75% and export over 50%) and 2) companies that mainly sell their products in the domestic market (domestic market exclusively, domestic market over 75% and domestic market over 50%). Due to differences in the reporting requirements for business entities, it is not possible to make a full classification according to this criterion. However, the scope of coverage is still high – unclassified companies participated in the business income of the corporate sector with 10.2% in 2013 and 8.8% in 2022. The classification of sales in the domestic and international markets was made on the basis of the data contained in the companies' income statements. Since the necessary data exist only if financial reporting is based on the principle of "full coverage", a significant number of companies are unclassified (82.8% in 2022), but their share in total income (9.1%), business assets (16.9%) and employment (17.5%) is markedly lower. Considering that in the unclassified group there are mostly micro and small enterprises, the fact that their coverage in this case is relatively small (2.8% of micro and 16.6% of small enterprises) was taken into account when drawing conclusions about their export propensity.

Financial aggregates at the level of the corporate sector and groups that were formed based on the target classification criteria were obtained according to the gross principle, that is, by adding up the corresponding items from the financial statements of individual business entities.

Indicators

The analysis includes data from the balance sheet, income statement, cash flow statement and statistical report. An analysis of the balance sheet is necessary for understanding the scope and structure of assets that the company has, as well as the sources of such assets. The income statement is a necessary source of data for understanding the dynamics and tendencies in business, the sensitivity of business to internal and external influences, as well as for assessing the profit prospects. Cash flows show the monetary impact of the activities that the company carries out during the business year, and thus the ability to generate excess cash from business activities, as well as its use. The cash flow statement provides insight into the way the company finances investments and its relationship with owners through the payment of dividends and the raising of additional capital. All the above statements are necessary to fully understand changes in the company's asset position, financial structure of sources, turnover of funds, and to assess the impact of changes in the market position on the company's profitability, liquidity and solvency.

Jorgovanka Tabaković

graduated from the Faculty of Economics in Priština, on 14 May 1981 as the student of the generation. She was elected Member of Parliament in six parliamentary convocations. From March 1998 until October 2000, she served as Minister of Economic and Ownership Transformation in the Serbian Government. Her book "Monetary Policy – No Final Victories" was published in 2018, "My Answers – a Contribution to the History of Banking in Serbia in 21st Century" in 2020, and another one "The Turning Point – Balance is the Key to Success" in 2021. She has served as Governor of the National Bank of Serbia since August 2012. In June 2018 she was re-appointed for another six-year term of office, starting from August 2018. The reputable Banker monthly declared Governor Jorgovanka Tabaković the best governor in the world and the best European governor for 2020. She is a widow and mother of three children: Ivana, Milena and Nikola.

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Saša Ranđelović
University of Belgrade
Faculty of Economics and Business
Department of Economic Policy and Development

Aleksandra Đorđević
University of Belgrade
Faculty of Economics and Business
Department of International Economic Relations

REQUIRED LEVEL OF INVESTMENT FOR FAST ECONOMIC GROWTH: STYLIZED FACTS AND POLICIES

Neophodan nivo investicija za ubrzani privredni rast – stilizovane činjenice i politike

Abstract

To close the gap in economic development relative to the EU average, Serbian economy has to achieve significantly higher growth rates in comparison to other European countries over the longer period. Theoretical and empirical literature indicates that the level of investment in physical capital is one of the key determinants of the dynamics of economic growth. In this paper, based on data on investments and savings in Serbia and in 37 countries that in the previous three decades achieved an average GDP growth rate of over 5% per year (so-called fast-growing economies – FGE), we present and analyze relevant stylized facts. In the observed period, FGE had average total investments of 25.6% of GDP, of which 69% was private and 31% public investments, whereby private investments were predominantly domestic, which is associated with a high rate of gross domestic savings (of 27.4% of GDP). On the other hand, total investments in Serbia were 9.7% of GDP lower than the FGE average, which was a consequence of significantly lower public and domestic private investments, which was, among other things, a consequence of significantly lower domestic savings (by over 20% of GDP). As in the recent period there has been a noticeable increase in public investments in Serbia, in order to accelerate economic growth, it is necessary, in addition to maintaining them at a high level, to encourage a considerable increase in domestic private investments through economic measures policy and wider reforms of the general institutional environment, with the aim of having the total level of investments of over 25% of GDP over the next few decades.

Keywords: *investments, savings, economic growth, economic policy*

Sažetak

Da bi se smanjio jaz u ekonomskom razvoju u odnosu na prosek EU, neophodno je da privreda Srbije ostvaruje znatno veće stope rasta u odnosu na druge evropske zemlje u dužem periodu. Teorijska i empirijska literatura ukazuje da je nivo ulaganja u fizički kapital jedna od ključnih determinanti dinamike privrednog rasta. U ovom radu, na osnovu podataka o investicijama i štednji u Srbiji i u 37 zemalja koje su u prethodne tri decenije ostvarile prosečnu stopu rasta BDP-a od preko 5% godišnje (tzv. brzorastuće ekonomije), predstavljene su i analizirane relevantne stilizovane činjenice. U posmatranom periodu brzorastuće ekonomije su u proseku imale ukupne investicije od 25,6% BDP-a, od čega su 69% bile privatne, a 31% javne investicije, pri čemu su privatne investicije bile pretežno domaće, što je povezano sa visokom stopom bruto domaće štednje (od 27,4% BDP). S druge strane, ukupne investicije u Srbiji bile su za 9,7% BDP niže od proseka ovih zemalja, što je posledica znatno nižih javnih i domaćih privatnih investicija, usled, između ostalog, znatno manje domaće štednje (za preko 20% BDP-a). Kako je u poslednjem periodu primetan porast javnih investicija u Srbiji, u cilju ubrzanja privrednog rasta potrebno je, pored njihovog održavanja na visokom nivou, podsticati znatno povećanje domaćih privatnih investicija, kroz mere ekonomske politike i šire reforme opšteg institucionalnog ambijenta, sa ciljem da u periodu od narednih nekoliko decenija ukupan nivo investicija bude preko 25% BDP-a.

Ključne reči: *investicije, štednja, privredni rast, ekonomska politika*

Introduction

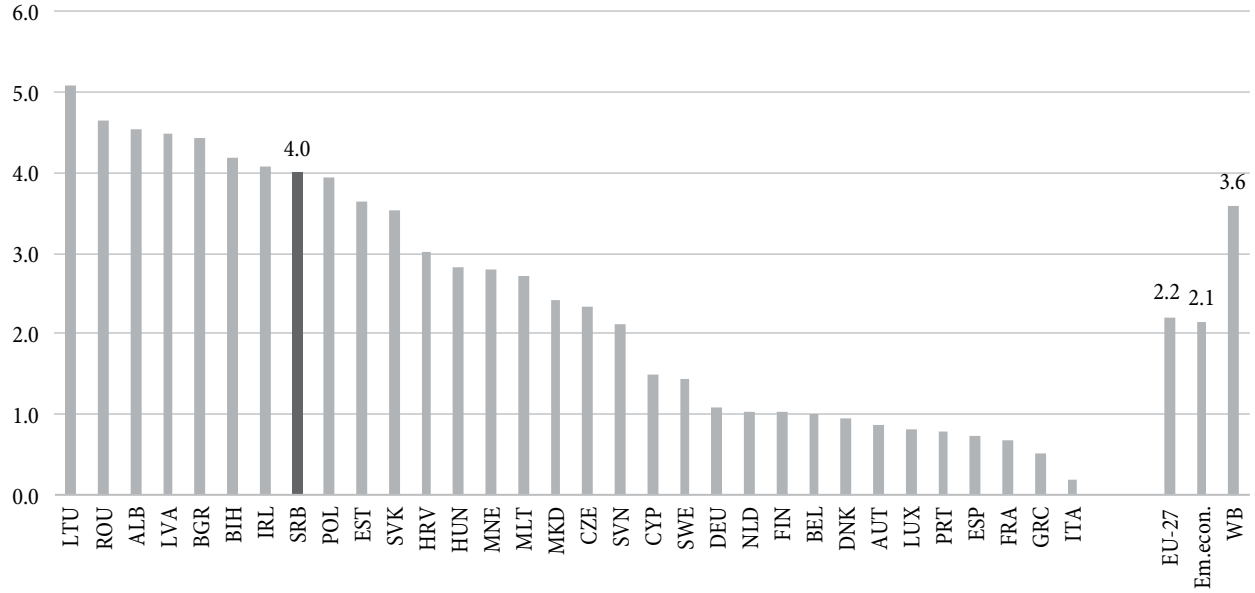
Since the beginning of the 21st century, there have been noticeable advancements in Serbia's economic performance. Based on the World Bank – World Development Indicators data [86] on GDP per capita (PPP adjusted), between 2001 and 2022 Serbia's GDP per capita increased by 119.18%, rising from 9,529 to 20,886 international dollars (constant 2017), while the EU-27 average increased by 44.05% from 33,463 to 48,203 international dollars (constant 2017). Serbia's average annual growth speed has exceeded those of the EU-27 by 1.8 percentage points for the period 2001-2022 (Figure 1), helping to bring Serbia's GDP per capita level closer to those of the EU-27. Moreover, Serbia's strong commitment to achieving higher rates of economic growth is also proven by its higher growth compared to the average of 95 emerging markets and developing economies (as per IMF definition), as well as compared to the average of the Western Balkan (WB) countries (Figure 1). From the time point of view, Serbia performed relatively well (in comparison to other countries in the Central and Eastern Europe) in two sub-periods: 2001-2008 and 2018-2021 [71].

Despite a positive convergence trend, additional efforts are needed to narrow the gap between Serbia and the EU-27. Based on the Figure 2, Serbia's GDP per capita (PPP adjusted) was 43% of the EU-27 average in 2022. Although this represents a 15-percentage-point increase from 2001, when Serbia's GDP per capita was a 28% of those of the EU-27 average, it indicates the substantial distance the country must cover to achieve full convergence.

To attain faster convergence, Serbia would need to significantly accelerate its growth rate to more than 5% per year over a longer period of time. If EU countries were to continue their economic growth at the same rate as in the past, with a GDP per capita (PPP adjusted) growth rate of 4% per year Serbia would need almost half a century to reach the EU-average level of economic development, while with the growth rate of 5% per year, the full convergence period would be reduced to 31 years. If Serbia is to post strong economic growth of 6% per year, it would take 23 years to achieve full convergence with the EU-average in terms of GDP per capita (PPP adjusted).

Economic growth is one of the most complex topics in economics, as theoretical and empirical literature suggests that more than 60 factors directly or indirectly affect the speed of economic growth. Although both theoretical and empirical models differ in their paradigmatic approach and practical specification of growth drivers, there is a broad consensus in economic literature that investments in physical capital stand for one of the most significant

Figure 1: Average GDP per capita growth rates for selected economies, 2001-2022 (%)



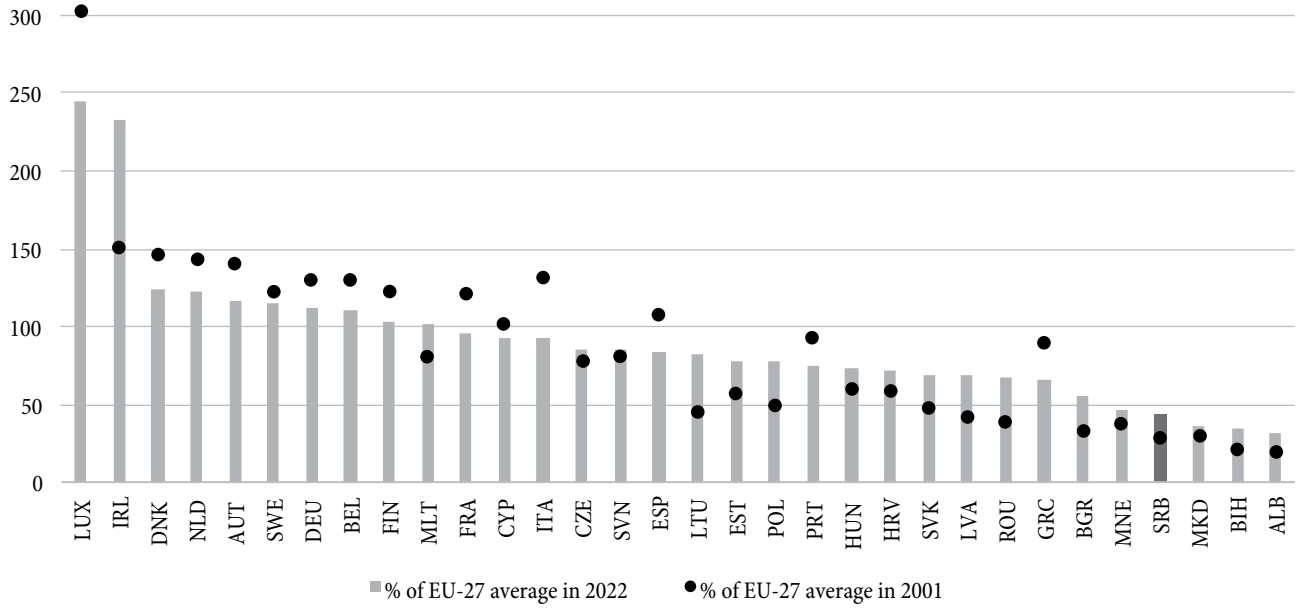
Notes: GDP per capita growth rates are calculated based on GDP per capita PPP adjusted, in constant 2017 international dollars. Em.econ. refers to Emerging markets and developing economies (as per IMF definition).
Source: Authors' calculation based on the WB – WDI database [86]

direct determinants of economic growth. To achieve fast economic growth, many conditions have to be met, some of which are under direct or indirect government control, while others, such as global economic trends, are beyond the government's control. The level of investments in fixed capital, as one of the most important drivers, is to a large extent shaped by the characteristics of government policies. However, as economic growth is influenced by many factors, the question is: What level of investments in fixed capital is required to achieve GDP growth of more than 5% per year? To provide a robust and precise answer to this question, sophisticated econometric analysis would be required. However, a broader insight into this issue can also be provided by taking into account the experience and stylized facts of the economies that posted such growth in the past.

In that respect, this paper uses the annual data from 1990 to 2019 to identify a set of countries which have posted GDP growth of more than 5% per year (FGE) in that period and to evaluate the level and structure of investments in fixed capital that have been associated with such economic performances. The results show that FGE on average had total investment in fixed capital of 25.6% of GDP, of which 69% was private and 31% public investment, whereby private investment was predominantly domestic, which was associated with a high rate of gross domestic savings (of 27.4% of GDP). The results of statistical tests (one-side Wilcoxon rank test) show that the median total investments (as a % GDP) in FGE were significantly higher than in Serbia, with both public investments and median private investments in FGE being higher than the respective median volumes in Serbia. The results also show that the median gross domestic savings in FGE were significantly higher than the respective median values in Serbia. These findings suggest that the policy strategy aimed at accelerating economic growth in Serbia in the long run should focus on increasing the overall level of investments, by keeping public investments at a high level and fostering the rise in domestic private investments. To achieve that, government policies oriented towards ensuring macroeconomic stability and strengthening the quality of formal and informal institutions are of crucial importance.

The remainder of the paper is structured as follows. Section 2 outlines the theoretical frameworks and the review of empirical literature on the domestic savings-investment-growth nexus. Stylized facts on savings and investments in FGE are presented and analyzed in Section 3, while the Section 4 is dealing with the identification of the gap between Serbia and FGE in terms of the size and structure of investments and domestic savings. Section 5 provides a conclusion with the discussion of policy aspects and implications of this topic.

Figure 2: GDP per capita, PPP (constant 2017 international dollars) as a % of EU-27 average



Source: Authors' calculation based on the WB – WDI database [86]

Theoretical framework and literature review

Identifying the key drivers of economic growth and understanding the mechanisms through which these factors exert their influence are one of the crucial topics in economics. Consequently, various theoretical models were developed which were later tested in many empirical studies.

Among the various economic growth theories, those emphasizing the significance of investments in driving economic growth stand out. According to the classical growth theory, originated from the seminal research of Adam Smith and David Ricardo, the key factors affecting economic growth are capital accumulation and productive investments, which were predominantly achieved through the reinvestments of profits resulting from specialization, division of labor, and comparative advantages [25, pp. 1-2]. Improvements to the classical theory of growth led to the development of other theories, such as the Harrod-Domar economic growth model, grounded in the Keynesian perspective [19], [26]. The model highlights the significance of investments in influencing economic growth through two channels. Firstly, investments generate income, referred to as the "demand effect". Secondly, investments contribute to gross domestic capital formation, influencing the economy's production capacity and output growth, known as the "supply effect" of investments. The impact of investments on economic growth through these channels is influenced by national savings and investments productivity, with domestic savings and the capital-output ratio emerging as crucial determinants in the Harrod-Domar model. Expanding upon the unrealistic assumptions of the Harrod-Domar model that only capital contributes to growth (given sufficient labor to utilize all available capital) and that capital-output ratios are fixed, Solow [78] and Swan [79] introduced the neoclassical theory of economic growth. The Solow-Swan model of long-run economic growth acknowledges three driving forces of economic growth. These are the accumulation of capital, labor or population growth, and technological progress. Under this framework, economic growth relies not just on the amount of accumulated capital but also on how that capital is utilized, with technological progress playing a central role in enhancing the productivity of labor. The model highlights the crucial role of savings in determining capital intensity, positing that a higher savings rate results in a greater capital stock (i.e., rise in investments) and, consequently, higher production levels. The aforementioned theories belong to the group of exogenous growth theories, where external factors determine economic growth. Over time, it was established that economic growth can be driven by endogenous factors, giving rise to the endogenous growth theory. This theory, developed by Romer [73] and Lucas [50], posits that investments in human capital, innovation, and knowledge significantly influence economic growth. The positive externalities and spillover effects generated by a knowledge-based economy are important for fostering economic development, supporting the role of physical capital in the growth process.

Investment-led growth theories have stimulated empirical research trying to examine the link between investments and economic growth. A considerable body of empirical studies supports the positive relationship between investments and economic growth, as suggested by theoretical models. In their empirical study, [62] proved the positive impact of investments in fixed assets, i.e., in gross fixed capital formation (GFCF), on economic growth of Bangladesh, India, Nepal, Pakistan and Sri Lanka in the period 1971-2006. The results showed that a 1% increase in capital raises GDP per capita by 0.61%. Similar results were obtained by [70] who conducted research on the same sample of countries but for the period from 1990 to 2014. According to their results, a 1% increase in GFCF leads to an increase in economic growth by 0.58%. Exploiting the data for India from 1970 to 2012, [9] showed that capital formation has a positive effect on economic growth in the long run, with an elasticity coefficient of 0.38. The long-run relationship between GFCF and GDP was also confirmed by [57], who examined the data for Uruguay from 1988 to 2011 and showed that the increase of one percentage point in GFCF leads to an increase in GDP by 0.128%. The positive impact of GFCF on economic growth has also been proven by numerous other authors in recent literature [37], [45], [65], [68], [82], [87], confirming that investments activities are an important tool to boost the economy.

Theoretical and empirical literature dealing with investment-led growth often emphasizes the importance of investments in physical capital. According to [72, p. 481], "physical investment is generally the most robust correlate of long-run growth", while the positive impact of physical capital on economic growth has been proven in many empirical studies [18], [47], [55], [69]. This approach to core determinants of economic growth is based on the Solow [78] growth model where growth is driven by physical capital accumulation since it leads to an increase in national production capacity. In the same line, capital accumulation is considered a proximate source of economic growth [72, p. 481]. According to the proximate approach to economic growth, variations in growth rates among countries are attributed to differences in the accumulation of resources (physical capital, human capital, and labor) and differences in the growth of productivity. These factors are commonly referred to as proximate drivers of growth [27], [28]. Empirical research has found mixed results about their impact on economic growth. Some studies suggest that economic growth is driven by increases in total factor productivity [21], [29], [41], while others showed that accumulation of physical capital serves as the principal driver of growth [23], [66], [83]. A significant contribution to this line of research was made by [42, p. 4], who examined the proximate factors driving growth accelerations and determined which factors sustain these accelerations. Their analysis, covering 156 growth accelerations identified in 158 countries between 1950 and 2019, gave special importance to the significance of physical capital. The results indicated that although improvements in total factor productivity are the primary drivers of growth accelerations, the accumulation of physical capital plays a crucial role in sustaining these accelerations.

Building upon the previous review of both theoretical and empirical literature, it is undeniable that there is a crucial link between investments and economic growth. However, the influence of capital accumulation on economic growth depends on the factors determining the accumulation of capital and their intensity [82, p. 2]. Although the literature dealing with the identification of factors that shape the overall level of investments in a country is very scarce (e.g., [74]), combining research that explores the determinants of various types of investments (public and private, domestic, and foreign) leads to a large number of factors that affect the overall level of investments in the country. Some of the most frequently identified factors in the theoretical and empirical literature belong to the group of macroeconomic drivers. Thus, lower interest rates generally encourage investments by reducing the cost of borrowing [38], [51], [59]. In the same line, a stable or low inflation rate creates a favorable environment for long-term investments [2], [17], [30], [54], [60]. Economic growth also belongs to the group of macroeconomic factors that influence investments, given the two-sided causality between investments and economic growth. A considerable body of literature deals with examining the causality of this relationship, showing that investments not only affect economic growth but also that economic growth stimulates further investments [10], [53], [67], [82].

In addition to macroeconomic, investments are influenced by political and institutional factors, such as political stability, government policies and legal framework, among others. Stable political environment and prominent development of political institutions have a stimulating effect on investments by providing lower risks for investors [40], [76], [85]. Investors are sensitive to government policies related to taxation, trade, and business regulations. So, a transparent and predictable policy environment is likely to attract more investments [44]. A robust legal system that protects property rights and enforces contracts enhances investor confidence, fostering higher levels of investments [11]. These political and institutional factors are particularly important for foreign direct investments, but they are also very important when it comes to domestic private investments. In the same line, political as well as economic instability can significantly impact investments decisions by creating considerable uncertainty regarding the determinants that are key in the investment decisions [74, p. 22]. Related to that, exchange rate stability is considered an important determinant of investments, bearing in mind that a stable exchange rate reduces uncertainty for international investors [15].

Financial variables are also regarded as important drivers of investments. A well-developed and well-performing

financial market indicates economic health and attracts both domestic and foreign investors. Within this group of factors, in addition to the already highlighted role of the price of capital (interest rate), availability of capital has a very important impact on investments levels [74, p. 23].

Besides the previous determinants that are commonly emphasized in the literature, investments are also influenced by infrastructure and technological development [14], [48], social factors like labor force, its education and skills, as well as demographic trends [63], international trade determinants like trade openness [35], [74], etc.

Although all the aforementioned factors determine investments to a greater or lesser extent, the variable that stands out in both theoretical and empirical literature as particularly important is savings. As previously stated, both Harrod-Domar and Solow-Swan model point to the key role of savings in investments activity. According to [52, pp. 200-201], a high savings rate leads to a substantial capital stock and elevates output in the steady state of the economy, while a low savings rate results in a diminished capital stock and reduced output. In the same line, [72 p. 481] states that "investments have to be financed by saving" emphasizing "the critical importance of domestic saving in economic growth", while according to [81, p. 140] accumulation of capital, as one of the three components of economic growth (along with growth in population and technological progress), arises when the current income is not entirely spent, but rather a portion of it is saved and invested to augment future output and income. The positive relationship between savings and investments has been confirmed in a considerable body of empirical research [33], [61], [77], [80].

Bearing in mind the evident importance of savings for investments and economic growth, it becomes crucial to explore the determinants of savings within a country. Both theoretical and empirical literature has identified numerous factors that can influence savings. Some of the most important are interest and inflation rate, dependency ratio, income, and government saving. The theory suggests that determining the impact of a change in the real interest rate on savings is not straightforward, due to the interplay of two opposing effects – the income effect and the substitution effect. An increase in the interest rate tends to boost future income and household wealth, encouraging higher current consumption and, hence, a reduction in savings. Conversely, a higher interest rate implies that postponing current consumption will yield greater future consumption, thereby leading to an increase in savings. Therefore, the overall effect of an increase in the interest rate on the savings rate is uncertain [8]. Given this complexity, it is not surprising that empirical research yields mixed results. While some studies demonstrate a positive correlation between interest rates and savings [1], [3], [6], [12], others indicate a negative impact [75].

Savings rates may also be influenced by inflation rate changes, but the impact remains unclear. On the one hand, a rise in the inflation rate diminishes the real value of the wealth of households, leading to uncertainty regarding the future values of assets and real incomes, resulting in increased savings. Conversely, a higher inflation rate is linked to greater uncertainty about the rate of return, potentially exerting a negative impact on savings. Empirical studies confirm the unpredictability of the inflation effect. For example, [16] and [75] found a negative effect of inflation on savings, while [6] and [12] reported a positive impact, supporting the notion that increased economic uncertainty stimulates individuals to increase savings.

One of the crucial factors influencing savings, particularly in countries that are less developed, is the dependency ratio reflecting the structure of the population. The higher dependency ratio results in lower disposable income as a result of high expenditure level, leading to reduced savings, and conversely. The negative effect of an increase in the dependency ratio on the savings rate has been proven in empirical research [24], [39], [46].

In the theoretical model of consumption, one of the primary factors influencing savings is the value of wealth or budget constraint. Under this framework, consumption in a specific period relies on anticipated future income. Thus, income as well as its growth plays a crucial role in shaping consumption patterns and, consequently, savings. Empirical research has confirmed a positive correlation between income and the magnitude of savings [6], [20], [24].

Public saving is another determinant that can significantly influence national savings. The neoclassical

interpretation of the life-cycle model suggests that reducing government savings is likely to boost consumption while discouraging overall savings. This occurs by shifting the tax burden to future generations, resulting in a decline in national savings. In contrast, the Ricardian theory argues that an increase in government savings would not affect national savings. This is because any such increase would be offset by a proportional reduction in private savings [4]. Empirical results are also ambiguous [6], [13], [24], [49].

In addition to the mentioned factors, the level of savings in the country can also be influenced by other factors such as the development of the financial market, terms of trade, political (in)stability, productivity growth, etc. [3], [4], [7], [16], [24], [36], [43].

Considering the previously discussed importance of investments for economic growth, analysis of the level of investments and their structure is crucial for giving policy recommendations related to achieving higher rates of economic growth.

Investments and growth nexus: Stylized facts from fast-growing economies and Serbia

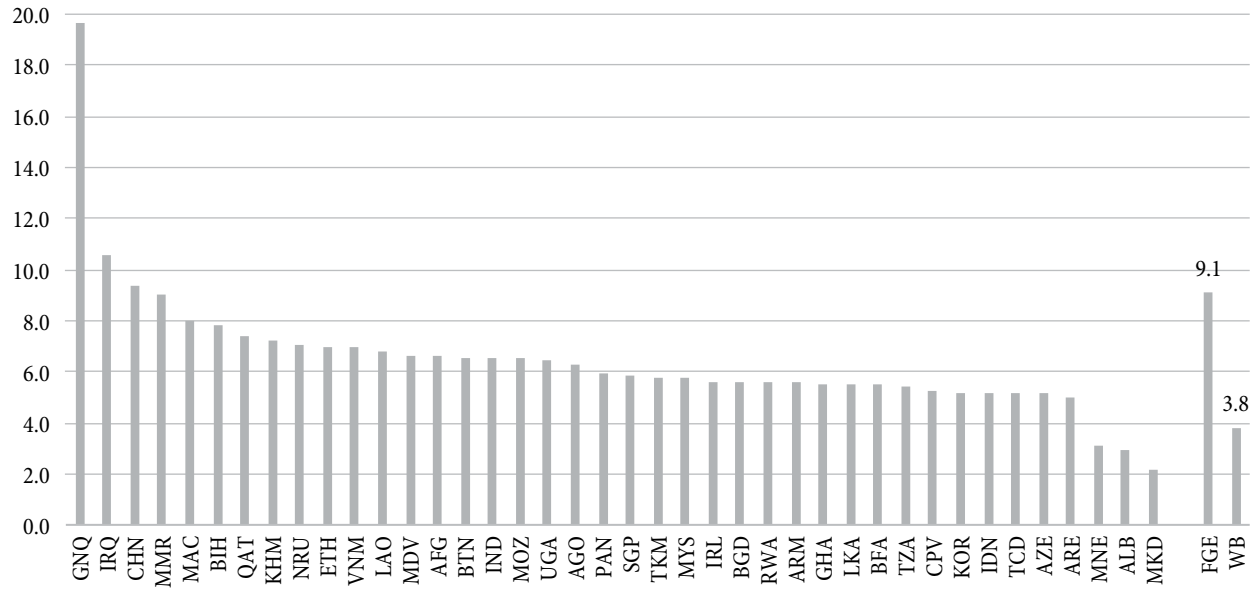
Investments and economic growth

Analyzing the level and structure of investments for countries that have achieved high rates of economic growth in the previous period yields valuable insights for formulating policy recommendations aimed at fostering economic growth in Serbia and expediting the convergence process with the EU-27.

In order to identify fast-growing economies, we looked at the average GDP growth rate achieved in the period from 1990 to 2019 (the period 2020-2022 was excluded due to the global pandemic's impact). Subsequently, we selected countries exhibiting an average GDP growth rate exceeding 5% during this period. Thirty-seven countries met this criterion[1], constituting the sample of fast-growing economies (FGE) for this research. In the observed period, FGEs posted average GDP growth rate of 9.1%, while without the data on Equatorial Guinea, which can be seen as an outlier, the average GDP growth rate in FGEs was 6%. Figure 3 delineates their average GDP growth rates, including the data for the Western Balkans (WB) countries, both at the individual country level and the average for the WB region – except for Serbia, for which comparable data on 1990-1995 are not available. However, even if the period for Serbia is shortened to 2000-2019, which does not include a deep economic downturn in the 1990s, the

1 These countries are: Afghanistan, Angola, Armenia, Azerbaijan, Bangladesh, Bhutan, Bosnia and Herzegovina, Burkina Faso, Cabo Verde, Cambodia, Chad, China People's Republic of, Equatorial Guinea, Ethiopia, Ghana, India, Indonesia, Iraq, Ireland, Korea Republic of, Lao P.D.R., Macao SAR, Malaysia, Maldives, Mozambique, Myanmar, Nauru, Panama, Qatar, Rwanda, Singapore, Sri Lanka, Tanzania, Turkmenistan, Uganda, United Arab Emirates, Vietnam.

Figure 3: Average GDP growth rates for selected countries, 1990-2019 (%)



Source: Authors' calculation based on the IMF – WEO database [31]

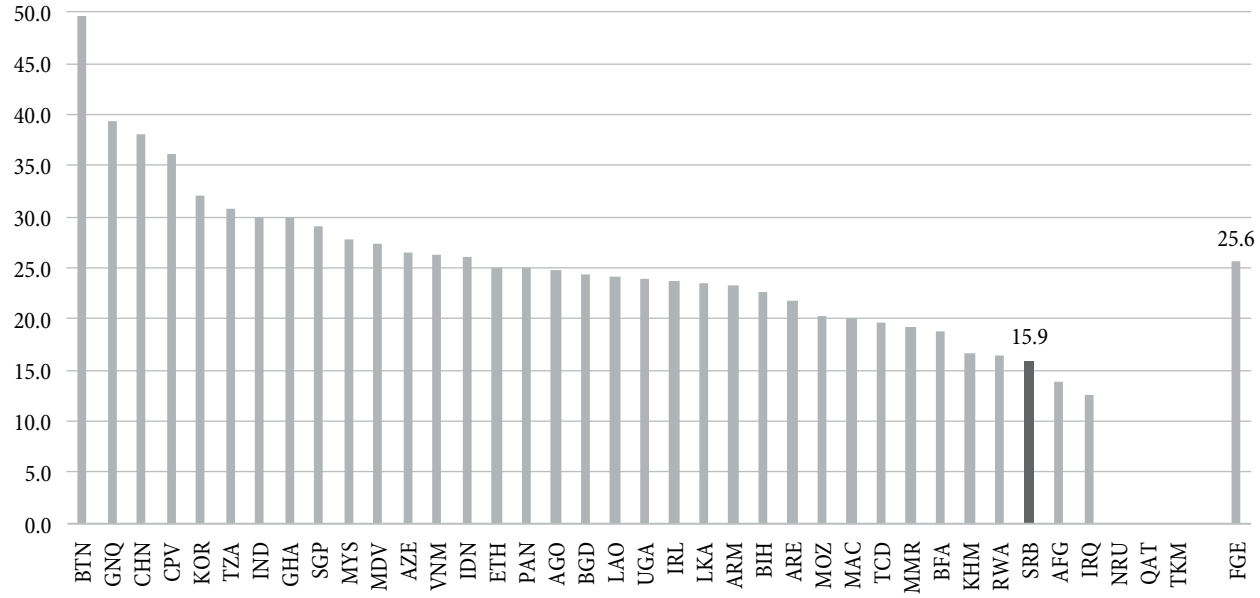
average GDP growth rate was close to 3.6% per year, which is close to the WB average, but still substantially below the FGE average. It should be noted that even if the time span is reduced to 1995-2019 or 2000-2019, no country from Central and Eastern Europe or WB passes the sample threshold of GDP growth rate of more than 5%.

According to the data (Figure 3 and Figure 4), the speed of economic growth in FGE is positively correlated with the total investments. Data on the average level of investments in FGE in the period 1990-2019 (Figure 4) indicate that FGE had total investments of around 25.6% of GDP. Six FGE countries (including China) had total investments of more than 30% of GDP over the observed period. The average rate of total investments remains pretty stable even if the time span is shortened to 1995-2019 or 2000-2019.

Public *versus* private investments

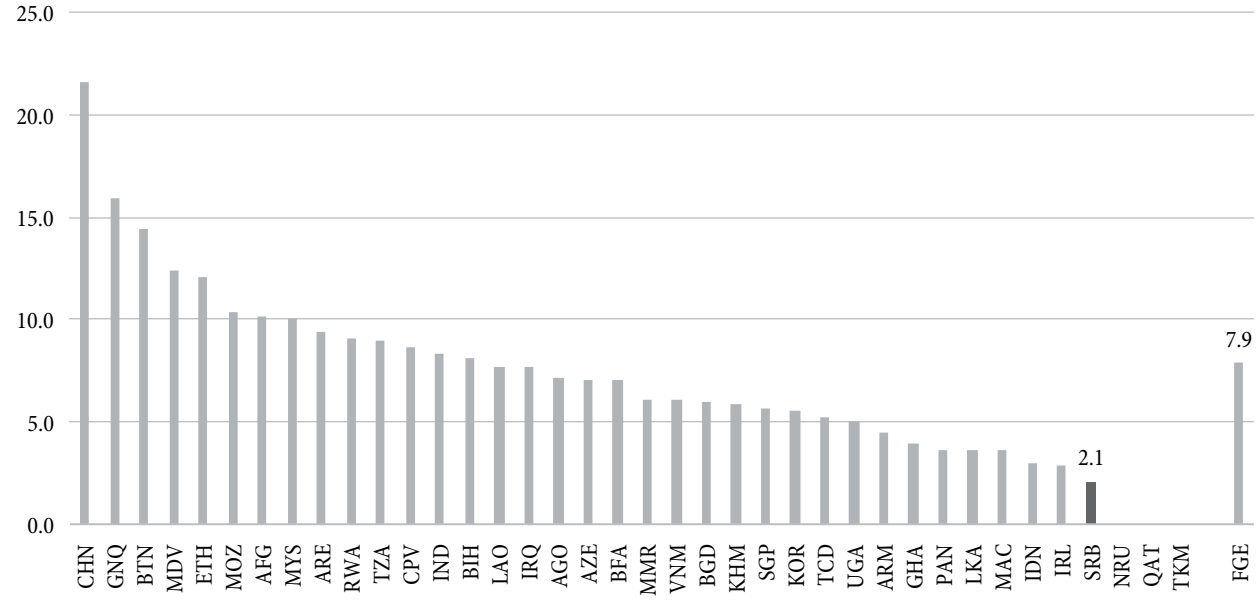
Having in mind that both public and private sectors undertake investments activities, an analysis of the average level of

Figure 4: Average level of investments (% GDP) for selected countries, 1990-2019



Note: Data for NRU, QAT and TKM are not available.
Source: Authors' calculation based on the IMF Investments and Capital Stock Dataset [32]

Figure 5: Average level of public investments (% GDP) for selected countries, 1990-2019



Note: Data for NRU, QAT and TKM are not available.
Source: Authors' calculation based on the IMF Investments and Capital Stock Dataset [32]

public and private investments (as a % of GDP) provides additional valuable insights. These data are presented in Figure 5 and Figure 6 and indicate that in FGE most of the investments in physical capital come from the private sector (around 70% of the total investments, i.e. on average close to 8% of GDP), while the contribution of public investments to overall fixed capital formation is smaller (30% of total investments, i.e. 17.7% of GDP), albeit still considerable. This finding is consistent with the research of [64]. These authors proposed a new interpretation of the term 'investment' [64, p. 1332] and developed a new methodology that they applied to the data on public and private investments in 28 EU countries. Their results suggested that "the private sector mostly invests in fixed capital, whereas the public sector mostly invests in human capital" [64, p. 1330].

Structure of private investments: Domestic *versus* foreign capital formation

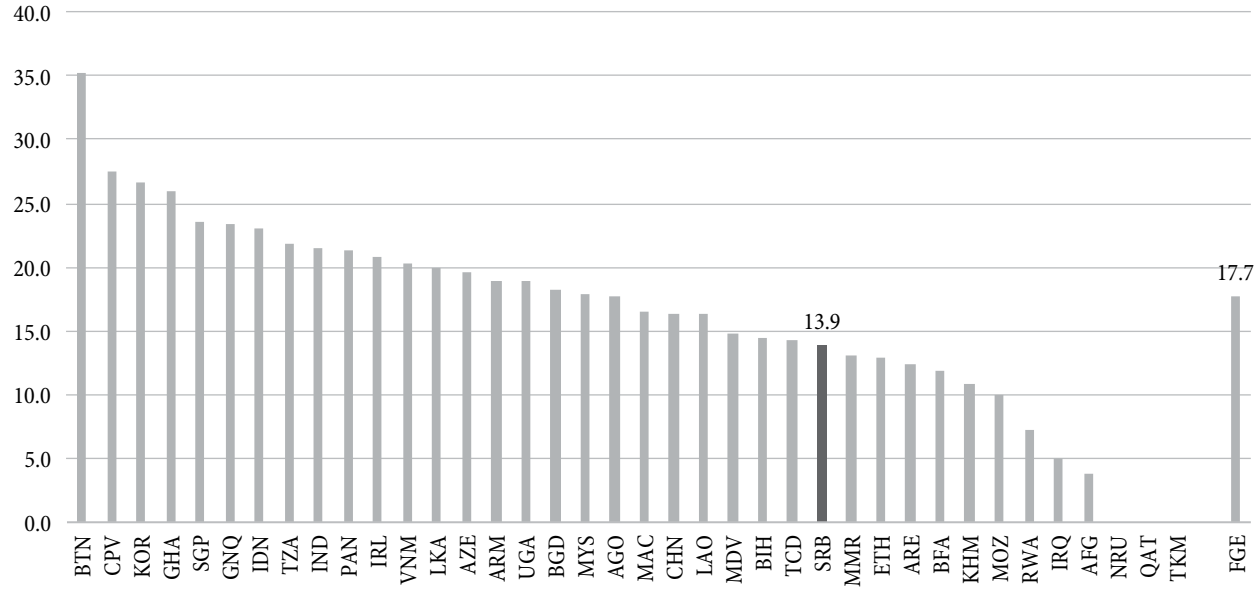
Additional valuable conclusions can be reached by analyzing the role of domestic and foreign investments in posting high total investment. However, it is challenging to separate foreign capital formation from domestic capital formation. The option of subtracting foreign direct investments (FDI) and public investments from gross fixed capital formation (GFCF) and considering the residual as an approximation for domestic private investments has several drawbacks. First, FDI data does not precisely reflect the foreign component of GFCF, since mergers and acquisitions are not part of GFCG, while they can represent a large share of FDI. The problem can also occur in the case of joint ventures [22], [34], [58]. Second, GFCF and FDI are hardly comparable since they are measured according to the different accounting rules. Third, FDI flows registered in the balance of payment do not directly match to any measure of real investments [5].

To assess the role of foreign capital in financing investments and stimulating economic growth, one can examine the data on the proportion of FDI in relation to GFCF, as reported by UNCTAD (Figure 7). The data presented in Figure 7 show that FGE have been relying more heavily on domestic investments in financing their growth. In the sample period in FGE, FDI accounted for 16.6% of the overall investments, which means that the major share of investments in those countries (83.4%) has been funded by means of domestic investments. Three quarters of FGEs had an FDI-to-GFCG ratio of less than 20% during the period of strong economic growth.

Domestic savings and investments

Having in mind that domestic savings constitute a significant source of financing domestic investments, as

Figure 6: Average level of private investments (% GDP) for selected countries, 1990-2019



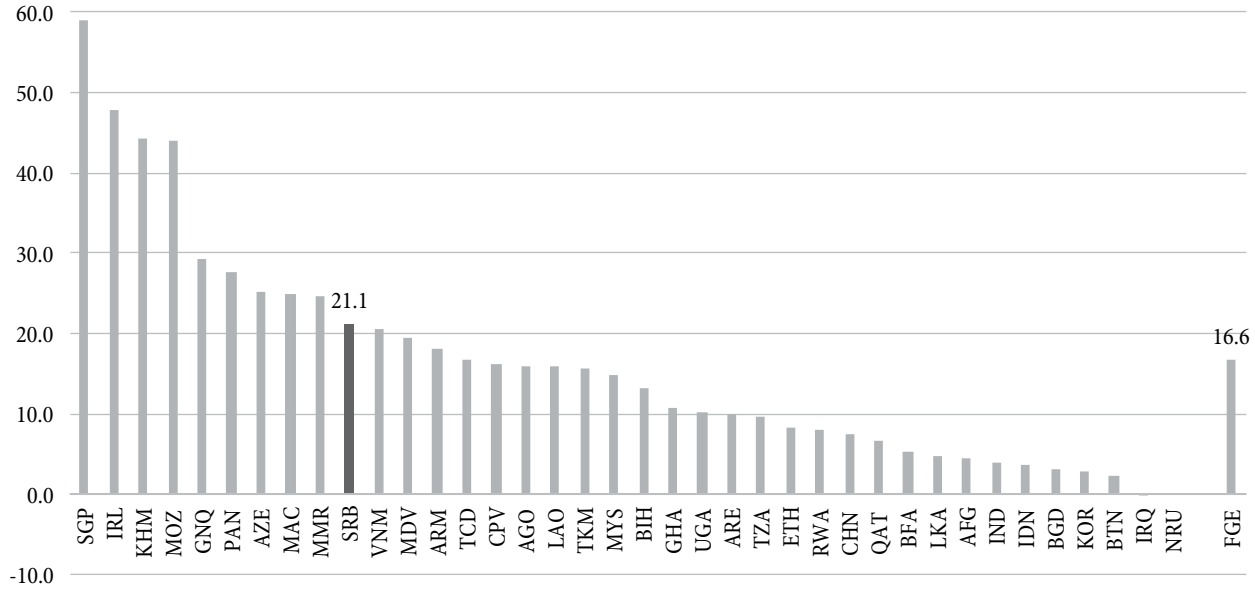
Note: Data for NRU, QAT and TKM are not available.
Source: Authors' calculation based on the IMF Investments and Capital Stock Dataset [32]

discussed in Section 2 of this paper, it is useful to analyze the average level of gross domestic savings (expressed as a % of GDP). The data presented in Figure 8 show that FGE countries had high gross domestic savings, with the average of 27.4% of GDP over the observed period, while close to 40% of FGE countries had domestic savings of more than 30% of GDP. The data (Figure 9) also indicate a solid positive correlation (0.31) between gross domestic savings and total investments.

Investments and savings in Serbia versus fast-growing economies: Gap analysis

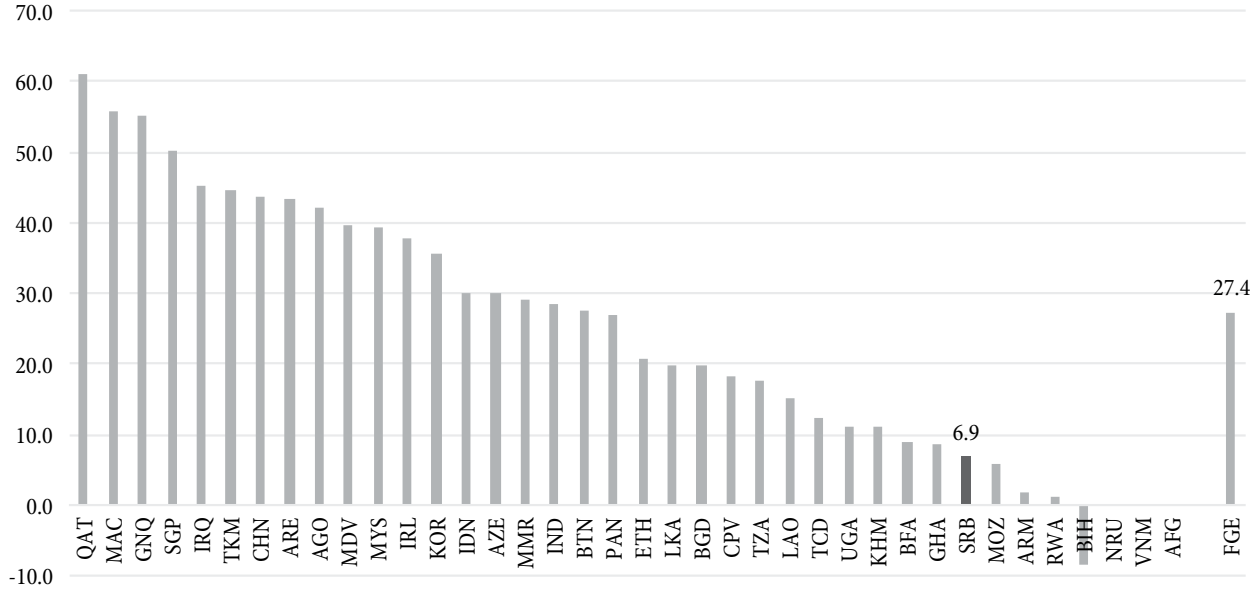
The total investments in Serbia over the sample period amounted to 15.9% of GDP on average, which was substantially (by 9.7% of GDP) below the FGE average. The overall investment gap was pronounced due to lower levels of both private investments (by 3.8% of GDP) and public investments (by 5.8% of GDP). In addition to the

Figure 7: FDI inflows as a ratio to GFCF, average for the period 1990-2019 (%)



Note: Data for NRU are not available.
Source: Authors' calculation based on the UNCTAD Stat database [84]

Figure 8: Average gross domestic savings (% GDP) for selected countries, 1990-2019



Note: Data for NRU, VNM and AFG are not available.
Source: Authors' calculation based on the WB – WDI database [86]

difference in volume, the structure of investments in Serbia differed from the structure in FGE. While in FGE public investments accounted for 31% of total investment, in Serbia they accounted for less than 14% of total investment. In addition to that, the structure of private investment in Serbia was different from the respective structure in FGE. The data indicate that in the observed period, FDI-to-GFCF ratio in Serbia stood on average at 21.1%, while in FGE the respective share was 16.6%, which means that Serbia was more prone to rely on FDI in financing investments than it was the case with FGE. Since domestic investments are to a large extent conditional on domestic savings [33], [61], [77], [80], relatively lower share of investments financed from domestic sources in Serbia can be explained by its relatively low savings rate. With the overall gross savings rate of 6.9% of GDP, Serbia underperformed substantially (by 20.5% of GDP) in comparison to FGE, with respect to gross domestic savings.

In order to examine whether the differences in relevant investments and savings variables in Serbia compared to FGE are statistically significant, we conducted an additional statistical analysis. For these purposes, the one-sample Wilcoxon signed rank test was implemented, which represents a non-parametric alternative to a one-sample t-test in situations where the data cannot be assumed to follow a normal distribution. The results of the Shapiro-Wilk test of normality, presented in Table 1, justify the application of the one-sample Wilcoxon signed rank test.

Table 1: Shapiro-Wilk test of normality

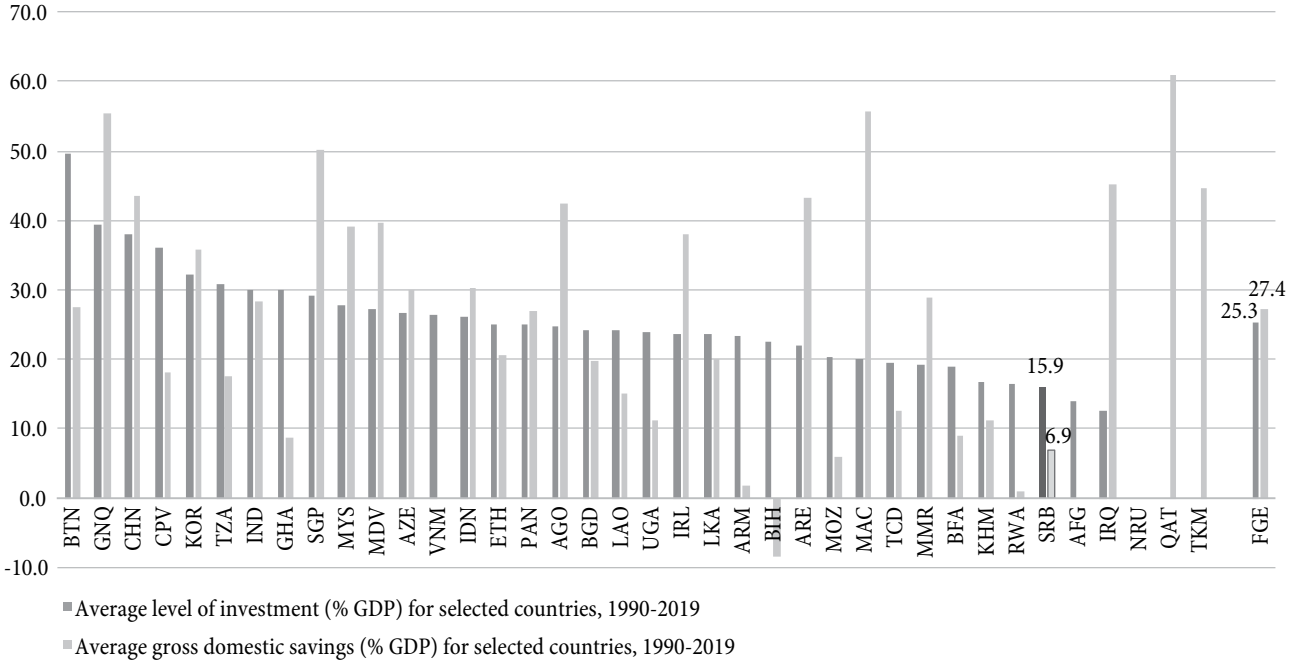
	Statistic	df	Sig.
Total investments (%GDP)	.968	821	<.001
Public investments (%GDP)	.861	821	<.001
Private investments (%GDP)	.978	821	<.001
FDI/GFCF	.726	821	<.001
Gross domestic savings (%GDP)	.997	821	.183

Source: Authors' calculation

One-sample Wilcoxon signed rank test enables to determine whether the median of the sample is equivalent to a specified standard value. In the context of our research, this test statistic enables us to determine whether the median of the sample of FGE and the median for Serbia are equal. The test results are presented in Table 2.

The results of the one-sample Wilcoxon signed rank test suggest that the median total investments (as a % GDP) in FGE was significantly higher than the median in Serbia, with both median public investments and median private investments in FGE being higher than the respective median volumes in Serbia. Consistently, the one-sample Wilcoxon signed rank test indicated that the median FDI/

Figure 9: Average level of investments and gross domestic savings (% GDP) for selected countries, 1990-2019



Note: Data for investments are not available for NRU, QAT and TKM, while data for savings are not available for NRU, VNM and AFG.
Source: Authors' calculation based on the IMF Investments and Capital Stock Dataset [32] and WB – WDI database [86]

GFCF in FGE was significantly lower, while the median gross domestic savings was significantly higher than the respective median values in Serbia.

Concluding remarks and policy considerations

Investments in fixed capital stand for one of the critical determinants of economic growth dynamics. This paper has investigated the size and structure of investments and domestic savings in the set of 37 FGEs and estimated the respective gaps in comparison to Serbia. The 1990-2019 annual data show that FGE on average had overall investments in fixed capital formation of more than 25% GDP, with the pronounced share of both public investments (31% of total volume) and private investments (69% of total volume). Private investments in those economies were mostly financed from domestic sources, as the FDI-to-investments ratio was relatively low. In comparison to FGE, in the same period Serbia had substantially lower volume of investments, the gap being particularly pronounced in terms of public investment and domestic private investments, which was connected to much lower gross domestic savings.

Stylized facts and lessons from the set of FGE imply that to foster economic growth to higher growth rates (of more than 5% per year) in Serbia, a significant rise in the overall level of investments is required. In the last few years, public investments in Serbia increased substantially, from below 4% to more than 6% of GDP. A rise in public investments significantly contributes to an increase in the overall level of investments, both directly and indirectly, as empirical literature suggests that in emerging Europe, public investments tend to crowd-in private investments [56]. However, for public investments to generate their full potential, in terms of fostering private capital formation and economic growth, a rigorous selection of investment projects based on objective economic criteria and their efficient implementation are needed. With respect to private investments, Serbia performed well in comparison to other emerging European countries, in the sense of inflow of FDI and financing of investments from foreign sources. However, with a global rise in interest rates and geopolitical tensions, the dynamics of investments from foreign sources in the future will be linked to considerable level of uncertainty. Taking into account these circumstances and the stylized facts on FGE, it is concluded that for a significant and sustained rise in private investments, a robust increase in domestic savings and domestic private investments is required. In that respect, the focus of the government should be on policies that would reduce economic and other risks associated with directing FDI in Serbia, as well as on policies that would promote domestic saving and investments. In that sense, in addition to ensuring macroeconomic stability, further improvement in the legal and institutional framework is necessary, with the focus on providing a level playing field (e.g., by tackling the shadow economy and corruption), ensuring the effective rule of law, enhancing the efficiency of public administration, and improving the quality of education. In addition to that, fiscal (tax and public expenditure) policy that would discourage consumption and promote savings can also provide a valuable contribution.

The results presented in this paper provide tentative indication of the savings-investment-growth nexus in the set of countries which have experienced solid economic growth over the past three decades. However, since economic growth is a multidimensional and complex issue, to provide more precise and robust results on the thresholds and structure of investments and savings that would lead to accelerated economic growth, it would be

Table 2: One-sample Wilcoxon signed rank test summary

	Total investments (%GDP)	Public investments (%GDP)	Private investments (%GDP)	FDI/GFCF	Gross domestic savings (%GDP)
Total N	1017	1017	1017	1055	879
Test Statistic	468686.000	510316.000	356882.000	126805.500	364704.000
Standard Error	9369.382	9369.382	9369.382	9899.120	7529.447
Standardized Test Statistic	22.398	26.842	10.466	-15.326	22.754
Asymptotic Sig. (2-sided test)	<.001	<.001	<.001	<.001	<.001

Source: Authors' calculation

necessary to control for the impact of many other factors on that nexus, by applying relevant econometric techniques, which opens the floor for further research on this topic.

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Saša Ranđelović

holds the position of a full professor at the University of Belgrade's Faculty of Economics and Business, where he also serves as the Vice Dean for Finance and International Relations. He was conferred his PhD degree in economics in 2012 by the University of Belgrade. He was also garnered with the award for the best doctoral dissertation in the field of economics in Serbia for the academic years 2011-2012, bestowed by the Scientific Association of Economists of Serbia. Professor Ranđelović is the author of three books and has an extensive portfolio of articles published in various esteemed international journals, in addition to contributing chapters to both international and domestic scholarly monographs. His research expertise encompasses a broad range of topics within economic policy, including fiscal policy, taxation, inequality, and the shadow economy. Professor Ranđelović's academic influence extends beyond his primary institutional affiliations through his active participation in numerous high-profile domestic and international research and policy projects, notably including those under Horizon2020, Instrument for Pre-Accession Assistance (IPA), World Bank, GIZ, and USAID, among others. He is member of the International Fiscal Association and a Visiting Fellow at the European Institute of the London School of Economics and Political Science.

Aleksandra Đorđević

is an assistant professor of International economics, International finance and International economic relations of Serbia at the University of Belgrade – Faculty of Economics and Business. She obtained her PhD degree in 2021 at the same faculty, earning the award of the Chamber of Commerce and Industry of Serbia for the best doctoral dissertations in Serbia in 2021-2022. Aleksandra published a significant number of scientific papers, presented her research at many international scientific conferences, and participated in several domestic and international projects. She holds several certificates in the field of international economic relations awarded by UNCTAD, WTO, etc. Based on a scholarship from the U.S. State Department, Aleksandra developed her professional skills in the USA as one of the participants of a highly competitive six-week program "Study of the U.S. Institutes for Scholars – U.S. Economics and Business" held in Boston, New York, and Washington in the summer of 2022. Her research expertise encompasses a broad range of topics within international economics, international finance, foreign direct investments, exchange rates.

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Dragan Lončar
University of Belgrade
Faculty of Economics and Business
Department of Business Economics and Management

POTENTIAL FOR SUSTAINABLE INVESTMENTS IN SERBIA: SDG INVESTMENT MAP

Potencijal održivog investiranja u Srbiji – SDG investiciona mapa

Abstract

The Serbia SDG Investor map is created using an established SDG Investor Map Methodology 2.0 – a comprehensive step-by-step UNDP methodology that combines secondary data research with desk analysis, interviews, and discussions with public and private sector stakeholders to verify findings and contribute new insights. The data are analyzed to distill Investment Opportunity Areas (IOAs) and data-backed business models. The findings on the SDG Investor Maps are uploaded to the SDG Investor Platform, allowing the investors to use extensive functionality to search for market intelligence on Serbia's SDG-aligned investment opportunities by filtering on several criteria of particular interest, including sectors, regions, SDGs as well as return profiles, market size and timeframes of investments. Serbia's proposed SDG investment portfolio consists of thirteen Investment Opportunity Areas, which came out as a result of the process of prioritization of the country's sustainable development needs, the existence of supporting country and sectoral policies, and the identification of appropriate business models for investment development. The total IOA pipeline is estimated at more than $8.3 billion in the next five years.

Keywords: *sustainable investments, sustainable development goals (SDGs), investment opportunity areas (IOAs), Serbia*

Sažetak

SDG investiciona mapa u Srbiji kreirana je primenom uspostavljene SDG investicione metodologije 2.0 – sveobuhvatne „korak po korak" UNDP metodologije. Ova sveobuhvatna metodologija kombinuje istraživanje sekundarnih podataka sa analizom izveštaja, planskih dokumenata, intervjuima i diskusijama sa relevantnim zainteresovanim stejkholderima iz javnog i privatnog sektora kako bi se proverila postojeća saznanja i doprinelo novim saznanjima. Podaci se analiziraju kako bi se izdvojila područja investicionih mogućnosti (IOA) i poslovni modeli podržani prethodno prikupljenim podacima. Identifikovana polja investicionih mogućnosti su dostupna na SDG investicionoj platformi, omogućavajući korisnicima da koriste obimne funkcionalnosti za pretragu tržišnih informacija o investicionim prilikama u Srbiji, usklađenim sa SDG. Filtriranje se može vršiti po nekoliko kriterijuma od opšteg interesa, uključujući sektore, regione, kao i profil prinosa, veličinu tržišta i vremenski okvir investicija. Predloženi održivi investicioni portfolio Srbije obuhvata trinaest područja investicionih mogućnosti, koja su proizašla iz procesa prioritizacije održivih razvojnih potreba zemlje, postojanja podržavajućih politika i strategija zemlje i sektora, kao i identifikacije odgovarajućih poslovnih modela za razvoj investicija. Ukupni procenjeni potencijal portfolija IOA iznosi više od 8,3 milijarde dolara.

Ključne reči: *održive investicije, ciljevi održivog razvoja, polja investicionih mogućnosti, Srbija*

Introduction

UN Agenda 2030 defines 17 interconnected global Sustainable Development Goals (SDGs) that address humanist significant challenges today. In Serbia, the Agenda 2030 was adopted in 2016, connected to the country's development strategies and policies, and implemented with the support of the Government, the UNDP, and about 20 agencies, funds, and programs.

The 17 SDGs mandate global, regional, and national entities, including governments and companies, to actively implement solutions for pressing global issues. Companies bear a significant responsibility and must integrate these goals into national economies for effective operationalization. Incorporating SDGs into corporate reporting is essential but complex. Establishing a multidimensional reporting system that combines financial data with assessments of social and environmental risks supports an ESG approach, offering a potential solution to address this challenge [16, pp. 96-98].

To achieve the ambitious SDG Agenda goals, there is a need for substantial global financing. However, even with a broad international commitment to the agenda, there is a substantial investment gap of around $2.5 trillion annually towards developing countries. It is necessary to sharpen investment focus more towards SDG-aligned areas.

In most developing countries, the level of available data and market intelligence about the potential SDG-aligned investments is rather low, which translates to low interest and lower than possible overall private investments.

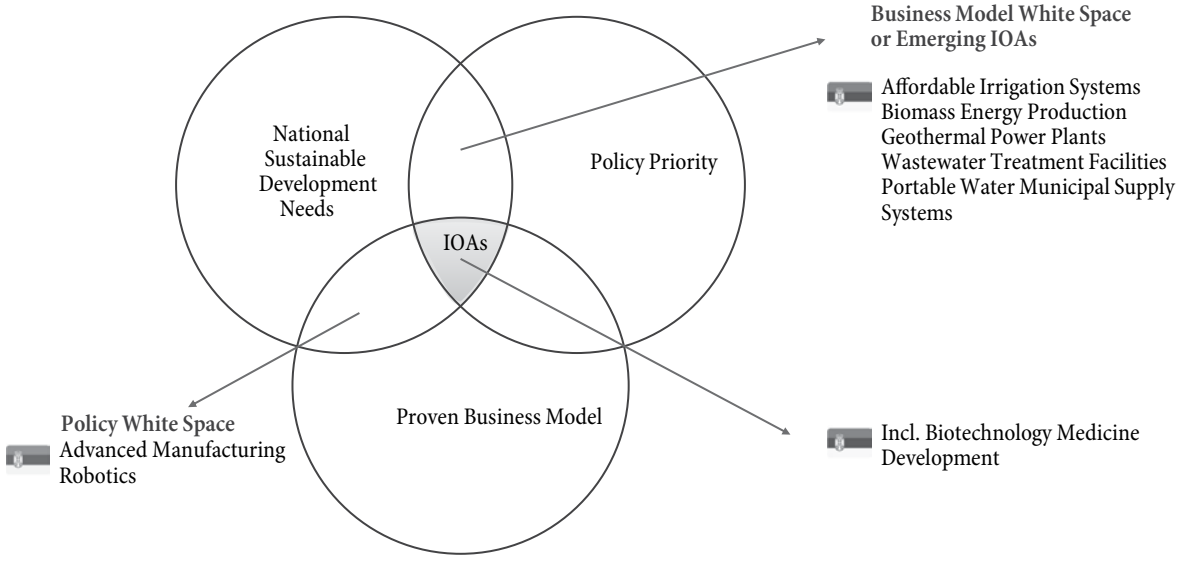
To improve this situation and narrow the financing gap, UN SDG Impact designed an SDG Investor map as a market intelligence tool with the intent to help predominantly private investors and institutions identify investment opportunities and business models in developing countries that advance the SDGs.

For investment potential to qualify as an IOA, certain methodological criteria and conditions must be met:

- The IOA should be appealing to potential private investors, both domestic and foreign, meaning that the investment should be financially attractive or profitable.
- The investment should align with at least one, or several, Sustainable Development Goals (SDGs) of the United Nations.
- The existence of strategic documents at the national and local levels has identified these areas as priorities for investment.
- The presence of proven business cases, such as case studies or business models that are already functioning in practice in Serbia.

In addition to investment opportunities that meet the criteria, there are also identified investment opportunities known as "white spaces" – potential investment fields that may currently not meet all the methodological conditions

Figure 1: Identified SDG investment opportunities through SDG investing maps, emerging IOAs & "white spaces"



Source: Authors' presentation

but deserve attention in terms of updating the Investment map in the proximate future.

According to Figure 1, Biotechnology Medicine Development, for example, meets the above-mentioned criteria and is recognized as an IOA. Advanced Manufacturing Robotics is aligned with SDGs and has proven models in Serbian practice, however, is not recognized in the policy documents and thus can be considered a white space. Geothermal Power Plants are a policy priority but lack explicit business models.

The Serbia SDG Investor Map is created to provide added value for major target groups, investors, and the country as a whole.

For investors, Investor Map:

- provides information about possible SDG-focused private-sector investments or how to align existing investments in support of local SDG priorities for investors and enterprises (both domestic and foreign);
- helps private investors (funds, financiers, corporations), who recognize that sustainable investments have higher financial payoffs in the long term, and who want to increase the SDG-related impacts of their investments to identify bankable investment opportunities and business models that advance the SDGs;
- provides country-level market intelligence, backed by actionable data, on investment opportunities where SDG needs, and market opportunities intersect.

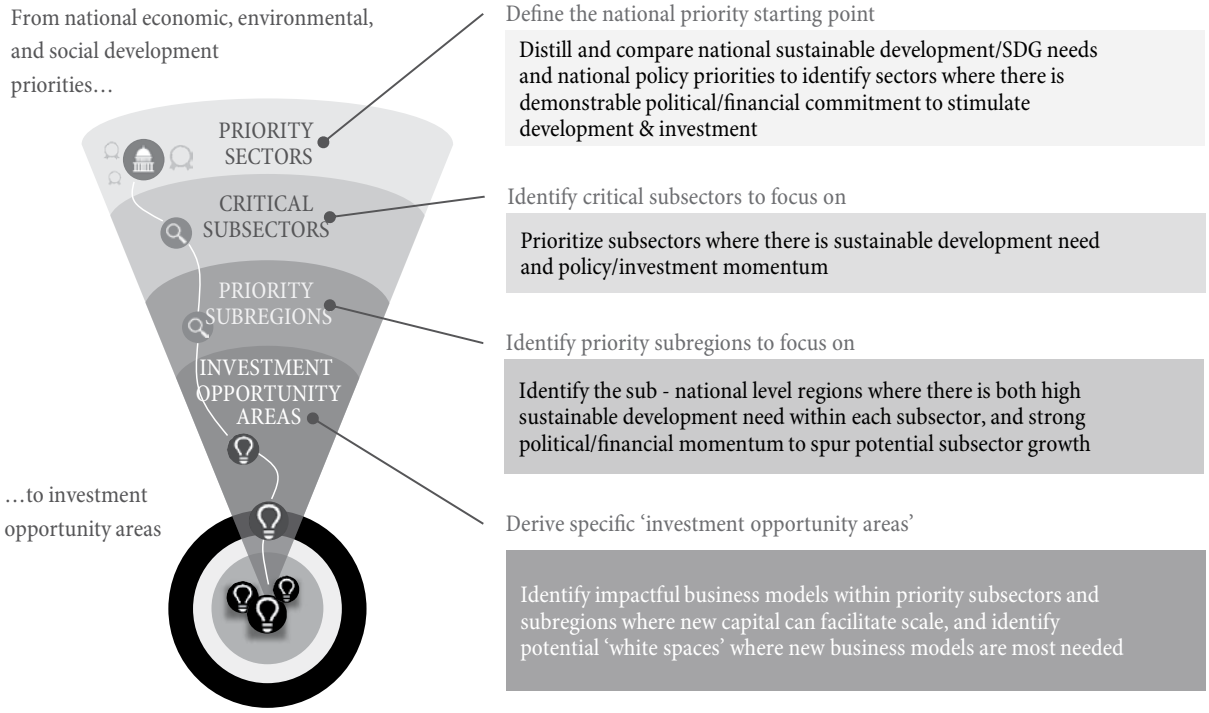
For Serbia benefits are the following:

- Achieving the SDGs requires significant investment, and the current level of investment by the government, development agencies, and other actors is not enough to meet the ambitious targets. The private sector needs to play an instrumental role in closing the SDG financing gap.
- The Map becomes the country's tool for attracting the private sector to increase their investments towards the country's SDGs as well as to focus on marginalized areas and communities.
- The investors and enterprises convenings that will be organized based on the Map findings could help to mobilize new financial resources to realize the SDGs and catalyze local investments.

SDG Investor Map methodology and process

The Serbia SDG Investor Map utilizes the SDG Investor Map Methodology 2.0, designed by UNDP experts. It involves thorough secondary data research, desk analysis, and

Figure 2: Mapping investable solutions: Addressing country-level SDG needs through SDG investor maps



Source: [4]

stakeholder interviews to explore development needs, policy priorities, and market opportunities, ensuring a comprehensive and validated approach. Data undergoes meticulous analysis using the funnel method as illustrated in Figure 2 to identify Investment Opportunity Areas (IOAs) and formulate data-supported business models. The outcomes are synthesized into an Excel template and uploaded to the SDG Investor Platform. This platform empowers investors with extensive functionality, allowing them to explore Serbia's SDG-aligned investment opportunities using filters for sectors, regions, SDGs, return profiles, market size, and investment timeframes.

UNDP SDG IM methodology

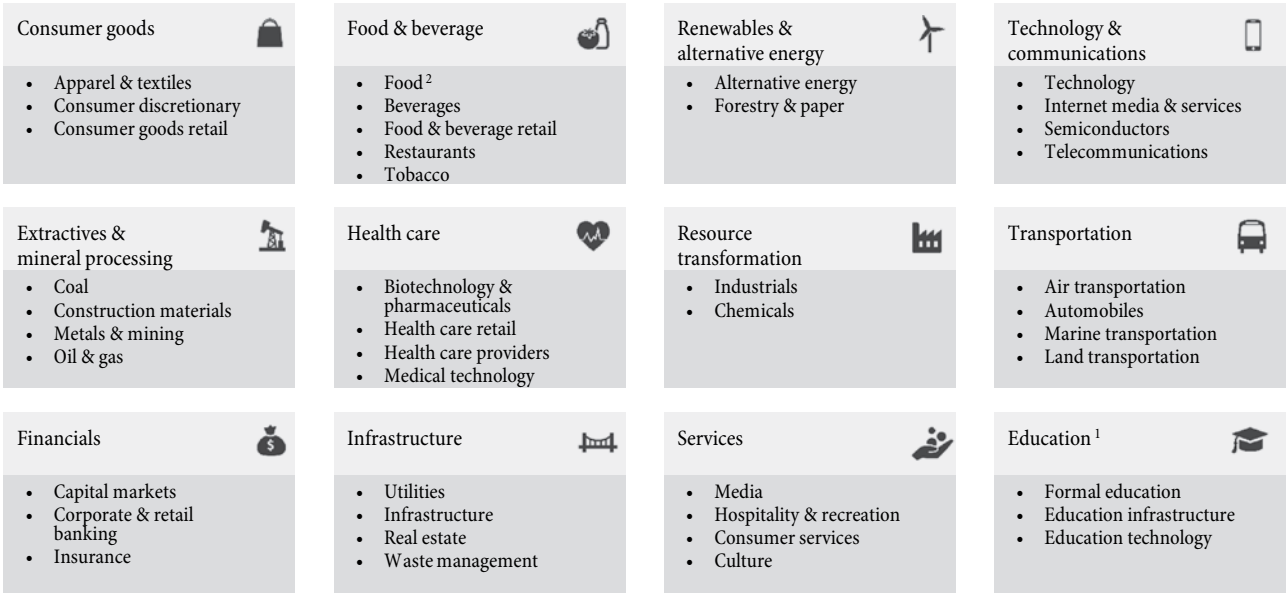
Based on the analysis of a vast database of secondary documents and sources – comprising over 170 national strategic documents accepted by the Republic of Serbia and applied in various investment areas – along with numerous interviews with representatives of the government, ministries, local self-governments, and private capital investors, both domestic and foreign, this methodology was applied. The focus was narrowed down to priority sectors, as illustrated in Figure 3, and further refined into sub-sectors. Subsequently, they were filtered geographically by regions or geographic areas within the Republic of Serbia. Ultimately, the core result of the Investor Map, consisting of thirteen Investment Opportunity Areas (IOAs) for potential investors, was finely tuned.

The defined methodology required a detailed focus on each criterion, being highly structured and constituting a validated approach that allows little room for improvisation and subjectivity. Rather, it mandates that every choice and decision be substantiated by the appropriate database, relevant strategic document, and corresponding national strategic priority or stance – backed by the argument of the pertinent stakeholder.

The task was not merely to identify Investment Opportunities, but to match these Areas with the seventeen Sustainable Development Goals based on the SDG Industry Matrix guide. When considering the Food and beverage sector in Figure 4, it is directly connected to SDG 2 Zero Hunger, SDG 3 Good Health, SDG 13 Climate Action, and is not directly associated with SDG 4 Quality Education or SDG 11 Sustainable Cities and Communities. The goal is to prove and demonstrate the linkage between each proposed Investment Opportunity Area (IOA) and a specific Sustainable Development Goal (SDG).

Each IOA is elaborated and described in an Excel format through 20 informational points, such as a detailed description of the business model, a comprehensive showcase of proven examples from Serbian investment practices operating within the specific Investment Opportunity Area, a detailed presentation of market potential, existing competition, regulatory environment, indicative returns on the potential investment, investment horizon from the

Figure 3: SASB'S Sustainable Industry Classification System® (SICS)



Source: [4]

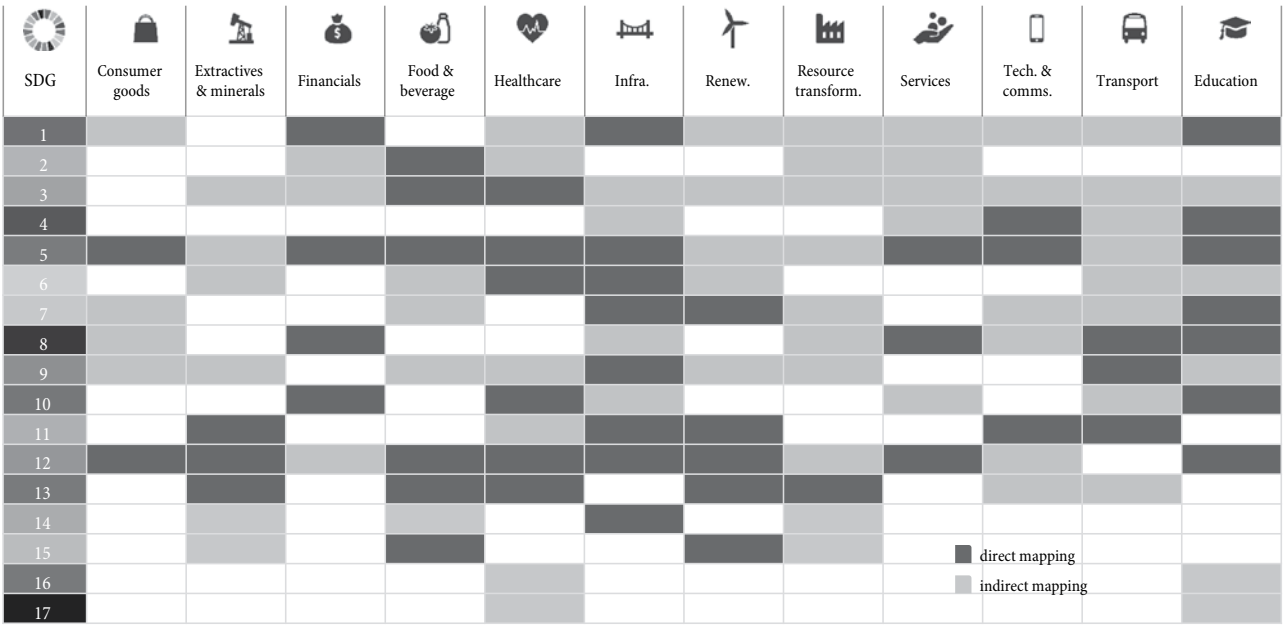
perspective of an individual investor, estimated ticket size or the average investment amount if the investor plans to enter that IOA, and a multitude of other points illustrated in Figure 5.

The data was gathered through discussions with numerous stakeholders, a substantial number of structured and semi-structured interviews, and an extensive document review.

The results of this research have been published on the SDG Investor Platform website, enabling any interested investor from around the world to access this platform and practically obtain all the necessary information regarding potential sustainable investments in Serbia [34].

To secure funding for Serbia's green transition from the EU and other organizations, the program must pinpoint sources of extraordinary growth potential. The strategy comprises impact investments in infrastructure and tradable sectors, emphasizing the adoption of climate-neutral technologies in major industrial sectors like steel, copper, cement, and agriculture. The third pillar involves restructuring the existing industrial base to align with "go green" criteria, especially in energy production and

Figure 4: SDG Industry Matrix



Source: [4]

Figure 5: Foundations of IOAs: 20 actionable data points encompassing business and impact factors

Source: Authors' presentation

land-use industries. Harmonizing industrial policies with core macroeconomic policies and implementing structural adjustments in key sectors like ICT, energy, industrial production, agriculture, and construction is crucial. Finally, a new financing platform using a multitrack approach aims to pool significant funds for these initiatives [6, pp. 23-24]. The SDG Investor Map Methodology highlights priority sectors where the potential IOAs align with the SDGs.

Sectoral prioritization

Based on the applied methodology, the selection has been narrowed down to five priority sectors. These are:

- Food and Beverage
- Renewables and Alternative Energy
- Technology and Communication
- Infrastructure
- Healthcare

Food and Beverage

The contribution of agriculture to Serbia's GDP is between 6% and 7%, traditionally [41]. Serbia possesses an incredible natural potential with 5.06 million hectares of agricultural land, constituting nearly 2/3 of the territory of the Republic of Serbia. Approximately 3.4 million hectares are cultivated in Serbia [19]. In 2022, we had a foreign trade exchange in the agricultural and food product segment close to 8 billion euros, representing a growth of about 20% compared to the year 2021. 25% of the exports, totaling 4.8 billion euros in 2022, consisted of agricultural products related to fruits and vegetables [21]. At this point, there is a quite pronounced potential that still has considerable space for further growth ahead.

Renewables and Alternative Energy

Serbia annually emits 62 million tons of CO_2, which represents that Serbia produces a higher per capita amount of CO_2 than the global average [15]. CO_2 emissions are dominated by the burning of fossil fuels for energy production, and heavy industrial production [32]. Based on the structure of electricity production in Serbia in 2022, 67% of the energy was generated from thermal power plants, 25% from hydropower, and only 3% from alternative energy sources. Within that, solar energy contributed a mere 0.03% to Serbia's energy balance this year, practically negligible. Wind energy has a slightly higher contribution with 500 megawatts of installed capacity. The ratio between the share of electricity production from fossil fuels and low-carbon sources is 70:30 [33]. All previously mentioned shows that there is quite a significant potential for private investments in renewable energy, which unequivocally aligns with SDG goals. The interesting case study overview shows that the application of the principles of the circular economy in energetics could be the foundation for new business models such as the Internet of Energy (IoE) or intelligent transmission smart grid. By applying IoT in the energy sector it could be possible to predict the required amount of electricity, as well as the amounts that can be produced. The technologies of a so-called Industry 5.0 could be applied in other areas and sectors such as smart agriculture, smart transport, and cities, quality of life and health, protection of critical infrastructure, and cybersecurity, all the way to a smart public sector [14].

Technology and Communication

Exports of the IT sector in 2022 amounted to around 2.7 billion euros, representing an impressive growth of 45% in 2022 compared to the previous year. This export resulted in a trade surplus of a remarkable 2 billion euros in 2022, with imports totaling 700 million euros [26]. Serbia's ICT sector has become a key driver of economic growth, contributing 10% to the GDP and ranking among the top four export sectors, alongside steel, automotive, and agriculture. With over 3,354 firms and 47,609 employees as of Q1 2022, the sector is marked by the presence of prominent U.S. companies. Serbian tech companies excel in software development for various industries, run call centers, and engage in diverse tech services, showcasing the sector's versatility and significant economic impact [12].

Infrastructure

The aim of the high-level policy plans and strategies of the Republic of Serbia is better accessibility of traffic infrastructural, social and communal services, and integrated infrastructure following crucial activities based

on sustainability, circular development, and mitigating the impact of climate challenges. This aim entails investment not only in road but also in rail, aviation, and port infrastructure. The previous investments in transportation infrastructure have not only reduced travel times and greenhouse gas emissions but also attracted a greater number of investors to these locations [11]. The foregoing unequivocally signals the existing potential, poised to persist into the future. Anticipating continued growth and development, this trajectory augurs well for sustained prospects.

Healthcare

It is known that the Republic of Serbia ranks among the countries with an older population globally, with an average age between 43 and 44 years, characterized by an inverted age pyramid and a predominance of chronic non-communicable diseases that absorb a significant portion of the public health budget [42], [40]. The current health expenditure by financing schemes in the Republic of Serbia is close to 6.5 billion dollars constituting approximately 10% of the GDP of the Republic of Serbia spent on healthcare [48]. The allocation of public funds to healthcare, as a percentage of the GDP, exceeds the average for South-Eastern European (SEE) countries, highlighting the potential for improvements in the healthcare system. The prevalence of significant and impoverishing out-of-pocket (OOP) payments underscores substantial shortcomings in actual health coverage [47].

Regional prioritization

The methodological approach in research and building SDG Investor Maps and IOAs, besides the sectoral dimension, envisioned a regional dimension consideration as well.

The Republic of Serbia Constitution adopted in 2006 recognizes five large statistical regions:

- Vojvodina Autonomous Province
- Belgrade Region
- Šumadija and Western Serbia
- Southern and Eastern Serbia
- Kosovo and Metohija Autonomous Province*

*Note: The Autonomous Province of Kosovo and Metohija has been administered by UNMIK since 1999 after the Kosovo War. Despite declaring independence in 2008, only part of the international community recognizes it. Due to the absence of access to necessary data, Kosovo and Metohija are not included in Serbia's SDG Investor Map.

Serbia's SDG investment portfolio

Within this framework, the portfolio of IOA in Serbia has been defined per business units, as shown in Table 1.

The potential investment volume in the 13 defined Investment Opportunity Areas (IOAs) over the next 5 years

Table 1: Serbia SDG investment portfolio

No.	Investment Opportunity Area (IOA)	Sector	Estimated Investment Potential in 5 years
IOA 1	Fresh Fruit and Vegetable Primary Production	Food & Beverage	< USD 50 million
IOA 2	Organic Agricultural Production	Food & Beverage	USD 50 million - USD 100 million
IOA 3	Decentralized Solar Energy Generation	Renewables & Alternative Energy	> USD 1 billion
IOA 4	Wind Farms	Renewables & Alternative Energy	> USD 1 billion
IOA 5	High-tech for Agriculture Production	Technology & Communications	< USD 50 million
IOA 6	Sophisticated Software Solutions	Technology & Communications	< USD 50 million
IOA 7	Waste Management Services	Infrastructure	USD 100 million - USD 1 billion
IOA 8	Port Infrastructure	Infrastructure	USD 100 million - USD 1 billion
IOA 9	Energy-Efficient Residential Housing	Infrastructure/Real Estate	USD 100 million - USD 1 billion
IOA 10	Hospitality Facilities	Infrastructure/Hospitality	USD 100 million - USD 1 billion
IOA 11	Medicine Production and Delivery	Healthcare	> USD 1 billion
IOA 12	Digital Healthcare Solutions and Specialized Medical Services	Healthcare	< USD 50 million
IOA 13	Biotechnology Development	Healthcare	USD 100 million – USD 1 billion
		Total IOA pipeline estimated	**USD 8.30 billion or more**

Source: Author

is $8.3 billion. It's crucial to recognize the multiplicative impact of these investments, considering indirect effects on related businesses in value chains. Each dollar invested in these IOAs has the potential to generate $2.4 in investments in related businesses, leading to a maximum investment volume exceeding $20 billion. In terms of employment, each employee in these IOAs indirectly supports an additional 2.8 jobs in related sectors. Additionally, every $1 contribution to the GDP of these IOAs adds $2.3 to the economy of the Republic of Serbia.

Apart from the 13 identified IOAs, there are "Emerging IOAs" aligning with Sustainable Development Goals (SDGs) but not meeting all criteria. These include Advanced Manufacturing Robotics, Affordable Irrigation Systems, Greenhouse Agricultural Production, Livestock Production and Processing, Fruit and Vegetable Processing into Juices, Biomass Energy Production, Geothermal Power Plants, Wastewater Treatment Facilities, and Water Supply Systems for Drinking Water.

IOA close-ups

IOA 1 Fresh Fruit and Vegetable Primary Production

Table 2: Key points of the IOA 1

Business Model: Build and operate the integrated fruit production facility with inputs such as land, CAPEX for production machinery, labor, and seeds and fertilizers.			**Impact Thesis**: Support sustainable farming, promote high-value markets, reduce undernourishment, and ensure food security.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
10-15%	< USD 50 mil.	USD 1-10 mil.	5-10 years

Source: Author

A large number of practical cases and successful business models in the fruit and vegetable sector in the Republic of Serbia have been analyzed. One notable example is the Iceberg Salat Center Company, which collaborates with McDonald's. Other successful entities include Agros doo, Atos Fructum from Mala Remeta, which, through cooperation with Južni Banat, and the cooperative with Panonian Apples, exports apples to over 20 countries worldwide. Additionally, well-known successful companies in the fruit and vegetable sector include MK Agrar, Delta Agrar, and numerous others already engaged in successful fruit and vegetable cultivation today. An innovative approach in vegetable production is vertical farming using automated containers with sensors. This method enables up to 10 production cycles annually for green vegetables like arugula and lettuce, demonstrating high efficiency and year-round viability. The estimated market size potential in the next 5 to 7 years is less than $50 million, with an estimated ticket size per hectare ranging between $10,000 and $60,000 [39]. The investment segment demonstrated a Compound Annual Growth Rate (CAGR) of 5-10% in recent years, with an estimated average return on equity (ROE) between 10-15% [3]. What has also been observed in recent years is faster growth in fruit orchards compared to vegetable cultivation in the Republic of Serbia, especially in berries such as blueberries, blackberries, raspberries, etc. [35]. There is a sense that there is room for accelerated investment growth in the vegetable segment, particularly under greenhouses and hothouses. Out of the 92,000 hectares dedicated to vegetables in Serbia, a substantial portion, 30,000 hectares, is allocated to potatoes, followed by vegetables with significantly smaller shares of the total area [20], [36]. Due to its natural potential, the Republic of Serbia has the potential to become a net exporter in the vegetable segment.

IOA 2 Organic Agricultural Production

Table 3: Key points of the IOA 2

Business Model: Produce primary and processed high-valued organic goods which entail highly fertile soil land surface, organic production technology, machinery, and workforce, all supported by long-term contracts with buyers with the fulfillment of the conditions prescribed by the Law on Organic Production of the Republic of Serbia, Codex Alimentarius and EU regulations on control and certification in organic production, processing, labeling, storage, transportation, circulation, import and export of organic products. The result is high-quality organic products of plant and animal origin for domestic use and export.			**Impact Thesis**: Ensure food security while promoting healthy soil and benefiting human and environmental well-being.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
5-10%	USD 50-100 mil.	USD 0.5-1 mil.	More than 10 years

Source: Author

In this IOA, the focus is on organic plant and animal agricultural production. The higher value-added content of organic products commands higher prices, offsetting increased production costs. Serbia's Law on Organic Production, in force since 2011, regulates various aspects, aligning with EU regulations for control and certification. In the Republic of Serbia, the independent, non-governmental, and non-profit civil organization "Serbia Organika" was founded in 2009. "Serbia Organika" is a member of international organizations such as IFOAM (International Federation of Organic Agriculture Movements), AVALON (Foundation for the Advancement of Sustainable Rural Development in Central and Eastern Europe), ISOFAR (International Society of Organic Agriculture Research), and the Danube Soya Association [38]. According to the FAOSTAT database, in 2009 4,900 ha of cropland area was under organic agriculture, and in 2020 it was 17,453 ha, which is 3.5 times more compared to 2009 [7]. Based on all the aforementioned, the potential for growth remains pronounced. There is immense potential, illustrated by successful examples such as the Curug organic milk farm with 2,000 cows, including 1,000 milking cows, and plant production on 2,000 hectares [8]. Another noteworthy case is the Medino company in Krnjevo, producing organic honey, with 60% of the honey exported to international markets [18]. The current market size is relatively small, approximately 40 million euros annually, but there is significant potential for at least 25% to 30% annual growth. The ticket size depends on the specific crop or type of poultry being raised; however, it is estimated to be from $0.5 to $1 million [37].

IOA 3 Decentralized Solar Energy Generation

The significant focus is on renewable energy, specifically solar and wind farms in promising locations. Challenges include securing a power grid connection and financing. The main funding source for large projects is conventional financing through banks, with an equity-debt ratio of 30:70. Selling electricity at auctions introduces pricing unpredictability. A thorough project mapped Serbia's solar potential, identifying almost 100 optimal locations for solar power plants based on energy potential and minimal spatial conflicts to minimize environmental impact. The study produced a map overlaying solar development and impact potential, estimating an installed capacity of 10 MW for each location. It is estimated that 200,000 – or 10% – of Serbian households could be powered from the 100 selected sites, saving one million tons per year in carbon emissions [2]. Simplified, if we multiply 100 potential power plants by 10 megawatts (which is approximately the capacity of the solar power plant that opened in April in Lapovo, funded by private capital from MT-Komeks), we arrive at a potential of 1 gigawatt in solar energy. This is slightly below the declared goal in the Plan of the Ministry of Mining and Energy for 2030, where around 1.4 gigawatts of solar power are projected by that time [23]. Several successful case studies or business models have already been established. One of them is the already mentioned solar power plant in Lapovo with a capacity of 9.9 megawatts, with an investment of around 9 million euros [25]. Another planned project by the MK Group in collaboration with the Italian company Fintel Energia is the agrosolar project in Kula with a capacity of 660 megawatts on 770 hectares of agricultural land [24]. Some might argue that this conflicts with SDGs since the power plant is built on high-quality agricultural land, but it involves an innovative agrosolar project that enables a win-win situation. The solar panels are installed at a certain height, and underneath, crops are planned to be cultivated, providing a higher yield in the shade compared to direct sunlight. This is a typical example of how it's possible to meet the investor's need for returns without compromising the natural environment.

Table 4: Key points of the IOA 3

Business Model: Set up and operate solar plants to generate revenue by selling electricity produced from solar panels. The inputs required include solar panels, inverters, mounting structures, electrical equipment, land, and sunlight. Target markets are utility companies, municipalities, and commercial businesses looking to reduce their carbon footprint and energy costs. The amount of power that a power plant can produce depends on its size, technology, and energy source, and can range from a few kW to a few dozen MW.			**Impact Thesis**: Support energy security, reduce greenhouse gas emissions, and make energy affordable.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
15-20%	> USD 1 bil.	> USD 10 mil.	more than 10 years

Source: Author

IOA 4 Wind Farms

Table 5: Key points of the IOA 4

Business Model: Construct and operate wind farms to generate revenue by selling electricity through long-term Purchase Power Agreements, covering the expenses and potentially selling renewable energy credits. Distributors are obliged to purchase all the energy produced from renewable sources. Wind power plants require supplying equipment, transportation, risk mitigation and planning know-how, location with frequent and robust wind, energy license, use, and construction permit.			**Impact Thesis**: Reduce harmful energy production emissions, increase energy security, and replace fossil fuels.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
5-10%	> USD 1 bil.	> USD 10 mil.	more than 10 years

Source: Author

The interconnected theme in the energy sector related to the previously mentioned is wind energy. What is distinctive about wind energy is its current generation of 3% of total Serbia's electricity generation. Presently, the capacity utilization of wind in 2021 was 31% [13]. Most wind parks are predominantly located in the South Banat administrative district, namely in Kovacica, Vrsac, Alibunar, and others. As mentioned earlier, Banat has been chosen as an ideal region for wind farm development due to its wind power strength and the absence of adverse environmental impact, given that there is no need to clear forests, migratory birds do not traverse the area, and agricultural land is utilized almost to its full extent even before the construction of wind parks [10]. A notable example is Cibuk 1 in Vladimirovci, with a capacity of 158 megawatts. It stands as the largest wind park in the Western Balkans, located just 1 km from the Deliblatska Pescara special nature reserve. Featuring 57 turbines, this project received an investment exceeding $300 million. The investor is the company Masdar from Abu Dhabi. Out of the $300 million, $215 million was provided as support by the IFC and EBRD [17]. Estimated metrics of this IOA show a similar potential as in Decentralized Solar Energy Generation.

IOA 5 Smart Agricultural Technologies

The business model can be highly diverse. It involves the IOA, which is broadly structured. Good examples from practice in our country include the BioSense Institute, which significantly focuses on the importance of analytics,

Table 6: Key points of the IOA 5

Business Model: Develop and deliver high-tech solutions to help farmers increase yields, reduce costs, and manage their operations more effectively. Such smart agricultural technologies that are used to improve the efficiency and productivity of farming operations include precision farming (using data and analytics to optimize farming operations), vertical farming (growing crops in vertically stacked layers using controlled environmental conditions, such as temperature, light, and nutrients, to optimize yields and minimize resource usage), livestock monitoring (using sensors and data analytics to monitor the health and well-being of livestock), and crop genetics (using genetic engineering to develop crops that are more resilient to pests and diseases, have improved yields, and can grow in challenging environmental conditions). The service can be marketed both in the domestic and export markets.			**Impact Thesis**: Improve crop yields and sustainability, create jobs, enhance resource efficiency, and inclusive access to technology.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
10-15%	< USD 50 mil.	USD 0.5-1 mil.	5-10 years

Source: Author

sensors, and nanotechnologies in smart agricultural production. This approach enhances yields, improves the quality of agricultural products, and reduces the need for human labor in certain segments. The potential extends to vertical farms, animal monitoring for health parameters, and tracking livestock performance through appropriate databases. In addition to the BioSense Institute, other practically successful examples include Delta Agrar, which employs smart agriculture techniques such as drone-based plant feeding, smart irrigation, and orchard nutrition. Another notable company is Nestle, with its Agrivi360 system and regenerative agriculture practices, representing a significant leap forward in agriculture for the company. The payback period for these investments is between 5 to 10 years with an annual return of investments from 10 to 15%.

IOA 6 Sophisticated Software Solutions

The business model is broadly defined as in the previous IOA. The defined field of investment can encompass software development, cloud computing, data analytics, business intelligence (BI), Internet of Things (IoT), the increasingly crucial segment of cybersecurity, gaming, web and mobile application development, and many other sectors. In the Republic of Serbia, numerous success stories are widely recognized, including companies such

Table 7: Key points of the IOA 6

Business Model: Develop, sell, and maintain software products and services to improve business operations, such as custom software development, cloud computing services, data analytics and business intelligence, and cybersecurity services. Customers receive delivery, implementation, training, and support. Software services developed in Serbia are mainly exported. Sophisticated software solutions can target a wide range of industries, including healthcare, finance, manufacturing, retail, education, transportation, and logistics.			**Impact Thesis**: Increase efficiency and productivity, improve decision-making, create job opportunities, and provide access to information and knowledge.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
>25%	< USD 50 mil.	> USD 10 mil.	less than 5 years

Source: Author

as Endava, Microsoft, Comtrade, Nordeus, Wega, Levi9, and many others. What is intriguing about this IOA is its rapid growth, with exports increasing at a rate of 40-50% annually. The expected return rate for investors, albeit with increased risk, is over 25%, and in some cases, surpassing 30% on an annual basis. The average time horizon for the development of a software solution is less than 3 to 5 years.

IOA 7 Waste Management

Table 8: Key points of the IOA 7

Business Model: Provide waste management services, such as collection, transportation, and disposal of waste, and provide new waste collection, sorting, and recycling plants and equipment through Public-Private Partnerships (PPPs). The collected waste could be reused as a substitute for raw materials or in the process of waste-to-energy solutions. The government provides regulatory oversight and contracts, while the private company is responsible for the day-to-day operations of the waste management system and provides a source of funding for capital investments. Investors must fulfill the permits prescribed by the Environmental Protection Ministry.			**Impact Thesis**: Reduce waste and illegal landfills, eliminate pollution, and soil contamination, and provide better protection of the environment and public health.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
5-10%	USD 100 mil. - 1 bil.	> USD 10 mil.	more than 10 years

Source: Author

Serbia currently has around 140 landfills, approximately 3,500 non-sanitary and illegal dumpsites, and 12 sanitary landfills. One notable example is the Vinca landfill, a highly successful sanitary landfill that absorbs about 350 thousand tons of municipal waste annually. When looking at a comparative perspective, Serbia generates 2.9 million tons of municipal waste per year, roughly equivalent to filling 58 of the "Beogradjanka" skyscraper with garbage from bottom to top annually. Only 30% of this waste is transported to sanitary landfills, while the remaining 70% ends up in non-sanitary, illegal dumpsites, and landfills [22]. Despite significant efforts in this sector, there is still considerable room for investment which is shown through the project "Clean Serbia". Environmental issues associated with non-sanitary landfills include fires that release toxic substances such as dioxins and furans, groundwater pollution, wind dispersion of waste, facilitated by birds, and many other problems. Around 50% of municipal waste is biodegradable, presenting a valuable source for compost or biogas. While waste management traditionally involves collection and disposal, efforts are being made to reduce waste, promote reuse, recycling, and explore energy recovery. Energy recovery from municipal waste, converted into RDF and SRF, holds significant investment potential for use in various industries. The resulting ash from incineration is generally non-toxic, making it a promising commercial product.

IOA 8 Port Infrastructure

Table 9: Key points of the IOA 8

Business Model: Finance, design, construct, and operate river port infrastructure through a Public-Private Partnership (PPP), targeting both goods and people. The government owns the port land and assets but grants a concession to a private sector entity to finance, construct, and operate the port facility for a specified period. The private sector entity finances the project, including construction costs, and operates the port facility for the concession period. In return, the private sector entity receives a share of the revenue generated by the port, such as through port fees or lease payments.			**Impact Thesis**: Improve transportation of goods and people with lower environmental impact, reduce logistical inefficiencies, and boost economic productivity.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
< 5%	USD 100 mil. – 1 bil.	> USD 10 mil.	more than 10 years

Source: Author

This IOA is recognized as having substantial investment potential. The Port Management Agency has played a significant role in the development of port infrastructure in the previous period. The "Zaplovi Srbijom" project, initiated by the Port Management Agency, aims to build infrastructure for passenger and nautical traffic, including

marinas and international passenger terminals, as well as the development of line traffic and canal tourism [29]. An interesting fact is that the total length of rivers in the Republic of Serbia is 66 thousand kilometers. The Danube River alone, which flows through Serbia, covers a length of 588 kilometers. This river serves as the main corridor, currently transporting 80-90% of the cargo by water, and is known as Corridor 7 (Danube Corridor). Serbia has 76 rivers with a length exceeding 50 kilometers. For example, the Velika and Zapadna Morava rivers have a combined length of 500 kilometers, indicating enormous natural potential. Currently, there are 9 ports on the Danube in Serbia, facilitating international maritime traffic [27], [28]. Much has been achieved in terms of licensing operators and investing in ports and marinas. One notable upcoming project is the Prahovo port, where Elixir Group, in collaboration with the state, plans to invest around 35 million dollars. The goal is to triple the port's capacity by 2030. Another successful example is the DP World acquisition of the Novi Sad port for 30 million euros.

IOA 9 Energy-Efficient Residential Housing

Table 10: Key points of the IOA 9

Business Model: Build energy-efficient residential housing and offer custom home design and construction services, utilizing advanced building materials and technologies such as insulated concrete forms (ICFs), geothermal heating and cooling systems, and energy-efficient windows and appliances. Constructing energy-efficient residential housing requires technology, permits, workforce, capital, know-how, land, and sustainable building materials with a high focus on insulation, windows, lighting, sourcing energy, heating, and cooling for energy efficiency. The business model can appeal to clients with environmental awareness who are looking for cost-effective housing solutions in Serbia in semi-urban areas.			**Impact Thesis**: Improve energy efficiency and limit environmental impacts of buildings.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
15-20%	> USD 1 bil.	> USD 10 mil.	5-10 years

Source: Author

Investment activity in the Real Estate sector in Serbia is currently in full swing, with a slight slowdown in the last few months. Interestingly, this surge in construction began around 2015, following several decades of relatively slow residential development from 1985 to 2015. Property prices increased by an average of 18% in Serbia in 2022 compared to 2021 [44]. There is a clear trend of rising property prices, now slowing due to saturated demand, higher mortgage rates, and other factors, but it still represents investment potential. Encouragingly, there is an increasing focus on the quality of construction in terms of energy efficiency. Both investors and property buyers are paying attention to insulation, materials used, heating and cooling systems, and energy sources in residential buildings. On prime locations, 70% of apartments are sold before the foundation is completed, often financed by advance payments from buyers. Cash purchases constitute 85%, while only 15% are financed through mortgages. It's worth noting that, due to rising interest rates, the production of residential loans has more than halved in the first five months of 2023. Interest is not limited to urban cores; the post-COVID-19 pandemic period has seen activation in other locations near major cities, such as Fruska Gora, Kosmaj, and projects like Solar Valley near the city of Novi Sad. The ticket size or investment package for a residential complex or condominium of around 20,000 square meters is between 15 and 20 million dollars.

IOA 10 Hospitality Facilities

Table 11: Key points of the IOA 10

Business Model: Establish and operate hospitality facilities for accommodations using local value chains and local cultures and heritage in areas such as preselected cities, spa areas, and mountains. That entails capital, land, building permits, know-how, technology, workforce, and experienced staff. If it's a built-in protected area, it needs a permit for construction. Serbia has 28 spa regions and 19 climate areas suitable for investment.			**Impact Thesis**: Promote economic growth and job creation while prioritizing diversity, local cultures and heritage, and equality.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
5-10%	USD 100 mil. - 1 bil.	> USD 10 mil.	more than 10 years

Source: Author

This IOA is focused on investment in hotel capacity. The investment in hotel capacity implies that certain conditions must be met in terms of sustainable tourism development. The main objectives of sustainable tourism development are that hotels in Serbia operate following green procurement principles, and are conscious and ready to improve their business operations to support green procurement, eco-labeling, responsible economy,

and sustainable development [46, p. 451]. In Serbia, particularly in Belgrade, where the number of hotels has more than doubled in the last 5 years, yet there is still a shortage of around 2,500 rooms. This is particularly relevant with upcoming events like Expo 2027 and a significant expected influx of tourists. The city has hosted major sports events, business conferences, political gatherings, and more. Despite the recent growth in hotels, there is still a deficiency in 4 and 5-star hotels. In 2022, Serbia recorded 12.2 million overnight stays, with 3.2 million in Belgrade alone, including 2.7 million stays by foreign tourists [43]. The estimated total foreign exchange income from tourism in 2022 was around 2.2 billion euros [49]. Three potential focal points for new hotel construction in Serbia are city centers, exemplified by the Hilton Hotel investment worth 70 million dollars with 240 rooms. Spa tourism is another area of interest, with 28 spa regions in Serbia showing potential for hotel development [5]. A notable example is the Vranjska Banja, where Marriott plans to build two hotels, one with 4 stars and the other with 5 stars, with a total investment of around 90 million euros. The third aspect is mountainous areas, with examples including the construction of the Ramonda Hotel on Rtanj, as well as numerous hotels on Kopaonik and Zlatibor. Vranjska Banja stands out due to its hot springs with a temperature exceeding 94 degrees Celsius and a source capacity of over 110 liters per second, representing significant potential for development [45]. The future of the hotel industry hinges on adopting sustainable business practices. The key recommendation is to learn from successful examples of sustainable hotel management, emphasizing the promotion of quality to positively impact business results, as well as the broader environment and community's economic and social factors [31, p. 447].

IOA 11 Medicine Production and Delivery

The majority of medical devices are imported into the Republic of Serbia, and there is potential to substitute this import with domestic production, whether financed by domestic or foreign capital. Interestingly, the total market potential for drugs annually in the Republic of Serbia is around 1.5 billion euros [1]. This represents a substantial market, partially dominated by domestic companies such as Hemofarm, Stada, Galenika, Zdravlje Actavis, and others. Hemofarm is an exemplary case of collaboration with the German company Stada, with an investment of up to 150 million euros over the past 15 years in production and R&D capacities. Galenika received an investment of 35 million euros, while Pharmaswiss in Zemun had a factory built in 2013 with an investment of 30 million euros, and so forth [30]. There has been a sequence of significant investments in the pharmaceutical production sector in recent years, indicating the untapped potential in this industry.

Table 12: Key points of the IOA 11

Business Model: Build and operate production plants and laboratories for medicines for non-communicable diseases (cardiovascular diseases, cancer, chronic respiratory diseases, diabetes, obesity, etc.), vitamins, and supplements. Develop complementary delivery mechanisms directly to customers, using various methods such as online ordering, mobile apps, or delivery services. Needed inputs include research and development, production facilities, and a broad knowledge base of researchers and labor. In addition, companies often rely on patents and other forms of intellectual property and must comply with strict regulatory requirements governing their products' development, testing, and marketing. In Serbia, public health insurance is mandatory and is provided by the National Health Insurance Fund. The fund covers the cost of medical services, including doctor visits, hospitalization, diagnostic tests, and medication. Private health insurance is also available in Serbia, but it is not mandatory, and the coverage varies depending on the policy. Some medications may not be covered by public health insurance in Serbia, particularly newer or more expensive drugs. In such cases, patients may need to pay for the medication out of pocket or seek alternative treatments. However, the government is working to expand the list of drugs covered by public health insurance to ensure that everyone has access to essential medication.			**Impact Thesis**: Increase accessibility of medicines and improve healthcare situations, especially for marginalized communities.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
> 20%	> USD 1 bil.	> USD 10 mil.	more than 10 years

Source: Author

IOA 12 Digital Healthcare Solutions and Specialized Medical Services

Although it may seem like a new field, it has actually produced numerous innovations in the recent past. This includes telemedicine, which involves monitoring the health parameters of patients remotely. An excellent example is

Table 13: Key points of the IOA 12

Business Model: Develop and deliver digital healthcare solutions, such as telemedicine, patient portals, mobile health, and electronic health records to Serbia's rural areas, the older population, young people needing remote assistance, and patients with specific conditions and requiring specialized medical services.			**Impact Thesis**: Improve healthcare service delivery overall and enhance access to healthcare solutions for underserved areas.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
> 25%	< USD 50 mil.	USD 0.5 - 1 mil.	less than 5 years

Source: Author

the case of HTEC, a company that has developed a device for remote monitoring of arrhythmias or heart function. In this scenario, doctors automatically receive data, allowing for rapid response and potentially saving lives in the case of a cardiac event. Another notable example is Neuroblast, a company that monitors the neurological condition of patients remotely. There are also mobile applications and expert portals for patients, such as Doctor Care Anywhere developed by Vega IT company. Devices for self-evaluation are also available, such as Photofinder, a company that can assist with self-dermoscopy, enabling individuals to perform a preliminary self-assessment of their moles. If the application indicates a risk of melanoma, it is crucial to consult a doctor for timely intervention. There is a vast number of innovations in artificial intelligence in medicine, remote surgeries, personalized medicine based on the "treat to target" principle, and many other advancements.

IOA 13 Biotechnology Development

Biotechnology medicine is recognized as an immense potential and a strategic priority for the Republic of Serbia, emphasized multiple times by both the government and the Ministry of Science, what is definitively certain in 2023 is the commencement of the construction of the Bio4 Campus, with a projected investment of 300 million euros for the initial phase. The Bio4 Campus is grounded in four pillars – biomedicine, biotechnology, bioinformatics, and biodiversity. What holds enormous potential is the application of biotechnology in agriculture, medicine, and the food industry. For instance, in medicine, there is a globally remarkable growth in cellular and gene therapies, genome sequencing, R&D for entirely innovative drugs for chronic and lifestyle diseases, regenerative medicine, and

Table 14: Key points of the IOA 13

Business Model: Build and operate production plants and laboratories in the relevant areas, such as bio-manufacturing, bioeconomy (biotechnology plus biomanufacturing), clinical trials, personalized medicines (diagnostics and prognostics), artificial intelligence in medical development and health care, and secondary data usage for research and development (R&D) and similar. Biotechnology products can be produced from the areas such as regenerative medicine, cell and gene therapy, advanced healthcare through genome sequencing, rapid and precise development and manufacturing of medicine and vaccines. The business model is based on strong Government cooperation with private sector to create a world-class regulatory environment for development of knowledge-based industries. Serbia changed dozens of laws on various topics, including e-commerce, immigration, intellectual property protection, corporate law and introducing a new law on digital assets. Serbia also introduced a wide range of very generous tax incentives, including so called IP Box, accelerated R&D deduction, lower tax and social contributions for employing repatriates and foreigners, for people employed in R&D and for employing young people, as well as tax credit for investing in a startup, which the private sector can take advantage of.			**Impact Thesis**: Support the development of life-saving drugs and therapies and medical research advancements, as well as create job opportunities and economic growth.
Indicative Return	**Estimated Market Size**	**Ticket Size**	**Timeframe**
> 25%	USD 100 mil. – 1 bil.	USD 1 - 10 mil.	5-10 years

Source: Author

personalized medicine, i.e., creating personalized drugs for each patient. The projected yield from these investments is well above 25% annually, but a crucial question arises regarding the protection of intellectual property, specifically expertise in the regulatory acceptance of drugs or therapies.

Conclusion

A typical stereotype in the business world is that sustainable investments are not bankable. This paper aimed to show that there are many investment opportunity areas in Serbia that can reconcile seemingly contradictory criteria: profitability, proven business cases, recognized by national strategic documents as economic priorities, and aligned with SDGs.

The SDG Investor Platform project emerges as a pivotal force in propelling sustainable development in the Republic of Serbia. By facilitating partnerships between private investors and projects aligned with the United Nations' Sustainable Development Goals, the platform not

only attracts crucial investment but also lays the foundation for transformative change. As Serbia strides towards a more sustainable and inclusive future, the SDG map's role in promoting environmental, social, and governance (ESG) principles becomes instrumental. Through the collaboration fostered by this initiative, Serbia is poised to achieve significant progress in addressing global challenges, contributing not only to the nation's prosperity but also to the shared well-being of the global community. A green economy can also be observed from the perspective of Porter's Diamond Model of national competitiveness. As such, a green economy creates a climate for gaining a competitive advantage, which is crucial in global economic flows. Likewise, all characteristics and attributes of the green economy confirm its potential as the carrier of long-term sustainable economic development [9, pp. 416-417].

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Dragan Lončar

is a professor and an associate dean at the Faculty of Economics and Business, University in Belgrade, and the founding partner of business consulting firm Peterhof Consulting. He graduated from the Faculty of Economics and Business, completed a Master in Management at the University of Cambridge, and acquired PhD title at the Faculty of Economics and Business. Dragan Loncar received a Fulbright scholarship in 08/09 for postdoctoral research in financial management, conducted at the University of Chicago. He is a CFA charterholder. He has had various experiences in numerous economic projects and a pivotal role in WB, USAID, GIZ, UNDP, and EU projects. Dragan is the co-author of the reference books for Strategic Management and Project Management and the author of numerous research studies and papers in academic journals. He is a member of the Board of Directors of Banca Intesa Belgrade, a member of Supervisory Board of Metalac Gornji Milanovac, and the president of the Audit Committee of Wiener Stadtische Serbia.

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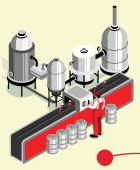

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Dejan Malinić
University of Belgrade
Faculty of Economics and Business
Department of Accounting and Corporate Finance

Savka Vučković Milutinović
University of Belgrade
Faculty of Economics and Business
Department of Accounting and Corporate Finance

ACCOUNTING FOR SUSTAINABILITY: THE CHALLENGE OF ALIGNING SDG METRICS AT GLOBAL, NATIONAL AND CORPORATE LEVELS

Izveštavanje o održivosti – problem usklađivanja metrike na globalnom, nacionalnom i korporativnom nivou

Abstract

The adoption of the Sustainable Development Goals (SDGs) marks the most significant qualitative step forward in the pursuit of sustainable development, surpassing all previous efforts in that direction. They comprehensively address humanity's most pressing global challenges. Anchored in the principle of equity, the SDGs cover, in a balanced manner, diverse issues faced by both developed and less developed nations, with the overarching ambition to fulfil the goal of "leaving no one behind" by 2030. Therefore, within the SDG framework, in addition to addressing issues related to poverty, hunger, inequality, and child abuse, the challenges faced by developed countries such as the uncontrolled consumption of natural resources, environmental pollution, including negative spillover effects on other, mostly less developed countries, are also considered. It is even more important that behind the sustainable development goals lies a strong commitment to their successful implementation. The complexity of this process is determined by the global character and diversity of the goals as well as the intertwined responsibilities of institutions at the global and regional levels, governments of individual countries, companies, and the wider public. Loose institutional mechanisms at higher levels only amplify the challenges. In this paper, the focus is on measuring and reporting not only the activities related to sustainable development but also the progress made in that process. The imperative for reporting arises from the requirements of managing the SDGs at the global, regional, and national levels, as well as the need to transfer significant responsibility to companies that play a pivotal role in their implementation. Different responsibilities in this process require tailored metrics, which are challenging to be established institutionally due to the variety of goals and issues. A particular problem lies in the lack of clear understanding of the relationships between global, national, and corporate reporting needs, making it challenging to find universally applicable solutions. The presence of multiple conceptual frameworks in the field of corporate sustainability reporting highlights the significant complexities inherent in this area. Bearing the aforementioned in mind, although the primary focus is on sustainability measurement and reporting, equal efforts are devoted to clarifying the connections between global, national, and corporate reporting, as their understanding is a key prerequisite for establishing a high-quality and coherent sustainability reporting system.

Keywords: *sustainability, sustainable development goals, environmental protection, sustainability accounting, corporate sustainability reporting, SDG index, international spillover index, SDG targets, SDG indicators*

Sažetak

Usvajanje ciljeva održivog razvoja (SDGs) predstavlja najveći kvalitativni iskorak u dostizanju održivog razvoja u odnosu na sve prethodne aktivnosti preduzimane u tom pravcu. Oni na sveobuhvatan način obuhvataju najvažnije globalne probleme sa kojima se čovečanstvo suočava. Shodno principu pravičnosti ciljevi održivog razvoja se na jedan uravnotežen način odnose na sve probleme koji opterećuju razvijene i nerazvijene zemlje sa namerom da se do 2030 ispuni cilj „leaving no one behind", odnosno da niko ne bude izostavljen. U tom smislu, u okviru ciljeva održivog razvoja se ravnopravno sa problemima koji se odnose na siromaštvo, glad, nejednakost i zloupotrebu dece, razmatraju i problemi koji su svojstveni razvijenim zemljama po pitanju nekontrolisane potrošnje prirodnih resursa, zagađenja životne sredine, uključujući i prelivanje negativnih efekata na druge, najčešće nerazvijene zemlje. Još je važnije što iza ciljeva održivog razvoja stoji snažno opredeljenje u pogledu njihove uspešne implementacije. Kompleksnost ovog procesa je određena globalnim karakterom ciljeva, njihovom raznovrsnošću, kao i isprepletanom odgovornošću institucija na globalnom i regionalnom nivou, vlada pojedinačnih zemalja, preduzeća i najšire javnosti. Labavi institucionalni mehanizmi na višim nivoima čine izazove još većim. U ovom radu fokus je stavljen na merenje i izveštavanje, ne samo o ostvarenim aktivnostima

koje su povezane sa održivim razvojem, već i ostvarenom napretku u tom procesu. Neophodnost izveštavanja opredeljena je potrebama upravljanja ciljevima održivog razvoja na globalnom, regionalnom i nacionalnom nivou, ali i potrebom prenošenja značajne odgovornosti na preduzeća koja imaju važnu ulogu u njihovoj realizaciji. Različite odgovornosti u ovom procesu zahtevaju i različitu metriku, koju zbog raznovrsnosti ciljeva i problema nije lako institucionalno postaviti. Poseban problem je nedovoljno jasno prepoznavanje veza koje postoje između globalnih, nacionalnih i korporativnih potreba za izveštavanjem, što otežava dolaženje do univerzalnih rešenja. Različiti konceptualni okviri koji u ovom trenutku postoje na području korporativnog izveštavanja o održivosti na ubedljiv način potvrđuju velike izazove koji postoje na ovom području. Imajući ovo u vidu, iako je fokus na merenju i izveštavanju o održivosti, jednaki napori su uloženi na prepoznavanju veza koje postoje između izveštavanja na globalnom, nacionalnom i korporativnom nivou, jer je njihovo razumevanje ključni preduslov kvalitetnog i logično postavljenog sistema izveštavanja o održivosti.

Ključne reči: *održivost, ciljevi održivog razvoja, zaštita životne sredine, računovodstvo održivosti, korporativno izveštavanje o održivosti, SDG indeks, internacionalni indeks prelivanja, SDG targeti, SDG indikatori*

Introduction

There is no doubt that humanity has made enormous progress in various spheres during its long history, from numerous innovations, incredible economic achievements and increasing growth rates, increased food production, improvement in infrastructure and transportation, better quality of education, fascinating advancements in information and communication technologies, reduction in newborn mortality, to the improvement in gender equality, employment increase, higher healthcare quality, rise in population life expectancy, and enhanced well-being. However, there is another side to this story. The incredible development has, on the other hand, brought many problems that have been ignored for a long time. Namely, the price paid for the aforementioned achievements is quite high.

The development of industrial production has been accompanied by investments in the construction of production capacities, residential areas, infrastructure in the broadest sense, etc. All of this has led to the consumption of raw materials, deforestation, the reduction of fertile land, and so on. The depletion of natural resources leads to the grim fact that current generations are actually consuming resources that belong to future generations, which exacerbates intergenerational inequality. At the same time, the unequal distribution of wealth jeopardizes intragenerational equity, resulting in a widening gap between the rich and the poor. Moreover, despite significant development, the number of hungry people has not decreased. Additionally, climate change seriously threatens the planet. Global warming is a reality that is difficult to change. Large areas of fertile land are turning into worthless deserts. The destruction of large areas of forests not only depletes natural resources but also increases the risks of soil erosion. The reduction in biodiversity, through negative impacts on human health and climate change, directly endangers long-term sustainability and, consequently, the achievement of the sustainable development goals. If we also consider the significant irresponsibility towards the environment, resulting in water, soil and air pollution, disposal of large amounts of toxic waste with long lifespans, and degradation of the ozone layer, then it becomes quite obvious that we have truly paid a high price for the development we have experienced thus far.

The aforementioned infrastructure sectors, such as energy, transport, water, digital communications and construction, are alone responsible for 79% of total greenhouse gas emissions (50 billion tons) and 88% of the total costs of climate change adaptation (USD 81.6 billion for the period 2010-2015), including ensuring uninterrupted water supply, protecting infrastructure facilities in coastal areas from flooding, building early warning systems, establishing emergency infrastructure, relocating infrastructure facilities from threatened areas, among others [27, pp. 13-14]. Moreover, global construction activities within infrastructure sectors (energy, transport, water, and digital communications) are booming more than ever before. It is estimated that the implementation of the sustainable development goals will require investments of USD 50 trillion in these sectors in the period 2016-2050 [27, p. 18]. Therefore, the consequences that may arise if we disregard the principles of sustainability in infrastructure development seem crystal clear.

It is paradoxical that today the richest countries in the world and the wealthiest individuals are discussing climate change, the green economy, and sustainability.

These are the very economies, companies, and individuals that have contributed the most to climate change, excessive consumption of natural resources, and environmental pollution. This raises questions about honesty and ethics, particularly considering the need for new businesses, new technologies, the application of artificial intelligence, and other costly endeavors that are not accessible to everyone but still yield high profits. Now, these initiatives are being presented under the guise of environmental protection and in pursuit of other sustainable development goals.

Geopolitical interests still outweigh the sustainable development goals, as war conflicts directly undermine their achievement. The most developed and largest countries, which should have the greatest responsibility for shaping events on the international level, do not seem to be up to the task entrusted to them. It is obvious that geopolitical upheavals have not been caused by less developed countries. The war in Europe, in which, directly or indirectly, the largest countries of the world participate, has completely overshadowed the narrative of the green transition, climate change, and renewable energy sources. Armed conflicts lead to a great loss of human lives, substantial infrastructural destruction, destruction of natural resources, rises in food prices, increases in poverty, and the use of public funds for military purposes, etc. Today, world military expenditure is increasing, both in countries that directly participate in conflicts and in countries that are not involved in them. In 2021, for the first time, global military spending exceeded USD 2 trillion [29, p. 7]. The number of refugees in 2022 increased by 35% compared to 2021, reaching a record high of 36.4 million people by the end of 2022 [31, p. 14]. This requires the redirection of funds, among other things, from financial resources that could be used for the implementation of sustainable development goals. Consequently, their achievement by 2030 is highly questionable. In this sense, the system of measuring progress in implementing the SDGs must not be adapted to show that something has been accomplished when, in fact, it has not.

In light of the aforementioned facts, the primary objective of this paper is to explore the issue of measuring progress towards SDGs at the global and national levels as well as the role of corporate reporting in facilitating their achievement. At the global level, monitoring the implementation of the SDGs calls for the development of metrics that will evolve into a multidimensional global index or a comparable composite measure that would enable effective monitoring of progress and the ranking of individual countries based on their contributions to achieving these goals. At the national level, metrics should enable the monitoring of progress toward individual sustainable development goals and targets, contributing to enhancing sustainability within individual countries, in all parts of the world, and ultimately, on a global scale. Finally, responsibility for reporting on specific activities falls on the corporate level, and this reporting must align with expectations at both the national and global level. These efforts collectively aim to bolster the efficiency of sustainability management across all three levels.

Challenges of measuring progress in achieving sustainable development goals

Despite the existence of some sustainability-focused activities before, albeit of a more partial nature, we could argue that the establishment of sustainable development goals by the United Nations, one of the most known and influential global institutions, was a pivotal and long-awaited process. It represents a universal call for heightened responsibility in safeguarding the planet and people from the spread of pollution, climate change, hunger, poverty, and unequal access to education and healthcare, fostering more conscientious production and consumption, protecting biodiversity, i.e. advancing towards creation of a fairer, safer and more responsible society. It also serves as a heartfelt plea for the preservation of the planet and all life inhabiting it, in a manner that does not jeopardize the rights and interests of future generations. Further, it is an attempt to guide the entirety of humanity towards behavior that promotes sustainability across all areas critical to the survival and functioning of the planet. At the very beginning of the 2030 Agenda, the directions of action are clearly defined: eradicate hunger, reduce poverty, enable a dignified life for all inhabitants of the planet, reduce pollution, ensure sustainable production and consumption, sustainably manage natural resources in the

interest of current and future generations, ensure gender equality, the right to healthcare, quality education and prosperity, just and inclusive societies, free from wars and other forms of violence. Activities in this direction should enable the green transition and sustainable development.

The adoption of comprehensive global sustainable development goals took place on September 25, 2015, at the United Nations Summit on Sustainable Development. Alongside this milestone, the 2030 Agenda for Sustainable Development was adopted [28], comprising a set of 17 Sustainable Development Goals (SDGs) to be achieved by 2030. Simultaneously with the adoption of the Agenda, responsibility for their implementation was delineated and distributed. It is an event of historical importance, especially considering that, in the context of sustainability, no country can claim to be sufficiently developed, regardless of its location in Europe, North America, Asia, or any other part of the world. Furthermore, countries with more developed economies have made significantly greater contributions to the adverse impacts of climate change, pollution, and the depletion of natural resources. Many countries consume resources far beyond their capacities. By importing raw materials, relocating production, and polluting technologies to other, less developed countries, they have depleted global resources, endangering sustainability beyond their borders, and widening the gap between the rich and the poor. For instance, "the EU uses almost 20% of the Earth's biocapacity although it comprises only 7% of the world population. In other words, 2.8 planets would be needed if everyone consumed at the rate of the average EU resident" [32, p. 6].

In addition to the numerous activities aimed at achieving the ambitiously set diverse sustainable development goals, effective management of these complex issues involves monitoring progress in their implementation. This underscores the challenge of measuring performance in reaching defined goals. Monitoring progress enables an assessment of the pace at which progress is being made toward achieving the SDGs, providing insights into how close or far a country is from reaching its sustainable development goals. Measuring progress helps in both setting and reviewing strategies, identifying weaknesses and risks associated with SDGs implementation, assessing deficits in financial resources, etc. The broad range of goals, along with numerous targets within each and a variety of metrics, presents a significant challenge, boiling down to the question: How can we establish a functional system for measuring the achievement of sustainable development goals that would simplify comprehensive monitoring of their implementation, making key dimensions of sustainable development visible? Answering this question is far from straightforward, as multiple complexities can be identified across different areas.

Although the SDGs are officially established by a resolution of the UN General Assembly, individual states have no legal obligation to integrate these goals into their legal systems. This does not mean that individual states do not undertake such integration, but rather that solutions in this regard are not universally applied. The extent of mandatory reporting can vary significantly, and the structure of reports may differ based on the chosen conceptual framework, leading to variations in metrics. These differences complicate the process of implementing sustainable development goals. The situation is further exacerbated by the lack of clear institutional oversight over the achievement of global goals [3]. In practice, states have the freedom to interpret the relative importance of individual SDGs, determine how to implement them, and track progress towards their achievement. Accomplishing the SDGs requires the utilization of substantial national capacities in the process of enhancing performance to achieve sustainability. Furthermore, "companies are expected to define their goals in compliance with the SDGs and to incorporate them into their strategies" [16, p. 93].

While the sustainable development goals have a global character and call for universal application, it is important to recognize that sustainability-related challenges at the national level can vary significantly. Each country must chart its own path and carry out the transformation of its society in line with the SDGs, thereby contributing to the sustainability of the planet. Indeed, the SDGs are established globally, but their achievement actually begins with addressing national-level issues, which requires the active involvement of governments, leveraging their powerful regulatory and incentive mechanisms, as well as companies that are often seen as major contributors

to the current state of the planet. Hence, the SDGs should be tailored to fit the national and local context, taking into account factors such as development level, attitudes towards the environment, exposure to risks, and so forth. These goals should first be transposed to the level of individual regions, which may be differently affected by specific sustainable development goals, then to the level of individual countries and, finally, to the level of the primary contributors to pollution, namely, companies. Translating global aspirations to the national level is imperative, as national strategies and policies require significant capacities which are not always readily available, primarily due to uneven development of national economies, disparities in the reliance on environmentally compromised technologies and technological processes, unequal access to sources of finance, cultural differences, varying levels of responsibility, etc. Some authors highlight that the ability to align the global aspirations, as defined by the 17 SDGs, with the implementation of these goals tailored to the needs of each nation, can also serve as a measure of progress in their achievement [3, p. 28].

Due to their general and multidimensional nature, expressing the sustainable development goals numerically is not an easy task. The multitude of targets within each goal further complicates the measurement process. Let us recall that the 17 SDGs are underpinned by 169 targets, with 252 indicators initially conceived for their measurement. In such circumstances, it is evident that developing a single, composite measure to serve as a basis for monitoring progress and ranking individual regions and countries poses a significant challenge. Such measures should account for the diversity between individual regions and countries, while simultaneously assessing/measuring the contribution of numerous dimensions of the SDGs to the ultimate achievement of the goals outlined in the 2030 Agenda. The complexity of the problem is vividly illustrated by the fact that today, as we reach the halfway point of the projected period for achieving these goals, measurement challenges persist both conceptually and operationally. Namely, there is no universally accepted conceptual framework for reporting, which would be logical given the global nature of the issues. Instead, there are numerous efforts to develop different conceptual frameworks that cover various reporting objectives. However, it is obvious that there is no sufficient capacity to apply all of these frameworks. Furthermore, it is worth noting that among the numerous indicators that have been identified, a significant number of them are not functional, regardless of whether the issue lies in the lack of clarity on how something should be measured or if the methodology has not yet been developed.

Multidimensional goals necessitate multidimensional metrics. The SDGs are quite diverse and encompass different spheres of economic, environmental, and social development. Moreover, individual national economies are unequally impacted by various SDGs. For instance, addressing the issue of hunger differs significantly between Africa and the USA or Europe. Similarly, tackling child exploitation in value creation processes varies across regions. This complexity adds further challenges to the measurement process, as it raises questions about how to weigh the importance of individual SDGs when assessing their achievement at the level of national economies. While the issue of internal and external reporting is typically linked to accounting frameworks, it is evident that accountants currently lack the interdisciplinary expertise required to independently undertake this process. The necessity for broad interdisciplinary knowledge raises at least two questions. The first question pertains to whether the necessary interdisciplinary skills could be exclusively developed within the accounting profession. In light of these circumstances, another question arises regarding how the education process could be adapted to meet evolving expectations. An alternative approach involves expanding competencies and responsibilities beyond the realm of accounting, which entails integrating non-accounting experts from various fields, such as those with technical, technological, IT, and environmental protection-related knowledge, etc., into the reporting process.

Transposing the SDGs and their accompanying metrics, including specific indicators, to the corporate level introduces additional complexity and confusion. While the direct relationship between sustainable development goals and corporate activities may not be immediately evident, companies actually bear a significantly greater responsibility than initially perceived. It is relatively easy

to recognize the connection between business activities and environmental pollution or climate change, but it may be less obvious for other sustainable development goals. Nevertheless, companies play an important role in numerous processes that have a negative impact on the achievement of sustainable development goals. However, we firmly believe that companies possess the greatest potential to be the primary catalysts for sustainable development. This belief is grounded in their capacity to: 1) decrease the excessive consumption of natural resources, 2) implement climate-friendly technologies, 3) allocate resources more substantially towards socially responsible projects, and 4) fulfill their mission of generating value for all stakeholders, including, of course, the broader community. Simultaneously, it is imperative for companies to contribute to state revenues through taxes, carbon taxes, and other regular payments. These revenues can be utilized, among other purposes, for the implementation of certain SDGs. However, it is equally important for companies to engage in individual activities and projects aimed at aiding communities in addressing various challenges. In this context, the creation of value represents a significant potential that should be partially directed towards sustainable development efforts. Keeping this perspective in mind, we can agree with the assertion that "The United Nations' Sustainable Development Goals are introduced as a business-relevant, universally applicable framework that may guide companies in better measuring and managing their impacts on sustainability in light of this expanded understanding of corporate sustainability" [23, p. 1]. However, it is obvious that the matter of sustainability reporting remains unresolved and presents an urgent challenge for regulators.

The implementation of the SDGs calls for a green transition of the economy, which also means embracing the principles of a circular economy. While it is clear that such qualitative leaps require substantial investments on a global scale, it is important to acknowledge that sources of finance are not equally accessible to all countries. Without delving extensively into these issues, it is sufficient to mention at this point that regardless of the sources of finance (green bonds, green credit sources, primary issues of corporate shares for green investment, taxes, carbon taxes and other fees, international financial institutions, state funds, etc.), the rational utilization of these sources requires the establishment of clear criteria for capital allocation decisions. In other words, the provision of finance is intricately linked to metrics. Financing the implementation of the SDGs entails developing a suitable methodology for evaluating the viability of individual projects aligned with the green transition, while also discouraging environmentally compromised projects. Despite potentially offering attractive returns to investors, such projects are ultimately unsustainable in the long run. It is evident that the adopted methodology must align with the aim of attaining the SDGs as well as with metrics that clearly promote attractive green investment projects.

Measuring progress towards the SDGs at the global level

Measuring sustainability is not a novel challenge. There have been numerous attempts to establish a metric focused on sustainability. Let us mention Environmental Sustainability Development Indices (Ecological Footprint, 1990, Environmental Sustainability Index, 2000, Environmental Performance Index, 2005, Well-being Assessment Method, 1999), Urban Sustainability Indices (City Development Index, 1996, City Prosperity Initiative, 2013), Economic Sustainability Indices (Measure of Economic Welfare, 1972, Index of Sustainable Economic Welfare 1989, Genuine Progress Indicator, 1995, Genuine Savings Index, 1999), Compilation of sustainable development indicators, Eurostat, 2005, MDG indicators aimed at measuring progress towards the MDGs (Millennium Development Goals) and others [4]. The key characteristic of all these attempts is the aim to develop a single, often composite measure that can assess the progress towards predominantly partial sustainability-related goals.

Undoubtedly, the adoption of the UN 2030 Agenda has elevated sustainability to a new level of global significance. Today, it stands as one of the most pressing and research-worthy topics worldwide. Although sustainability is conceptually clear and currently has no viable alternative, managing sustainable development goals at the global

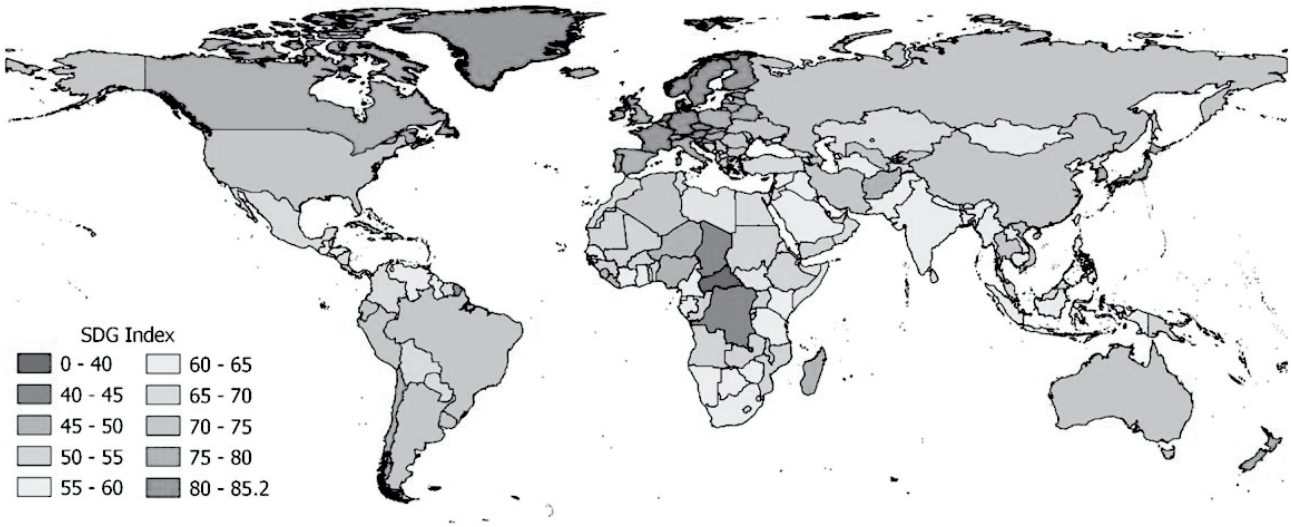
level is challenging due to the absence of comprehensive global mechanisms and often results in numerous debates on various aspects of sustainable development. A minimum requirement for more robust institutional monitoring of the fulfillment of sustainable development goals in the designated period is tracking progress in their implementation. Therefore, the global SDG index represents a significant advancement in creating metrics to assess the achievement of the SDGs.

The establishment of the sustainable development goals created an integrated framework that identifies key sustainability challenges through individual SDGs, targets aimed at achieving these goals, and numerous indicators measuring the progress toward each goal. In this regard, the SDG index, as a composite measure for assessing the global progress towards sustainable development goals, relies on a consistently established metric, enabling the ranking of countries based on their progress in achieving the SDGs and, consequently, enhancing the effectiveness of institutional management of these processes at the global level. While the SDG index is widely accepted as a comprehensive measure for monitoring progress in achieving the SDGs, it is not without its flaws. However, it has become the most widely used composite measure tracking progress in achieving the SDGs. The level of representation and expressiveness of the index in revealing progress towards the SDGs can be observed in Figure 1, which illustrates the positioning of certain regions and countries on the global map.

The calculation of the SDG index is based on a conceptual framework consisting of 17 SDGs elaborated through approximately 100 indicators. As information availability improves and methodology evolves, the set of indicators undergoes modifications, rendering the calculation of the SDG index a dynamic process. This process also entails periodic revisions of the methodology, driven by efforts to enhance the quality of individual indicators. Initially, individual indicators are calculated, and their arithmetic mean is determined to establish the score for each SDG. Subsequently, the scores for each of the 17 SDGs are averaged to derive the SDG index. The creators of the SDG index have opted for assigning equal weight to each SDG in the index creation process, underlining the belief that every SDG holds equal importance in the ultimate achievement of the goals outlined in the 2030 Agenda.

We have emphasized several times that creating a singular composite measure to encapsulate the multidisciplinary nature of the SDGs, as well as the nuances of regions and countries, varying levels of development, specific information needs, and numerous other disparities, is an exceptionally complex endeavor. A one-size-fits-all solution is challenging to achieve. Therefore, occasional adjustments are not only understandable but also necessary, encompassing the introduction of new indicators and

Figure 1: Map of the Sustainable Development Goals (SDG) Index reported for each country in the Sustainable Development Report 2019



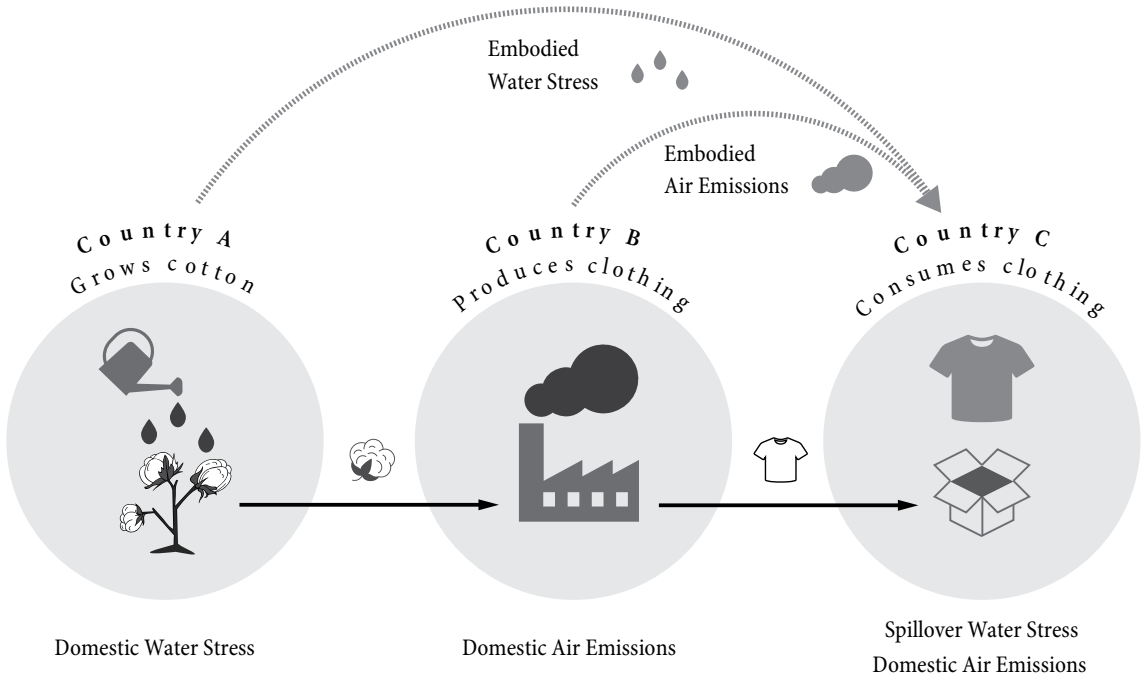
Source: [18, p. 2]

alterations in methodology to ensure the highest quality of information. At this point, we would like to underscore a particular issue that undoubtedly impacts the accuracy of the SDG index and the capacity to create a realistic portrayal of individual countries' contributions to global sustainability. Namely, it is a well-established fact that the ramifications of various corporate activities cannot always be neatly confined within narrow national borders. Certain negative effects of environmental pollution originating in one country can reverberate and inflict harm on others. Additionally, developed countries frequently outsource their production and environmentally detrimental technologies to other, less developed countries. One specific issue is the extraction of natural resources from less developed countries to fulfill the needs of developed societies, reaping benefits that extend beyond their own capacities. Consequently, the redistribution of wealth and the widening gap between the rich and the poor are inevitable outcomes. The emergence of international spillovers and their impact on the attainment of SDGs in other countries is depicted in a simplified manner in Figure 2.

Analyzing the illustration in Figure 2 underscores the crucial role of supply chains, whose activities span across multiple countries in the pursuit of sustainability goals. The stress stemming from water scarcity in the first country and gas emissions in the second country are not spillovers but rather domestic environmental impacts. However, they do represent spillovers to the third country where the demand for these products originates. So, it is important to note that not all sectors have the same level of impact on spillovers. Sectors such as construction, textile and clothing manufacturing often contribute to negative spillovers, but challenges may also arise in energy, forestry, water management, the chemical industry, and the trade sector. For instance, from the provided illustration, it becomes evident that negative spillover effects from one country to another, or across countries, hinder the effective addressing of sustainability issues from the perspective of the global community's interests. Redirecting these effects to other countries raises significant regulatory, business, and ethical concerns that warrant careful examination.

The impact of spillovers extends across several SDGs, with SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), and SDG 17 (Partnerships for the Goals) being frequently mentioned as particularly sensitive to these effects. The measurement of the impact of international spillovers on

Figure 2: Illustration of environmental impacts embodied in international trade



Sources: [24, p. 3]

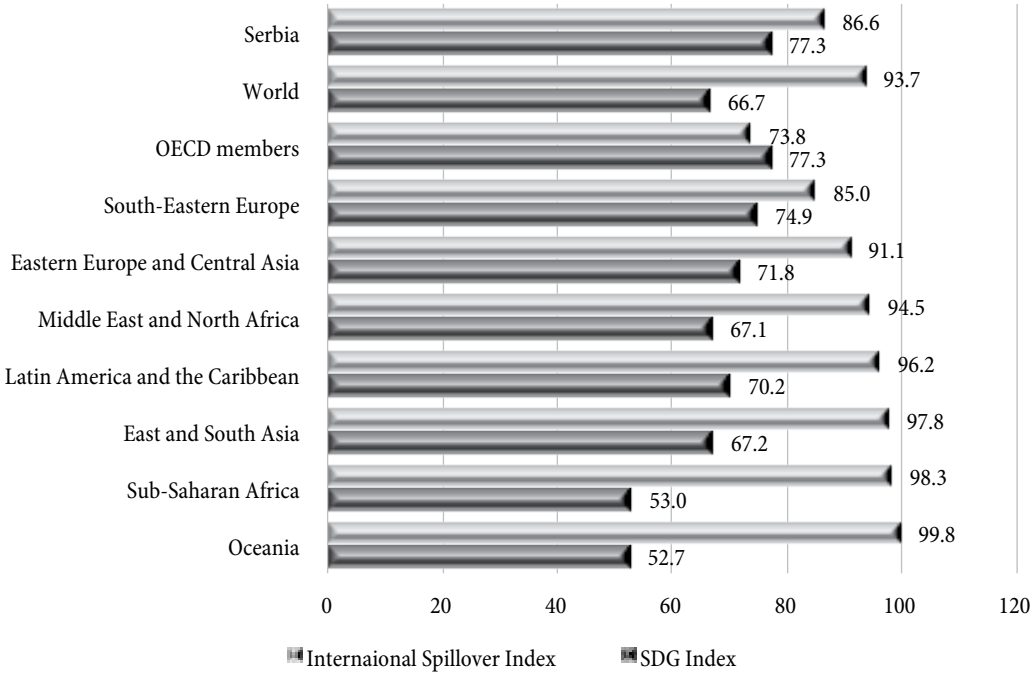
the achievement of the SDGs begins with identifying the likelihood of their emergence. In this context, it is useful to categorize spillovers into four distinct categories [20]:

1) Environmental and social spillovers embodied into trade – encompass negative effects associated with pollution, the use of natural resources from other countries, exports of toxic pesticides, illegal wildlife trade, and so forth.
2) Direct cross-border flows in air and water – entail effects transferred from one country to another due to emissions of harmful gases, water pollution, etc.
3) Spillovers related to economic and financial flows – involve investment flows, international financing, discretionary arrangements between banks and their clients, such as financial secrecy, corruption, etc.
4) Peacekeeping and security spillovers – cover negative externalities stemming from activities such as arms sales, organized international crime, and so on.

All of this clearly underscores the need to measure and monitor spillover effects on the SDGs. Recognizing the challenges in this area led to the development of the International Spillover Index, which is published alongside the global SDG index. In the following part of the section, we delve into the analysis of the SDG index and the International Spillover Index (Figure 3), considering results at the regional level as outlined in the sustainability development reports. Additionally, we provide information for the Republic of Serbia, Southeastern Europe, to which our country belongs, alongside the score for the global community (World).

There are several notable observations to highlight. First, the SDG index scores reveal significant disparities among regions regarding the level of SDG achievement, reflecting the diverse challenges they confront. Second, a closer examination of the average index reveals that regions such as Oceania, Sub-Saharan Africa, East and South Asia, and Latin America fall below the average, while OECD countries, representing the most developed nations, surpass it. Third, Serbia demonstrates a favorable position in terms of the SDG index, aligning with OECD countries and slightly exceeding the average for Southeastern Europe, where Serbia is included. Fourth, the International Spillover index tends to be notably high, particularly in countries with lower SDG index scores. OECD countries exhibit the lowest Spillover Index, suggesting that these countries have the most pronounced negative spillover effects on others, as a higher score indicates a greater contribution

Figure 3: SDG Index and International Spillover Index



Source: Authors based on: Online database for the Sustainable Development Report 2023 [21]

to positive and lesser contribution to negative spillover effects. This outcome is unsurprising given that developed countries typically consume the most resources, many of which are sourced from less developed countries. Lastly, Serbia's Spillover Index is relatively elevated, though it falls below the global average yet surpasses the average for OECD countries.

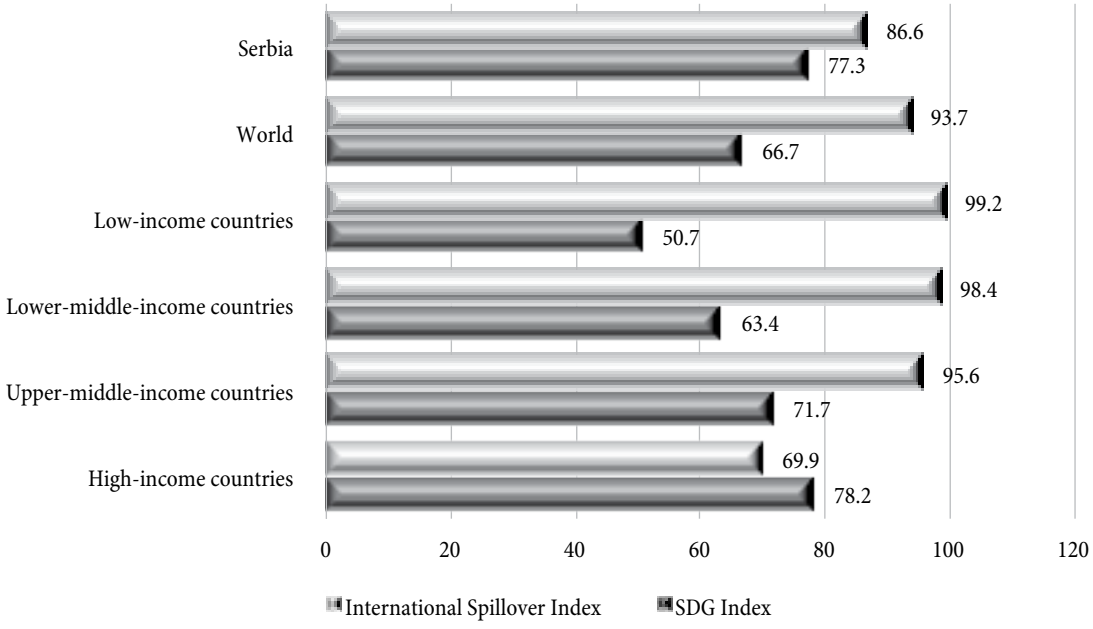
We can also analyze the Spillover and SDG indices in relation to income levels. From this perspective, countries are categorized into four groups: low-income countries, lower-middle-income countries, upper-middle-income countries, and high-income countries. Additionally, we include data for Serbia, as well as the global SDG and Spillover indices. The results are presented in Figure 4.

The analysis indicates that high-income countries exhibit the highest SDG index compared to all other groups we examined, including the Republic of Serbia and the global community average (World). However, high-income countries also generate the largest negative spillover effects compared to the other groups of countries included in this overview. This is attributed to unsustainable levels of consumption, financial secrecy, and the existence of tax havens [21, p. 32]. Conversely, the movement of the SDG index is inversely correlated with that of the Spillover index. From the viewpoint of low-income countries, as national income rises, so do the SDG indices, while positive spillover effects decrease. Concurrently, negative spillover effects, particularly those related to the environment, are influenced by low prices of natural resources and the adoption of national policies primarily focused on national goals rather than global interests aimed at preserving the planet [21, p. 32].

The developed SDG index offers numerous advantages. By encompassing all goals and available indicators in its calculation, it serves as a comprehensive metric for calculating the global index, providing detailed insights into progress in the implementation of SDGs across various fronts. The inclusion of all dimensions of sustainable development goals ensure that each goal receives equal attention, underscoring the importance of not overlooking any particular issue. Furthermore, despite the dynamic nature of its calculation, which affects the volatility of indicators not only due to progress or lagging behind but also due to changes in indicators and/or methodologies over time, it provides a consistent framework and a measure that can be the basis for gaining insight into the scores in different years in terms of progress towards the goals outlined in the 2030 Agenda.

However, we must point out that there are doubts about the potential bias in the calculation methodology of the SDG index due to the fact that predominantly underdeveloped countries tend to rank lower on the

Figure 4: 2023 SDG Index and International Spillover Index



Source: Authors based on: Online database for the Sustainable Development Report 2023 [21]

index, while developed countries, particularly those in Scandinavia and Western Europe, often occupy the top positions. Analogously, countries with lower GDP tend to face greater challenges in achieving the SDGs, as indicated by this index, which means that they lack sufficient sources of finance despite significant needs. Also, it should be noted that less developed countries do not have advanced industrial production and typically do not generate significant negative spillovers to other counties, unlike developed countries that often relocate polluting production capacities beyond their borders, exploit the natural resources of other countries, and exhibit high levels of consumption. Undoubtedly, developed countries are major contributors to environmental degradation and the hindrance of sustainable development goals. However, it is crucial not to overlook the greatest challenges faced by underdeveloped nations, including poverty, hunger, human rights, and child abuse. We believe that addressing these issues should be a priority for both less developed and developed countries.

Methodological challenges and the absence of official data in assessing cross-border impacts, or spillover effects, raises concerns about the reliability of the Spillover index. It appears that there may be a bias favoring developed countries over less developed ones. If this bias truly exists, it could obscure the true responsibility of developed countries for the current state of the planet.

The issue of prioritizing goals may not completely align with the principle of "leaving no one behind," but it cannot be entirely disregarded. It is important to recognize that different countries and regions face varying degrees of urgency in addressing specific SDGs. Additionally, achieving a synergistic effect across all SDGs can influence the sequencing of activities aimed at fulfilling individual goals. While political priorities should not be a decisive factor, they cannot be ignored given the reality of urgencies in addressing various issues.

The existing challenges in calculating the SDG index have prompted the search for alternative solutions. For instance, SDSN, the University of Tokyo, and Yale University have developed an alternative Spillover index known as the Global Commons Stewardship Index, which indicates that wealthy countries have the poorest scores in this index for 2023. Additionally, efforts are underway to enhance the utility of the SDG index.

When it comes to the objections regarding the bias of the SDG index, it is worth noting the views put forth by Puertas and Bermúdez (2020). They emphasize that the global average index is inadequate for monitoring the progress of individual countries or regions, particularly in terms of fairness, as some countries deviate significantly from the average. Consequently, the global SDG index average fails to indicate whether the progress pace of less developed countries is adequate for achieving the SDGs on a global scale.

Table 1: Indices for measuring progress towards achieving the SDGs

$$GSPI_1 = \frac{\Sigma \Delta (\text{SDG Index})}{n}$$

$$GSPI_2 = \frac{\Sigma \Delta (\text{SDG Index}) \times \text{Position}}{\Sigma \text{Position}}$$

$$GSPI_3 = \frac{\Sigma \Delta (\text{SDG Index}) \times \text{GDPRel}}{\Sigma \text{GDPRel}}$$

$$GSPI_4 = \frac{\Sigma \Delta (\text{SDG Index}) \times \text{GDPRel} \times C2}{\Sigma \text{GDPRel} \times C2}$$

Note: GSPI – Global SDG Progress Index; Position – Country's position in the SDG Index ranking; GDPRel indicates the relationship between the maximum GDP per capita (the one corresponding to the country with the greatest value) with respect to the GDP of the analyzed country; C_1 = Population; C_2 = ((ln (Population / Popmin) + 1) x ((ln (Area / Areamin) + 1); Popmin and Areamin are the minima for each of the two concepts.
Source: [18]

The first index presented in Table 1 (GSPI 1) is the simplest but also the least effective compared to all the indices presented here. While it indicates progress, it fails to identify which countries are propelling development. The second index is based on weighting the SDG index according to countries' positions on the SDG list, which means it should provide more incentive for countries with lower ranks, i.e., lower SDG indices. GSPI 3, on the other hand, weights the SDG index with GDPRel, likely aiming to highlight that countries with fewer available resources need to exert more effort to achieve the SDGs. Finally, GSPI 4 takes a further step to mitigate differences arising from the varying sizes of countries. For this purpose, two weightings related to population and area are employed. This final index aims to maintain the stability

of the SDG score. These suggestions indicate that further enhancements are feasible for the SDG index at the global level [18, pp. 6-9]. It is advantageous that the calculation of these indices builds upon the existing architecture of the SDG index, with additional information used for weighting being publicly available.

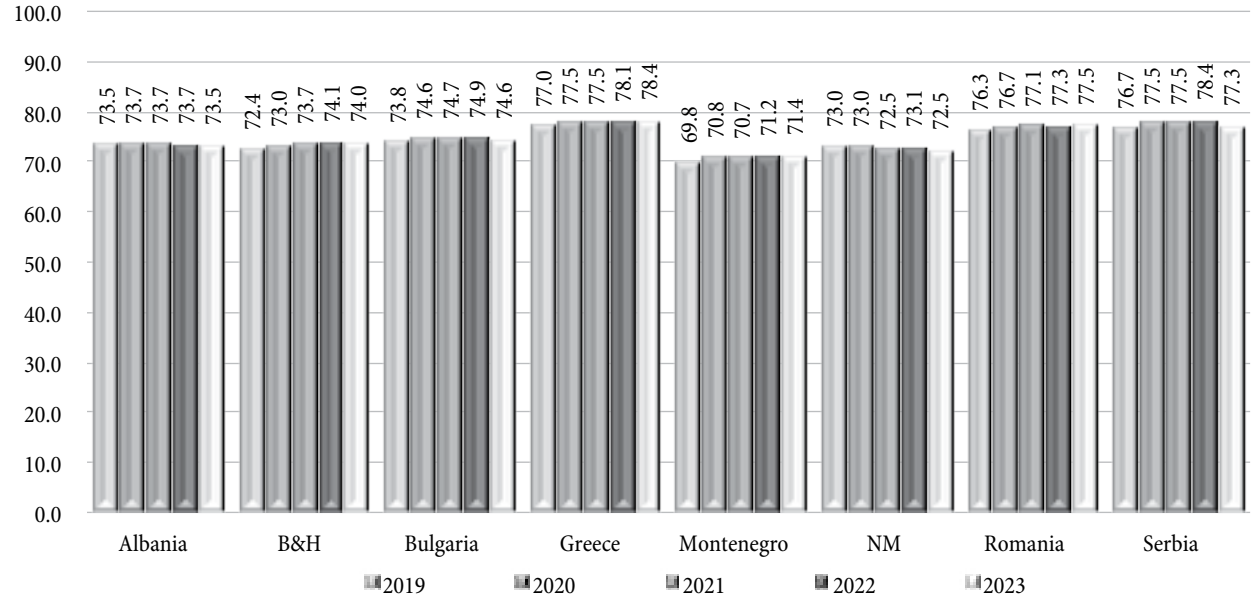
Finally, as anticipated, the global SDG index primarily assesses the level of achievement of the SDGs at the level of individual countries, first for each SDG individually, and then aggregates the scores into a national-level score as a weighted average. The ability to analyze the contribution of individual SDGs to the national-level index offers valuable insights into areas of less or greater progress, stagnation, or lagging behind. This is particularly important for decision-makers, especially at the state level, as it enables them to identify areas requiring greater effort and resource allocation to improve the current situation. Last but not least, the significance of the global SDG index lies in its ability to rank countries according to their progress towards achieving the SDGs. It provides an overview of each country's current position, its comparison with other similar countries or regions, and allows for the analysis of trends indicating the pace of progress or potential limitations in achieving the goals. The transparent publication of results as well as the availability of open databases make this information accessible to various stakeholders, including national, regional, and global policymakers, decision-makers, academic institutions, research organizations, regulatory bodies, civil society, and other interested parties.

Implementation of SDG metrics at the national level

National governments are in charge of the implementation of the SDGs in their countries. However, appropriate metrics and data collection systems are prerequisites for directing, measuring and monitoring national progress towards SDGs. A country's overall SDG Index score could be a good starting point. It is calculated on the premise that each SDG is equally important and consequently equal weights are assigned to each SDG. However, it should not lead to the conclusion that low performance of one goal could be compensated by high performance of some other one, since the 2030 Agenda requires progress on the whole spectrum of goals. The overall country index should be seen as average performance of the country across all 17 goals. Figure 5 shows this index for Serbia and other countries in South-Eastern Europe for the period 2019-2023.

In the given period, no significant changes could be identified in SDG index for South-Eastern countries. It is not surprising considering generally unfavorable conditions

Figure 5: South-Eastern European Countries' SDG Index scores for the period 2019-2023



Source: Authors based on: Online database for the Sustainable Development Report 2023 [21]

in this period due to the pandemic and geopolitical crises, which caused stagnation in the world average SDG index score, reducing the chances of meeting the SDGs by 2030. However, six out of eight countries slightly rose (up to two points) their scores in 2023 compared to their 2019 levels. Generally, the countries' performances were quite similar, since the whole region has some same attributes which influence individual SDGs in the same way. All scores were in the range from 69.8 to 78.4, whereby in 2023, Greece had the best achievement and reached score of 78.4. Serbia had the third-best achievement in 2023, but experienced a slight decline in the score compared to the 2022 level. It should be noticed that the score data from the original yearly reports are adjusted to reflect changes in methodology from year to year, so improving the comparability. However, this also contributes that time series are more smoothing.

The overall SDG Index could, however, blur low performance on some of SDGs if a country performs well on other SDGs. It is therefore necessary to look into the achievement of each SDG separately. In order to enable the measurement of a country's performance on each SDG, UN-backed Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) developed indicators for each SDG and its related targets. The last revision of indicators resulted in 231 indicators (248 with repetition). However, the calculation of SDG index includes a lower number of indicators to make the operationalization more effective, whereby some indicators exactly match those from official UNSTATS list of indicators or align with them closely, but there are indicators that are out of UNSTATS system. The approach employed is based on the intention to bridge some of the indicator and data gaps and provide useful metrics wherever possible. Table 2 presents the number of indicators per goal in 2023 SDG index and, for the purpose of comparison, the number of indicators per goal in UNSTATS.

The number of indicators varies significantly across the 17 SDGs. Although the average number of indicators per SDG goal is around 6 considering SDG index indicators used for non-OECD countries (7 for OECD countries), only 2 indicators (3 for OECD countries) are used for SDG 1 and SDG 10, while SDG 3 is covered with the highest number of indicators, 14 (17 for OECD countries). Since each SDG is rather broad by its nature, the usage of only a few indicators could produce some biases. The relative weight of indicators related to some SDGs decreases as the number of indicators increases, as the score per goal is computed as the arithmetic mean of indicator scores. It is also evident that the SDG index indicators

Table 2: Number of indicators across the 17 SDGs

SDG	SDG Index Indicators non-OECD countries	% SDG Index Indicators non-OECD countries	SDG Index Indicators OECD countries	% SDG Index Indicators OECD countries	SDG Indicators (UNSTATS)	% SDG Indicators (UNSTATS)
SDG 1	2	2.04	3	2.46	13	5.24
SDG 2	8	8.16	9	7.74	14	5.64
SDG 3	14	14.29	17	13.94	28	11.29
SDG 4	4	4.08	8	6.56	12	4.83
SDG 5	4	4.08	5	4.10	14	5.64
SDG 6	5	5.10	7	5.74	11	4.44
SDG 7	4	4.08	4	3.28	6	2.42
SDG 8	7	7.14	8	6.56	16	6.45
SDG 9	7	7.14	11	9.02	12	4.84
SDG 10	2	2.04	3	2.46	14	5.65
SDG 11	4	4.08	6	4.92	15	6.05
SDG 12	7	7.14	7	5.74	13	5.24
SDG 13	3	3.06	4	3.28	8	3.23
SDG 14	6	6.12	6	4.92	10	4.03
SDG 15	5	5.10	5	4.10	14	5.65
SDG 16	11	11.22	12	9.83	24	9.68
SDG 17	5	5.10	7	5.74	24	9.68
Total	98	100	122	100	248	100

Source: Authors (based on web page of Sustainability Development Report [13] and list of UN indicators [30])

and the UNSTATS framework differ to a large extent not only because of a number of indicators, but also due to distribution of the total number of indicators across the 17 SDGs. It is clear that including some indicators or not influences the final assessment of the SDGs achievement.

Insight into the score of each SDG can help national governments to identify the areas of concern and inform their policies accordingly. The progress towards the SDGs indisputably demands an active role of government [5]. Table 3 details the score per goal for South-Eastern countries over seven-year period. The whole region especially excels in SDG 1 (No Poverty), which is the highest achieving goal, scoring above 94 for all countries. On the other side, the lowest performance was observed in SDG 9 (Industry, Innovation, and Infrastructure), with 22 scores below 50 during the given period. More striking, three countries did not achieve to move the score above 50 even in 2023. This result reflects huge problems of developing countries with weak infrastructure. Innovation is also hindered by the lack of resources [33]. However, innovation is an important source of economic growth. SDG 5 (seven scores), SDG 14 (seven scores), SDG 17 (four scores), SDG 2 (one score) and SDG 10 (one score) are found to be below 50 for one or two countries. However, only Bosnia and Herzegovina remained with such a score in 2023 for SDG 5 (Gender Equality).

In general, there is still considerable room for improvement at the individual country level in advancing sustainable development. In 2023, in relation to SDG 2, Serbia was the best performer with score of 75.8, while the worst performing country was Montenegro with score of 51.8. For other goals, the best and the worst performers were: SDG 3 – Greece (90.3) and Montenegro (75.7); SDG 4 – Greece (97.1) and Bosnia and Herzegovina (64.1); SDG 5 – Bulgaria (71.6) and Bosnia and Herzegovina (47.1); SDG 6 – Greece (97.1) and Montenegro (65.2); SDG 7 – Albania (84.3) and North Macedonia (69.9); SDG 8 – Romania (83.2) and Montenegro (61.6); SDG 9 – Greece (81.6) and Albania (43.6); SDG 10 – Albania (88.1) and Bulgaria (51.0); SDG 11 – Greece (85.6) and North Macedonia (65.6); SDG 12 – Serbia (85.4) and Greece (64.8); SDG 13 – North Macedonia (92.8) and Greece (80.2); SDG 14 – Romania (86.7) and Albania (50.2); SDG 15 – Bulgaria (94.1) and Montenegro (54.3); SDG 16 – Montenegro (78.5) and Albania (60.7); SDG 17 – Montenegro (85.7) and Romania (51.3). Serbia made a significant progress in SDG 9 (industry, innovation, and infrastructure) and SDG 10 (reduced inequalities) during this 7-year period. In 2023, Serbia achieved 100% on SDG 1 (no poverty), but scored worst on SDG 15 (Life on Land) and SDG 16 (Peace, Justice and Strong Institutions).

The useful tool developed in the form of SDG Dashboards helps countries to manage more effectively their performance towards achieving the SDGs. It classifies the level of performance per each goal into one of four colors, from green for SDG achievement over yellow, suggesting that some challenges remain, to orange which denotes significant challenges, and red that warns of major challenges ahead. These four-color ratings that mark a country's performance on each goal are assigned based on two indicators which had the worst values among all indicators within the respective goal. This approach could be seen as too stringent, but it penalizes low values across all performance dimensions, thereby forcing countries to make progress in their worst-performing areas. Better achievements will bring benefits to sustainable development, but also help countries to boost their progress. Research shows positive link between green economy standards implementation and national economies' competitiveness [6].

Table 4 presents the SDG dashboards for South-Eastern European countries. Across all countries, South-Eastern Europe had a majority of SDGs in orange rating (61.8%), indicating significant efforts are needed to improve them and redirect to the track of sustainable development. More striking, 11% ratings are red, calling for urgent actions. Each country has one to three red ratings and should give priority to the related SDGs. In Serbia, SDG 15 and SDG 16 require particular attention. For the whole region, one-fourth of all ratings are green (5.1%) or yellow (19.9%).

Another important perspective in the measurement of progress towards SDGs relates to analysis of trends. Table 5 summarizes trends for South-Eastern Europe countries.

Since the 2030 Agenda requires the achievement of SDGs by 2030, it is necessary to look into the rate of progress

Table 3: South-Eastern European countries' SDG Index scores and scores per goal for the period 2019-2023

Country	Year	SDG Index	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG 9	SDG 10	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16	SDG 17
SRB	2017	74.8	100.0	72.9	81.0	95.4	61.3	74.5	70.8	76.5	52.0	58.6	75.5	84.6	86.7		59.3	69.6	78.7
SRB	2018	75.7	100.0	66.0	79.9	96.6	61.8	74.6	70.3	76.9	57.4	69.6	78.7	84.3	85.7		59.3	69.2	80.3
SRB	2019	76.7	100.0	75.1	82.6	96.1	62.0	74.8	71.2	78.2	59.9	73.5	71.9	84.4	85.6		60.2	70.4	81.2
SRB	2020	77.5	100.0	76.2	83.0	94.5	64.0	74.9	71.0	79.7	64.6	75.3	74.3	84.3	85.6		60.7	69.9	81.4
SRB	2021	77.5	100.0	77.2	81.6	94.2	64.5	75.0	71.4	79.7	65.3	75.3	73.2	84.3	85.5		60.7	68.7	83.6
SRB	2022	78.4	100.0	75.8	82.0	93.6	64.8	75.0	71.4	81.9	70.7	75.3	76.5	85.4	88.5		60.8	68.3	83.8
SRB	2023	77.3	100.0	75.8	82.5	93.6	64.9	75.0	71.4	81.7	71.9	75.3	73.2	85.4	88.5		60.8	65.9	83.5
ROU	2017	75.5	97.3	66.9	79.1	84.6	52.9	75.5	77.0	83.0	53.0	79.3	88.3	79.7	88.5	85.1	79.5	72.1	42.6
ROU	2018	75.9	97.8	71.9	78.6	80.8	57.1	75.7	76.5	82.0	60.3	72.7	89.2	79.3	88.0	85.2	79.5	73.2	43.0
ROU	2019	76.3	98.1	74.3	79.5	82.5	57.0	75.9	76.3	82.5	62.1	73.0	86.0	78.8	87.2	85.4	79.5	73.5	46.0
ROU	2020	76.7	98.2	73.3	80.0	83.4	57.5	76.1	76.4	83.3	64.0	77.2	84.5	78.6	87.5	86.2	79.5	71.5	47.1
ROU	2021	77.1	98.1	69.6	81.4	84.5	57.4	76.3	76.4	82.0	64.7	77.2	85.7	78.6	87.7	86.4	79.5	73.9	50.9
ROU	2022	77.3	98.4	72.9	80.7	84.6	54.8	76.3	76.4	83.0	68.0	77.2	84.9	79.2	87.2	86.7	79.5	74.4	50.0
ROU	2023	77.5	98.6	72.9	80.6	84.6	55.1	76.3	76.4	83.2	69.4	77.2	85.3	79.2	87.2	86.7	79.5	73.4	51.3
MKD	2017	71.1	94.4	64.9	76.0	71.5	50.8	71.2	71.9	60.2	43.5	76.0	69.9	81.0	90.8		80.7	71.0	63.2
MKD	2018	71.6	94.7	60.7	76.7	73.6	53.3	71.4	70.6	64.8	44.3	77.1	71.9	80.8	90.2		80.7	71.6	63.8
MKD	2019	73.0	95.1	64.5	76.4	75.0	56.3	71.6	72.3	66.0	45.1	81.5	73.3	80.8	90.7		80.7	72.8	65.8
MKD	2020	73.0	95.6	62.6	76.9	72.8	58.2	71.7	69.7	68.1	45.5	81.5	73.1	80.6	89.9		80.7	73.1	68.6
MKD	2021	72.5	95.1	62.8	75.7	66.6	58.0	71.8	69.9	68.3	45.9	81.5	67.8	80.6	91.0		81.2	72.4	70.8
MKD	2022	73.1	95.6	62.6	77.4	66.6	58.8	71.8	69.9	70.1	46.7	81.5	69.9	81.2	90.8		81.2	73.5	72.6
MKD	2023	72.5	96.2	62.6	76.9	66.6	59.0	71.8	69.9	70.0	46.7	81.5	65.6	81.2	90.8		81.2	73.9	72.7
MNE	2017	68.2	98.7	51.2	74.3	81.4	58.3	63.9	82.0	57.7	49.1	59.9	76.3	71.5	91.8	37.4	53.5	75.9	76.3
MNE	2018	69.6	98.8	51.1	76.4	85.9	58.3	64.3	78.2	61.6	51.3	66.5	76.3	71.0	91.5	45.8	53.3	76.1	77.7
MNE	2019	69.8	98.8	51.7	75.4	87.4	55.1	64.8	80.4	62.5	56.0	66.7	74.3	70.4	90.3	45.2	53.2	75.4	79.8
MNE	2020	70.8	98.9	51.4	75.2	87.6	58.4	65.0	79.0	62.5	58.3	66.7	77.3	69.9	89.9	51.5	54.7	76.4	80.8
MNE	2021	70.7	98.8	51.6	75.8	90.2	55.3	65.2	79.1	59.8	61.0	66.7	73.1	69.9	90.0	52.1	54.6	76.0	83.5
MNE	2022	71.2	98.8	51.7	75.8	88.2	56.7	65.2	79.1	60.8	61.9	66.7	73.1	70.4	92.8	52.1	54.5	76.2	86.4
MNE	2023	71.4	98.9	51.8	75.7	88.2	56.9	65.2	79.1	61.6	61.6	66.7	74.7	70.4	92.8	52.1	54.3	78.5	85.7
GRC	2017	75.7	98.6	67.8	88.4	94.4	63.0	87.6	76.5	64.2	61.2	77.2	86.9	68.1	78.7	63.4	81.4	72.1	57.6
GRC	2018	76.2	99.1	68.0	88.6	94.4	62.4	87.6	76.2	64.2	73.6	80.9	82.9	68.0	78.8	59.5	81.4	72.1	57.1
GRC	2019	77.0	100.0	65.8	89.2	95.1	62.6	87.6	77.0	66.8	75.3	85.5	86.7	66.9	77.9	59.9	81.4	73.5	57.5
GRC	2020	77.5	99.2	66.2	90.5	96.0	64.0	87.7	76.4	68.0	77.0	84.6	84.8	66.9	78.8	65.9	81.4	73.4	57.4
GRC	2021	77.8	99.0	66.5	90.2	97.1	64.6	87.7	76.4	69.0	78.8	84.6	78.3	66.9	80.4	65.9	81.3	75.3	60.6
GRC	2022	78.1	99.1	66.6	90.7	97.1	65.2	87.7	76.4	72.1	80.6	84.6	81.1	64.8	80.2	65.8	81.3	73.7	61.4
GRC	2023	78.4	99.2	66.6	90.3	97.1	65.4	87.7	76.4	73.8	81.6	84.6	85.6	64.8	80.2	65.8	81.2	71.1	60.8
BGR	2017	73.3	100.0	65.2	77.4	86.5	68.0	65.9	70.3	78.5	53.5	50.6	79.5	76.4	85.3	61.9	93.3	68.7	65.2
BGR	2018	73.9	100.0	67.3	78.2	82.1	70.1	65.9	69.6	80.9	55.6	52.8	81.1	76.0	84.5	61.6	93.3	70.5	67.6
BGR	2019	73.8	100.0	67.4	78.5	79.1	70.1	66.3	71.8	81.6	60.8	47.8	74.8	75.9	84.2	61.9	94.2	69.6	71.2
BGR	2020	74.6	100.0	67.7	79.2	79.5	71.4	66.3	71.4	81.0	63.5	51.0	77.2	75.7	84.5	65.3	94.2	68.9	72.1
BGR	2021	74.7	100.0	65.2	79.4	79.4	72.0	66.3	71.3	80.2	64.6	51.0	79.3	75.7	85.6	65.5	94.2	69.2	71.6
BGR	2022	74.9	100.0	68.2	79.3	79.5	70.8	66.3	71.3	81.7	66.5	51.0	80.4	75.1	84.2	65.6	94.2	68.0	71.9
BGR	2023	74.6	100.0	68.2	79.3	79.5	71.6	66.3	71.3	82.3	66.2	51.0	73.4	75.1	84.2	65.7	94.1	68.5	71.9
BIH	2017	71.0	99.7	64.8	74.1	56.1	40.1	73.2	65.2	67.4	40.7	80.8	78.7	78.7	85.3	73.5	79.7	71.2	77.8
BIH	2018	70.9	99.7	60.6	74.8	58.8	41.1	73.2	62.0	69.8	42.8	80.8	76.2	78.3	84.4	73.7	79.7	70.9	78.7
BIH	2019	72.4	99.8	65.9	76.5	64.1	41.2	73.3	71.4	70.4	44.0	80.8	78.1	77.9	84.3	74.1	79.7	67.9	81.5
BIH	2020	73.0	99.8	65.7	77.0	64.1	43.4	73.2	71.3	73.4	43.2	80.8	75.4	77.8	84.8	83.6	79.7	66.8	80.6
BIH	2021	73.4	99.8	67.2	76.1	64.1	46.1	73.2	71.3	73.3	44.8	80.8	74.2	77.8	84.6	83.8	81.3	67.8	82.2
BIH	2022	74.1	99.8	63.8	76.5	64.1	47.2	73.2	71.3	76.7	47.3	80.8	74.6	78.3	88.2	83.8	81.3	68.5	84.8
BIH	2023	74.0	99.9	63.8	76.9	64.1	47.1	73.2	71.3	76.9	47.3	80.8	74.6	78.3	88.2	83.7	81.3	66.2	84.7
ALB	2017	71.1	96.5	49.5	80.9	96.5	53.7	73.0	84.7	62.6	35.0	78.5	75.8	82.0	91.0	44.5	80.3	63.3	61.1
ALB	2018	71.9	96.7	56.9	81.7	93.8	55.5	73.3	81.5	64.3	37.0	81.0	77.5	81.8	89.9	45.1	80.1	62.6	62.8
ALB	2019	73.5	97.4	57.6	82.5	96.1	56.1	73.5	84.6	65.6	38.7	90.5	80.6	81.8	90.3	45.4	80.2	64.1	65.4
ALB	2020	73.7	98.5	58.3	82.6	95.2	57.4	73.6	84.2	66.1	39.3	88.1	78.1	81.7	90.3	49.4	80.1	63.4	65.7
ALB	2021	73.7	98.4	59.0	82.7	94.3	57.3	73.7	84.3	65.1	41.3	88.1	76.6	81.7	90.5	50.3	79.9	63.5	65.9
ALB	2022	73.7	98.5	59.1	82.1	86.8	60.7	73.7	84.3	66.1	43.6	88.1	77.4	81.7	90.6	50.2	79.8	63.6	66.1
ALB	2023	73.5	98.6	59.3	81.9	86.8	60.8	73.7	84.3	66.2	43.6	88.1	77.4	81.7	90.6	50.2	79.6	60.7	66.1

per each SDG and each country. The usage of 4-arrow system sheds light on these trends. Only when a trend is described as "on track" the goal score is increasing at the rate needed for the achievement of the goal. For South-Eastern Europe, more than half of all goal scores (60.3%) are on track (14.0%) or increase moderately (46.3%) in accordance with calculations for the year 2023. However, 36.1% goal scores are in the stagnation and 3.7% goal scores are decreasing. For all countries except Bulgaria, a majority of goals are on the track or moderately increase, although only Serbia and Greece have 70.6% goals (12 of 17 SDGs) with such trends, while Romania is in the third place with 64.7% goals. In the case of Bulgaria, the achievement of 53% SDGs is either stagnant or decreasing. It could be seen as a positive result for the whole region that only 3.7% of goal scores are decreasing.

Corporate sustainability reporting

It is undeniable that governments and companies play pivotal roles in achieving the sustainable development goals. Yet, without high-quality reporting on the SDGs at the corporate level, assessing companies' contributions to these goals becomes impossible. Sustainability reporting has been integrated into the reporting practices of numerous companies for a long time, on a voluntary rather than a mandatory basis, but even among reporting entities, comparing sustainability performance has been hindered by the availability of the diverse array of reporting frameworks developed by various private and public initiatives. The connection with the SDGs can be established either directly or indirectly, facilitated by various methodological tools. For example, the SDG

Table 4: 2023 SDG dashboards by South-Eastern European countries

Countries	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG 9	SDG 10	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16	SDG 17
Greece	yellow	orange	yellow	orange	orange	yellow	orange	orange	orange	yellow	orange	red	orange	red	orange	orange	orange
Romania	green	orange	orange	yellow	red	orange	yellow	yellow	orange	orange	yellow	orange	orange	yellow	orange	orange	orange
Serbia	green	orange	orange	yellow	orange	orange	orange	orange	orange	orange	orange	orange	orange	grey	red	red	yellow
Bulgaria	green	orange	orange	orange	orange	orange	yellow	yellow	orange	red	orange	orange	orange	red	yellow	orange	yellow
Bosnia and Herzegovina	green	orange	orange	orange	orange	orange	orange	orange	orange	orange	red	orange	orange	yellow	orange	orange	yellow
Albania	green	orange	orange	yellow	orange	orange	yellow	red	orange	yellow	orange	orange	green	red	orange	red	orange
North Macedonia	yellow	orange	orange	orange	orange	orange	orange	orange	orange	orange	red	orange	yellow	grey	orange	orange	yellow
Montenegro	green	red	orange	yellow	orange	orange	yellow	orange	orange	orange	orange	grey	yellow	red	red	orange	yellow

Note: Green – SDG achievement; Yellow – Challenges remain; Orange – Significant challenges remain; Red – Major challenges remain; Grey – Data not available.
Source: Authors based on: Online database for the Sustainable Development Report 2023 [21]

Table 5: 2023 SDG trends by South-Eastern Europe countries

Countries	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG 9	SDG 10	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16	SDG 17
Greece	↗	→	↗	→	→	↑	↗	↗	↗	↑	↗	↓	↗	↗	↗	→	↗
Romania	↑	↗	↗	→	↗	↑	→	↗	↗	↗	↗	→	↓	↗	→	→	↗
Serbia	→	↗	↗	→	↗	↑	↗	↗	↗	↑	↗	↗	→	o	↗	→	↗
Bulgaria	↑	↗	↗	↓	↗	→	→	↗	↗	↓	→	→	→	→	↗	→	↗
Bosnia and Herzegovina	↑	↗	↗	o	↗	→	↗	↗	↗	o	→	→	→	↗	↗	→	↗
Albania	↑	↗	↗	↓	↗	↑	↗	→	↗	↑	→	→	↗	→	→	→	→
North Macedonia	↑	↗	↗	→	↗	↑	→	↗	→	↑	→	→	→	o	↗	↗	↗
Montenegro	↑	→	↗	↗	→	↑	→	→	↗	↑	→	o	↑	↗	→	↗	↑

Note: ↑ - On track; ↗ Moderately Increasing; → Stagnating; ↓ - Decreasing; o - Data not available
Source: Authors based on: Online database for the Sustainable Development Report 2023 [21]

Compass links GRI indicators, which are based on the widely accepted framework of sustainability reporting according to the GRI standards, with the SDGs. However, a more operational and transparent SDG reporting system should explicitly align with the conceptual framework of the SDGs, as an integral component of sustainability reporting.

According to a KPMG study covering the period soon after the adoption of the SDGs – from July 2016 to June 2017, four out ten of the world's top 250 companies by revenues already referenced the SDGs in their corporate reports, which implies that the SDGs were recognized as an influential initiative from their very beginning. However, reporting contents differ significantly among companies and often could be described as poor, reflecting a probably low level of companies' engagement with the SDGs. In that context, it is worth mentioning that the majority of companies (84%) invested efforts to identify the SDGs which are the most relevant to their business and marked them as priority ones but, on the other hand, very few companies (only 2%) were advanced in performance measurement by setting both SMART performance goals as well as indicators related to the SDGs [15].

One of the reasons for the absence of SDGs-related metrics is the complexity of translating the SDGs and their defined targets to the corporate level. Indicators developed by UN (currently 231 indicators) are applicable to the level of national economies, helping governments in directing their efforts towards SDG achievement. However, many of these indicators are not suitable for companies, necessitating the development of tailored metrics for businesses. Leveraging existing reporting systems developed by companies according to established sustainability reporting frameworks would be justifiable and beneficial for this purpose. The challenge that needs to be overcome in this process is that companies should not remain in a 'business-as-usual' mode, merely seeking to relabel existing practices as SDG-related, as much more needs to be done "if there is to be any hope of achieving these goals" [22, p. 381]. More striking, Bebbington & Unerman [2, p. 9] pointed out that companies could misuse the SDGs-related rhetoric and in that way camouflage 'business-as-usual'.

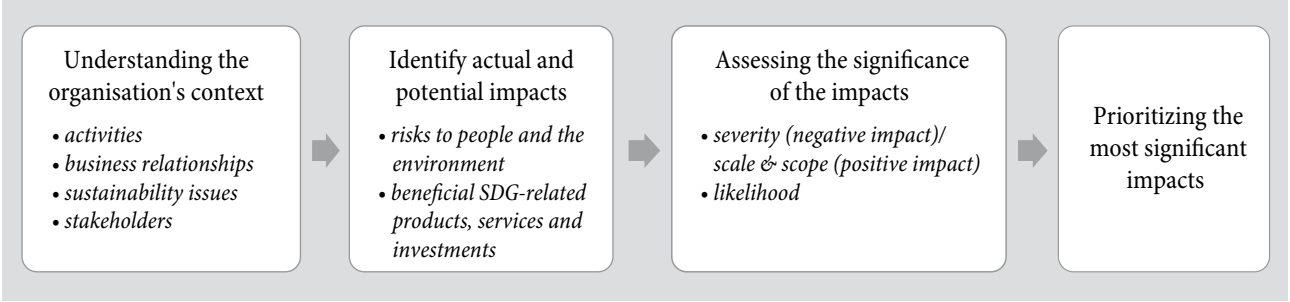
A distinctive feature of the SDGs relative to other conceptual frameworks of sustainability is the comprehensive setting of goals and targets across all aspects of sustainability. Consequently, the SDGs provide a necessary context for other initiatives that companies may have already implemented. As the broadest framework, the SDGs serve as a foundational starting point for analysis, which could unveil new opportunities and risks for companies, prompting them to undertake activities and make shifts in their current business models to align with the SDGs. To operationalize contributions to the sustainable development goals, companies should begin by focusing on individual targets. One of the proposed approaches for integrating the SDGs into reporting consists of three steps, where the first step includes the process of principled prioritization of SDG targets based on significant impacts that companies have on people and environment, the second step involves setting goals, strategies and metrics to monitor progress towards the selected SDG targets, and in the third step companies develop SDG reporting in accordance with best practices and the information needs of stakeholders [8]. Even though reporting is the final step in this approach, it is essential to acknowledge that reporting plays a crucial role in encouraging companies to adopt SDG strategies and carry out related activities [1], and that the absence of reporting can hinder the integration of SDGs in businesses. In accordance with the theory of targeted transparency regulation, Hombach & Sellhorn [12] explain that real effects in terms of changes in corporate behavior could be induced by mandatory corporate disclosures in two ways. The transparency-action chain is initiated by companies' disclosures in line with new requirements, which then trigger changes in the behavior of stakeholders as information users and finally cause companies to respond by taking relevant actions and improving their performance. The second way of influence is through the change of companies' internal information sets which in turn enhance the efficiency of managers' decision-making related to the disclosure area. Moreover, it could be argued that increasing pressure for sustainability disclosures by introducing mandatory reporting would indeed lead to real changes in corporate behavior.

An increasing body of empirical research about companies' reporting on SDGs sheds light on whether companies report on their contributions to SDGs as well as on the content and quality of reports. In their research covering 2,000 of the world's largest stock-listed companies, Waal & Thijssens [34] found that 58% companies published sustainability report in 2017, and only 23% reported on SDGs (39% of the companies providing sustainability reports). However, qualitative analysis shows that even in cases of the most extensive reports related to the SDGs, companies mainly disclosed intentions and future actions, while reporting on current actions taken, explicit business cases, measurable indicators or the processes of SDGs operationalizing was largely missing revealing limited companies' efforts to contribute to the achievement of the SDGs. Although some other studies indicate a growing interest in reporting on the SDGs, the quality of reports seems to be still questionable [25], [14]. Silva [25] discovered that two-thirds of Financial Times Stock Exchange (FTSE) 100 companies referenced the SDGs in their 2018 reports on sustainability performance, but only 23% made general reference, 31% provided some information on specific goals, while 13% reported on goal and target-level details. However, a lack of appropriate indicators to measure companies' contributions to the SDGs was noticed also for the last group of companies with target-level disclosures. Meanwhile, evidence from Europe, focusing on the sample of companies listed in the STOXX Europe 600 index indicates an increase in the number of companies addressing the SDGs in their annual reports from 15% in 2015 to 58% in 2018 coupled with an increase in the quality of disclosures but, despite this increase, reporting on potential and actual negative effects on the SDGs, as well as information on quantitative targets and outcomes of activities related to achieving the SGDs, remained at a low level [14].

The content of SDG disclosures which is mainly descriptive, without an appropriate metric, could be seen as the sign of superficial engagement with the SDGs and the potential exploitation of cherry-picking and SDG-washing practices by companies [11]. On the other hand, companies need both competencies and resources to operationalize the SDGs as well as reporting infrastructure to provide the necessary disclosures. Prioritization in SDG-related work is essential, not to give advantage to one goal over another, but to recognize areas where a company exerts significant impacts. It is in line with concept of materiality and demands systematical and comprehensive approach, as suggested in Figure 6.

The presented process of SDG prioritization should discourage companies from selecting certain SDGs simply because they are easier to contribute to. To demonstrate genuine commitment to the SDGs, companies are encouraged to disclose their prioritized SDGs as well as information on the process of SDG prioritization in their sustainability reports. Some SDGs could be recognized as being more close to businesses than others, and empirical research on multi-sector samples confirms this fact, as SDG 8 (Decent Work and Economic Growth), SDG 13 (Climate Action), and SDG 12 (Responsible Consumption and Production) commonly appear among the top three prioritized SDGs, while SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 14 (Life below Water) tend to have the lowest priority [11], [14], [25]. However, each organization should take into account its specifics, although some factors (e. g., sector affiliation) can influence which issues and SDGs

Figure 6: Principled prioritatization process



Source: Adapted from [7, p. 102], [8]

are given priority. Manes Rossi & Nicolo [17] found that energy sector companies most commonly disclosed SDGs related to the environment, precisely SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action), which is expectable due to heavy environmental impact of energy companies' activities. One study of Indonesian companies offers interesting evidence that SDG 11 (Sustainable Cities and Communities) was the most addressed goal by companies, which can be explained by the country's context, where companies engage in numerous activities to support the government and help increasing community welfare [10]. Nevertheless, the process of principled SDG prioritization should be conducted and disclosed, since otherwise material impacts could be missed, limiting companies' potential for meaningful engagement with the SDGs. The GRI & UN Global Compact [8] suggest that companies should not only understand the SDGs but also the specific targets associated with each SDG, and then further focus on certain SDG targets in their selected SDGs.

The operationalization of SDG targets at the company level requires the integration of priority targets into the company's objectives, strategies and business model. In addition, creating appropriate indicators to gauge progress towards the achievement of targets is the necessity, but also one of the most challenging issues as well. Waal & Thijssens (2020) pointed out that measurement of companies' contributions to SDG targets and indicators "is still a bridge too far". However, metrics are crucial, and attempts must be made to identify appropriate indicators. Some companies have already developed good practices demonstrating substantial commitment to the SDGs. The case of Smurfit Kappa shows that this company recognized its impact on water as one of the main elements in the paper industry and, among other SDGs, it selected SDG 6, focusing on targets 6.3, and then identified a suitable indicator for tracking progress toward this target – Chemical Oxygen Demand (COD) of water, commonly used to measure the polluting factor of water returned to nature. It set an objective of achieving a 60% reduction in COD by 2025 against the 2005 baseline, and measures progress toward this objective each year [26]. However, in a global study of sustainability reports of 1,340 companies, authors find that only 29% of companies made some connections between their strategies and/or objectives and objectives and targets of the SDGs, while a very small percentage of companies (2%) included KPI related to the SDGs [11, p. 323].

As a form of guidance to help companies to measure and report their progress against the SDGs, GRI & UN Global Compact [9] provide a useful inventory of qualitative and quantitative disclosures related to each SDG target, adjusted for company-level application. These disclosures are aligned with some of already developed frameworks for sustainability reporting (GRI Standards, SASB Standards, etc.). In this way, relevant disclosures are collected from different sources and presented together, making it easier for companies to identify ways to engage in the process of achieving the SDGs. Still, appropriate metrics are not always available, especially quantitative indicators. It makes it difficult for companies to deal with some topics. Additional efforts are required from companies to find solutions, and even in cases where metrics have already been developed, existing sustainability reporting infrastructure may not support them. Furthermore, the multiplicity of sustainability reporting frameworks and standards creates a complex reporting environment for sustainability in general, and reporting on the SDGs in particular.

Generally, the tendency of companies to address the SDGs is influenced by different factors. Rosati and Faria [19] identify the relevance of institutional factors and show that organizations reporting on the SDGs are more likely to be located in countries with higher levels of climate change vulnerability, national corporate social responsibility, company spending on tertiary education, indulgence and individualism, and lower levels of market coordination, employment protection, power distance and long-term orientation. However, in order to achieve stronger corporate SDG involvement, it is important for national governments to provide an appropriate environment. The existence of a national agenda related to the SDGs serves as an impetus for companies' engagement with the SDGs. Empirical evidence indicates that governments should not only develop but also communicate their SDG priorities

to encourage companies to follow them, since otherwise some national priorities may not receive sufficient support from businesses [10]. Besides communication, addressing gaps in the support of specific SDGs of national priority could be achieved through quality regulation framework, technical support, and different type of incentives.

Conclusion

Despite the fact that challenges in measuring and reporting sustainability have been recognized and addressed since the adoption of the sustainable development goals, it is evident that numerous issues persist unresolved to this day. At the global level, there is a pressing need for a comprehensive global index to accurately track the progress made by the global community towards the defined goals. The key is to develop metrics that are unbiased in depicting progress across both developed and less developed countries. The existing SDG index, calculated as an average index of all countries, has limitations, notably in its tendency to underscore the polarization between developed nations, with predominantly high scores, and less developed countries, which tend to have lower scores.

In this regard, efforts should be directed towards enhancing the existing methodology and adjusting the metrics to align with the requirements of global reporting and institutional management. It can be said that the existing SDG index is conceptually well established, but corrective measures are necessary to mitigate its biases. A similar approach should be taken with the International Spillover Index, which appears to overemphasize positive impacts of spillovers compared to negative ones, again in favor of developed countries. It is essential to consider that the growing importance of sustainability will likely further motivate developed countries and large corporations to prioritize maintaining top positions in sustainability rankings, which could potentially hinder efforts to improve metrics in this field.

Probably the biggest challenge in sustainability reporting lies at the corporate level, despite continuous and concerted efforts in this area. While numerous conceptual frameworks have been developed to this day, a universally acceptable solution still remains elusive. The global character of the sustainable development goals suggests a need for universal solutions in the field of reporting. A key issue is the failure to recognize the necessity for establishing links between global, national, and corporate reporting. Of course, achieving absolute alignment may not be feasible due to the diversity of goals and the fact that the necessity for corporate sustainability reporting is directly apparent only in certain SDGs. Hence, a flexible approach to sustainability reporting is imperative, wherein companies will acknowledge their duty to report transparently. In this segment, a high level of commitment from management to transparent reporting is much needed. Indeed, companies have an added responsibility to refrain from activities that contribute to the depletion of natural resources, environmental pollution, and negative impacts on climate change. This responsibility extends beyond activities conducted within national borders to encompass those undertaken in other countries, which once more emphasize the importance of measuring and reporting on spillover effects.

The reporting challenge extends beyond companies and requires institutional solutions. The role of governments of individual countries can be clearly identified in the part related to setting strategies, policies, implementing adequate regulations, and establishing effective control mechanisms. Ensuring a commitment to quality sustainability reporting is paramount, necessitating a clear stance from institutions and the corporate community against practices like greenwashing.

Undoubtedly, many of the issues jeopardizing the planet's survival today have roots in history. The industrial economy, which has been prevalent for over a century, has undoubtedly brought about successes such as advanced technological development, economic growth, high shareholder returns, and increased employment. However, these achievements have come at a significant cost. We now witness the adverse impacts of climate change, heightened pollution levels, excessive resource consumption, a widening gap between the rich and the poor, etc. In such circumstances, it is unrealistic to expect that problems stemming from long-standing lax behaviors can be swiftly resolved. This also applies to overly optimistic assessments regarding the attainment of sustainable development

goals, particularly in circumstances where geopolitical interests dominate over environmental preservation and the ongoing armed conflicts impede efforts to achieve these goals. Despite the absence of genuine optimism regarding the attainment of the established SDGs by the projected deadline of 2030, the critical inquiry persists: will they be met by 60% or perhaps 80%? In this context, unbiased and impartial metrics are imperative, ensuring accurate assessment of SDG attainment, free from any inclination to prematurely affirm their achievement when reality suggests otherwise.

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Dejan Malinic

is a full professor at the Faculty of Economics and Business, University of Belgrade. He teaches the following undergraduate, master and doctoral courses: Management Accounting, Financial Statement Analysis, Strategic Controlling, Corporate Profit Management and Strategic Management Accounting. As an author or co-author he has published books: Management Accounting, Policy of Company's Income, Divisional Accounting, Financial Markets and a monograph The Financial Performance Measurement in the Telecommunications – The Case of Serbia. Moreover, he has published more than hundred scientific and research papers in the fields of management accounting, corporate finance and financial reporting. From 2004 to 2011 he was a member of Securities Commission of Republic of Serbia. From 2015 to 2021 he served as the Head of Department for Accounting and Corporate Finance. He is a member of the Presidency of Serbian Association of Economists and the deputy editor of the SAE Journal of Business Economics and Management, Ekonomika preduzeca. Since 2022 he has been the manager of the project Building Forensic Accounting Capacity in Serbia supported by US Bureau of International Narcotics and Law Enforcement Affairs.

Savka Vučković Milutinović

is an associate professor at the University of Belgrade Faculty of Economics and Business. She is a member of the Department for Accounting and Corporate Finance and teaches courses in the field of auditing within undergraduate and master programs. She is a member of management team of the Building Forensic Accounting Capacity in Serbia project supported by US Bureau of International Narcotics and Law Enforcement Affairs. As a lecturer, she has participated in many education courses related to the implementation of professional standards in Serbia. She co-authored a book on auditing and published articles in the area of auditing and financial reporting.

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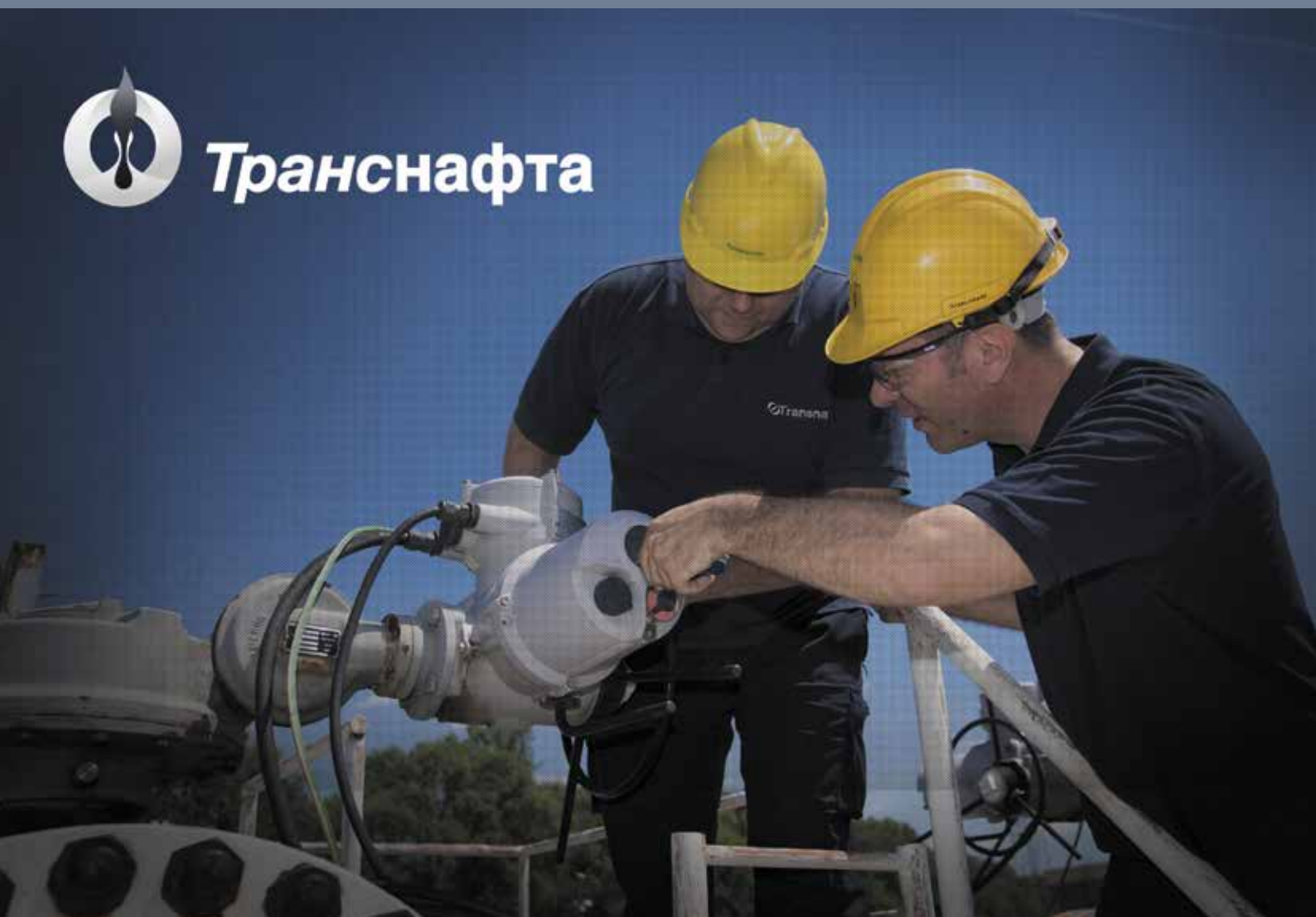

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The Serbian Biogas Association, established in March 2012, is a non-profit, non-governmental organization dedicated to bringing together companies committed to pioneering the development of the first biogas facilities in Serbia. The core motivation behind its formation was to pursue objectives aimed at fostering the production and utilization of biogas as a renewable energy source.

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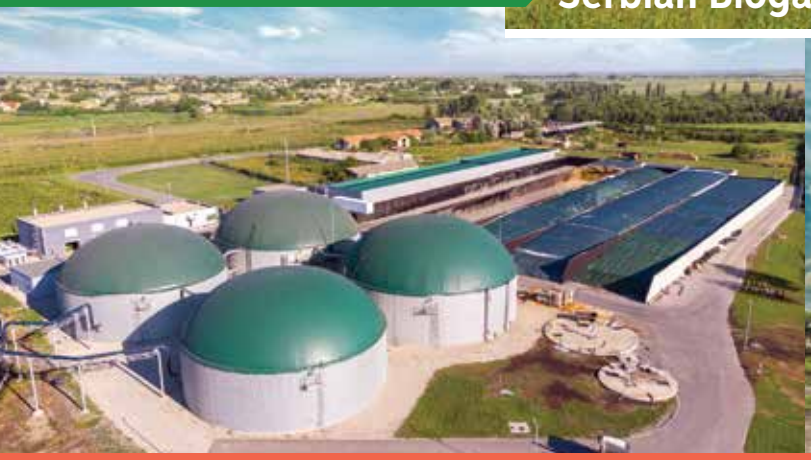

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Nebojša Savić
Metropolitan University, FEFA
Belgrade

Jelisaveta Lazarević
Metropolitan University, FEFA
Belgrade

Ana Jeličić
Metropolitan University, FEFA
Belgrade

Filip Grujić
Metropolitan University, FEFA
Belgrade

DIGITAL ECONOMY AND NEW CAPITALISM: GENERATION Z AS CONSUMER

Digitalna ekonomija i novi kapitalizam – generacija Z kao potrošač

Abstract

The development of the digital economy and the 4th Industrial Revolution (IV R) bring new dilemmas to economics. The challenges are numerous, and in our paper, we concentrated on two important phenomena of digitalization: (1) whether data has become an equally important factor of production as capital, labor, and land and (2) what changes occur in the structure of costs with the appearance of digital goods. Bearing in mind that these changes were deeply reflected both on the supply and demand side, in this paper, we have devoted special attention to the behavior of Generations Z and Alpha as consumers compared to other generations. We wanted to see, at least preliminarily, what kind of consumer profile is formed by the new generations born in the digital age and IV IR, that is, what kind of changes are occurring in the behavior of consumers of Generations Z and Alpha. We carried out research on their behavior on a sample of over 500 respondents.

Keywords: *data, production factors, digital economy, consumption, Generation Z, Generation Alpha*

Sažetak

Razvoj digitalne ekonomije i IV industrijske revolucije unose nove dileme pred ekonomsku nauku. Izazovi su brojni, a u radu smo se koncentrisali na dva važna fenomena digitalizacije: (1) da li su podaci postali podjednako važan faktor proizvodnje kao što su to kapital, rad i zemlja i (2) kakve promene nastaju u strukturi troškova sa pojavom digitalnih dobara. Imajući u vidu da su se ove promene duboko odrazile kako na stranu ponude, tako i na stranu tražnje, u ovom radu smo se posebno posvetili ponašanju nove generacije – generacija Z i Alfa kao potrošača u odnosu na druge generacije. Želeli smo da, makar preliminarno, sagledamo kakav profil potrošača formiraju nove generacije koje su rođene u digitalno doba i IV IR. Poseban fokus smo stavili na promene koje donose generacije Z i Alfa kao potrošači. Za potrebe ovog rada, sproveli smo istraživanje njihovog ponašanja na uzorku od preko 500 ispitanika širom Srbije.

Ključne reči: *podaci, faktori proizvodnje, digitalna ekonomija, potrošnja, generacija Z, generacija Alfa*

In last year's paper [39], [21], we investigated the needs and demands of employees, especially of Generation Z, who entered the labor market with different expectations and attitudes than any previous generation. In this year's paper, we analyze the habits of Generation Z as consumers in the new digital age.

Introduction

The profound changes taking place in the modern world in recent decades require a rethinking brought about by digitalization and the IV Industrial Revolution (IV IR) in the sphere of economics. In this paper, we will only look at some questions that the digital age has opened up and examine the changes that have occurred in customer demand, particularly among younger generations.

In the basic academic economic literature, the phenomena of digitalization and the digital economy itself are still not sufficiently represented. Even in two of the world's leading economics textbooks, Mankiw's *Principles of Economics* [24], which is neo-Keynesian, and Mishkin's *The Economics of Money, Banking, and Financial Markets* [31], which is a neoclassicist, these processes are not covered in detail. Of course, this does not mean that these phenomena are not treated at all in literature, but they are not given adequate attention.

In this paper, we present two very significant phenomena of digitalization:

(1) whether data has become an equally important factor of production as capital, labor, and land, and
(2) what changes occur in the cost structure with the emergence of digital goods?

Bearing in mind that these changes have had a profound impact on both the supply and the demand side, in this paper, we have devoted special attention to the behavior of Generation Z and Generation Alpha as consumers compared to other generations. The idea is to look at what kind of consumer profile is formed by the new generations born in the digital age and IV IR, that is, in which direction the demand for goods and services is changing. We conducted a survey of their behavior on a sample of over 500 respondents, the results of which will be presented in this paper.

Is data a new factor of production, and are we entering *Data Capitalism*?

With the entry into digitalization and the rise of the digital economy, data has gained special importance [16]. In the past decade, companies operating with data have dominated the ranking of the world's most valuable corporations, and the availability of data opens up a huge space for improving efficiency and innovation (to get more insights into the state of the Serbian national innovation system, please see [44]). Hence, the UN pointed to the importance of data [43], and the IMF registers these changes [7].

A decade ago, Viktor Mayer-Schönberger and Kenneth Cukier recognized the wave of *Big Data* and new technologies that began to sweep the world and fundamentally change economic, social, political, and all other environments [26]. The recent history of capitalism has been a story of firms and financial capital, but that has changed thanks to the revolution brought about by *Big Data*. Then Viktor Maier-Schonberger and Thomas Ramge indicated that data is starting to replace money as the driver of market behavior, and the combination of *Big Data* and *AI* leads to a new type of capitalism: *Data capitalism*. In it, algorithms for generating data about consumers and products and services enable the connection of buyers and sellers and in-depth understanding [27]. Only the future will tell whether data capitalism will be more efficient than price-based markets and how they will (co)exist. Read more about the digital economy and AI in the works of the world's leading author in the field of digital economy, Erik Brynjolfsson [4], [5].

The goal of emerging Data science is to improve the decision-making process using data analysis [14]. The earliest form of developed writing was recorded in Mesopotamia around 3,200 BC, so today, e.g., Walmart and other major retail chains around the world have had access to vast amounts of data on customer preferences by using point-of-sale systems, registering consumer behavior on the website and monitoring comments on social media. If you watched a movie on Netflix or bought something on Amazon, their websites will use the collected data to suggest what to watch next (blockbuster or bestseller), and another possibility is to guide you to a niche related to your preferences and tastes.

In traditional classical economic theory, the factors of production – labor, capital, and land – are physical factors. But we have known for several decades that other "newer" factors such as knowledge, technology, and management significantly influence production, which is all embodied in technological progress and innovation (to get deeper insights into the Serbian labor force as a component, see [19]).

Nobel laureate Robert Solow [41], a student of the famous American economist of Russian origin Nobel Laureate Vasily Leottiev (creator of the input-output model) and independently Trevor Swon, developed *the Solow-Swan model* of long-term growth that measures the contribution of each factor of production to GDP; it is an aggregate production function (Cobb-Douglas type) that as a nonlinear system with a differential equation that models the movement of capital stocks per capita, establishes a link with microeconomics, replacing the hitherto dominant Harod-Jammar model [1], [2]. This then allowed a number of economists to fundamentally develop Solow's neo-Keynesian model further. David Cass [8] and Tjalling Koopmans [17] came up with what is known as the Ramsey–Cass-Kopmans model endogenously in Frank Ramsey's consumer optimization analysis. And so came the theory of endogenous growth developed by two Nobel laureates of neoclassical provinciality – Robert Lucas [23] and Paul Roamer [37], who built Solow's neo-keynesian model into a neoclassical model of growth with the point that investments in human capital, innovation, and knowledge contribute significantly to economic growth. This is what Solow was the residual factor, which had the largest single contribution to growth (neither capital nor labor had a major contribution), treated as technical progress related to knowledge and innovation.

And today, as with Solow and Lucas, the question has arisen as to what are the key factors of production (besides labor, capital and land) in the digital age.

Xiang Xu [47] points out that in the digital age, data becomes a factor of production in two ways:

- the first is the traditional *data-driven decision-making process* ("*DDD model*"); data is directly used as input and connects IT with other technologies, especially *Big Data* and data science – so decisions are made based on data analysis; added value generated on the database, as a factor of production, and then profitability and productivity are significantly higher for those who use this factor in the same industry [3], and
- the second is a revised version of the *DDD model*, in which case the data serve not only as intermediate products but also as final products, which essentially means an extension of the value chain; it is mainly used in services, business media, investment consulting, and other similar industries; producers generate or collect a large volume of original and raw data by investing labor, capital and other factors of production, and after processing generate data as products.

Data shapes the future of humanity. The production, distribution, and consumption of digital data are the carriers of rapid improvement in machine learning, AI, and automation. That's why Eric Brinjolfsson [4], [5], a leading author in the digital economy, points out that the data is used to reduce search costs and transaction costs to strengthen information-driven choices; they facilitate scientific and medical research and make society more productive.

Xu concludes that the data have become the most critical factor of production that complements traditional factors of labor, capital, and land. But unlike capital, labor, and land, data does not belong to exhaustive resources; it is not limited, at least from today's point of view [47].

The abundance of IV IR, data, and the development of artificial intelligence led to profound structural changes in the job profiles [15] and labor markets with the potential to cause profound changes in the manufacturing factor market as well – the role of data and information is increasing, and the quantitative role of work is likely to decrease, with a sharp increase in quality. At the just concluded World Economic Forum 2024 in Davos, Erick Brynjolfsson [6] points out that a quarter of jobs face disruption – both growth and decline – due to geo-economic, technological, and green transition trends in the next five years.

The starting hypothesis of traditional economics is scarcity or limitation. The digital era has raised the question of whether new products, such as Windows,

Android, WeChat, etc., mark the entry into a new market... Does this mean that traditional economics may not be able to explain the various new economic phenomena of the digital age in the old way? On this line of thinking, Chunsheng Zhou and Xiuhai Hu [50] further open up dilemmas related to goods that have no limited supply and are part of *intangible assets*. They argue that scaling in the case of goods without limited supply depends on the number of users, while scaling in the case of goods whose supply is limited depends on production capacity.

Whether the data is used as a new abundant resource or as a new factor of production (in the rank of capital, labor, and land), it is necessary to ensure their optimal use, and this is achieved by developing new business models. The fastest-growing companies in the modern world have almost no physical assets but create innovative digital products and new data-driven business models.

What constitutes the core of all digital business models is the mass use of data, and they differ among themselves in monetization models, i.e. revenue generation.

These companies are completely different from the rest of the economy because they do not own classical assets and do not build their competitive advantages on physical assets. Digital giants do not focus on business models of accumulating physical assets, which is the biggest barrier for other companies to enter the markets. The focus of digital giants is on data-driven value creation.

In the world of physical goods, monetization is done directly by meeting the needs that consumers pay directly, while *data-driven* companies almost never monetize needs directly. Both Google's word search and Facebook and Pinterest's data are sold to advertisers for targeting.

In classical microeconomics, the goal function of a firm is to maximize profits (meaning that the company optimally uses the resources at its disposal). In the digital economy, monetization is often at the forefront, although these two objective functions are partly financially and economically connected [18].

The goal of each microeconomic entity is profit maximization, and profitability is a key indicator of the financial success and sustainability of the firm. In contrast to profitability, monetization is the process of generating income from products, services, or assets. Monetization requires finding different ways to transform non-monetary values into money. For example, when it comes to online platforms, monetization involves generating revenue from websites, applications, or digital content. Hence, the monetization strategies can range from subscriptions, ad placements, and clicks, sales of user data to third parties to freemium models, in which a service is provided free of charge, but there may also be an improved service, as a premium version, which is available with a subscription. Thus, monetization can be a way to make a profit, and whether this will be achieved depends on management and successful control of the company's costs.

Change in cost structure and *Zero Marginal Cost* (*ZMC*)?

Thanks to the large amount of data, new technologies are pushing the boundaries in production and opening up new opportunities for individuals and organizations [16]. With the advent of the digital economy, in addition to the open question of whether data has become a factor of production, there has also been a change in the structure of the company's costs. Digital technologies and the presentation of information in bits have made it possible to reduce the cost of storing, processing, and transferring data. The economic implications of these processes are enormous.

The key question is, what changes if the information is no longer in atoms but in bits? The digital economy is looking for answers to the question of what changes in the standard economic model when certain costs fall significantly or are not at all, which results in *Zero Marginal* Cost – *ZMC* (Figure 1).

According to Avi Goldfarb and Catherine Tucker [11], there are five types of economic costs that are reduced with digitalization: search, replicating, transport, tracking, and verification. Search costs are lower in the digital environment with higher quality and research coverage; digital goods can be replicated at zero marginal cost because they are usually non-rivalry in character with unchanged quality during the importance of geographical distance changes because transport costs for digital goods, i.e., data, are approximately zero. In addition, digital technologies have made it easier to track people's behavior and enable digital

verification, making it easier to verify the reputation and reliability of any individual, business, or organization.

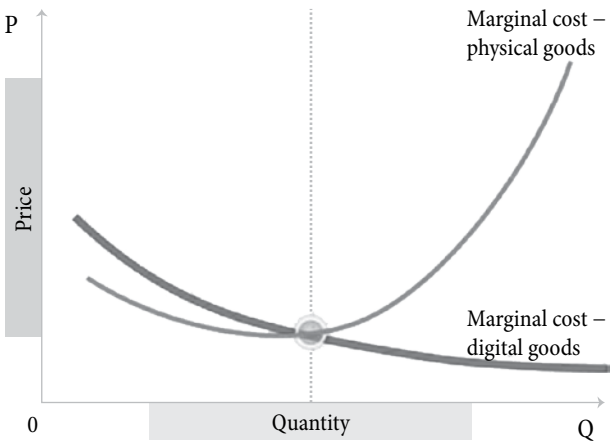
In physical products, the marginal cost (the cost of producing an additional unit of product) first decreases, then rises (does not approach zero) and includes the cost of raw materials, labor, and logistics... The key feature of digital goods is that they have ZMC because the production of an additional unit of digital goods is approaching zero or even zero. This means that digital goods can be multiplied without (or almost no) additional costs.

Examples are countless: the cost of producing an additional copy of an app, the cost of downloading an app that has already been installed 10,000 times on different devices, etc... Jeremy Rifkin [36] explained in detail the *ZMC* phenomenon in digital goods and the emergence of the so-called *Sharing economy.* The digital good must have financial, user, and other consumer values – Word documents, music on Spotify, web page, apps, Wikipedia page, emails, dropbox files, Airbnb apartments – all virtual goods that enable *JOB TO BE DONE* as a completely new approach to marketing.

Evolution of customer centricity as an implication of data limitless supply

By using data, companies get deeper insights into their customers, and those who succeed in utilizing that data to improve brands and customer experience are the ones who both lead and disrupt. The customer-centricity in brand creation and adoption is there to make this approach feasible.

Figure 1: Zero Marginal Cost



Customer centricity, a concept deeply embedded in the very fabric of modern commerce, has witnessed a profound evolution over the years. The roots of customer centricity go back to the pioneering insights of Peter Drucker, who, in his book *The Practice of Management* (1954), laid the groundwork for a fundamental switch from a product-centric to a customer-centric approach by saying that 'it is the customer who determines what a business is, what it produces, and whether it will prosper,' mirrored in part by Lewitt's (1960) statement that 'firms should not focus on selling products, but rather on fulfilling customer need' [40]. Looking back in history, an excellent illustration of a thriving customer-centric organization can be traced as far back as 1975. Tumi, an innovative USA-based suitcase manufacturer, serves as a noteworthy example. This company had each of its development divisions focused exclusively on a particular customer group, and through meticulous research, they designed products tailored specifically for each segment [22].

Though introducing customer centricity had its roots in the 20th century, George S. Day of Wharton School reignited interest in this concept in 2006. His survey underscored that the percentage of USA companies structured around customers would surge from 32% to 52%. This surge was prompted by companies racing to establish customer-centric organizational frameworks [22]. However, Day was not the sole catalyst for the recent surge in the popularity of this concept – a fiercely competitive and ever-evolving market landscape, coupled with advancements in technology and digitalization, has contributed to the increasing adoption of customer-centric approaches. Companies are now more inclined to focus on developing, designing, and maintaining long-term relationships with customers, shifting away from mere manufacturing.

Customer-centric organization. In recent years, 30% of Fortune 500 companies, including industry giants such as Intel, Dell, IBM, and American Express, have embarked on the journey to become customer-centric, initiating comprehensive restructuring efforts [22]. The strategic imperative of customer and human centricity has transcended mere business. Leaders across industries emphasize the transformative impact of prioritizing

the human element in business strategies, as the more a business focuses on providing a great experience for customers, the more it's able to adapt to their changing habits and expectations.

For a company, that means it's not only the external marketing strategies that need to be well thought out, but there also needs to be an internal cultural shift toward embracing empathy, innovation, and continuous improvement. The strategic importance of this shift lies in the impact it has on various facets of organizational functioning, from marketing and product development to employee engagement and corporate culture. Understanding this shift involves scrutinizing the contrast between companies focused solely on delivering products and those aspiring to cultivate a customer-centric ethos – or, in plain terms, the way they're doing business now versus the way they wish to do it moving forward.

Customer centricity and strategy. Customer-centric companies need to begin by embracing a fundamental philosophy: the company exists to serve the customers, not the other way around. This perspective dictates that all decisions should originate with the customers [40]. The overarching goal is to satisfy customer needs by designing the best solutions for them, not just providing the best product, as seen in product-oriented companies [38]. Contrary to product-driven companies, which seek to find multiple uses and customers for their products or sell products to all potential buyers [40], customer-driven companies aim to identify as many products as possible for specific customer segments [10]. The pivotal shift in the strategic component involves moving from the mindset of selling products to customers to creating value for them through forging long-term relationships.

Customer centricity and structure. This strategic move also leads to a significant difference in organizational structure. Beyond merely adjusting the business approach, it becomes essential to implement organizational changes aligned with the newly defined goal. In the realm of organizational structure, product-driven companies typically feature product profit centers, product managers, and product sales teams [40], [10]. According to Marc Rubin's definition, it's usually a single person who is responsible for a specific product or a group of products [38]. In contrast, customer-centric organizations necessitate the establishment of customer segment centers, customer relationship managers, and customer segment sales teams. These teams manage work processes and tasks based on user segmentation and their customer journeys rather than focusing on products.

A great example of aligning organizational structure with the customer journey comes from the Dutch company CoolBlue. In its pursuit of providing a distinctive customer experience, CoolBlue created domains such as Returns, Customer Service, and Shipping & Delivery, each corresponding to a step or a stage in the customer journey. These domains are supported by Knowledge Centres within the company, with a Domain Boss overseeing the strategic direction and underlying goals of each domain [45].

However, achieving a truly customer-driven organizational culture goes beyond the superficial aspects of organizational design. It entails developing and instilling a mindset with the core value of fostering long-term customer relationships and satisfaction.

Hyper customer centricity brings the customer into sharper focus using advanced data analytics and smart technologies to track and anticipate consumer behavior in near-real time, thus being able to deliver personalized products and experiences when, where, and how the customer wants or needs them. It means that from a strategic perspective, companies must integrate customer-centric principles into their core values and organizational DNA. This involves being more customer-facing and driving a high-performance culture by aligning internal processes, employee training, and performance metrics with the overarching goal of continuously delivering exceptional customer experiences. The process in itself is not a one-time initiative but an ongoing commitment that requires continuous learning and unlearning, which allows companies to promptly respond to evolving market dynamics and expectations.

Customer centricity and operation. Once a winning strategy is established and a customer-centric structure has been created, companies must ensure that their operations are aligned to deliver the desired customer experience. Transformational change needs to permeate

various layers within the company, with marketing and sales standing out as the initial focal points. In the context of the preceding comparison, the sales mindset should evolve from asking questions like "How do we ensure that our customers buy our services and products?" [35] or "How many users can we sell this product to?" to adopt a more customer-centric approach. The key questions then become "Why did the user buy our product?" and "In what situation did the user decide to buy the product?" with the objective of gaining a deep understanding of the customer's true needs.

The biggest change companies should embrace involves being on the customer's side in buyer-seller transactions, even if it means 'unselling' the product. This implies that a salesperson won't push product sales if it is not the right fit for a particular customer's needs. Moreover, the salesperson should feel empowered and supported by the company's vision to recommend products from other sellers if they better match the customer's requirements, as the goal is to cultivate a valuable, long-lasting relationship with the customer, not just a one-time transaction. In this transformed landscape, product placement and marketing storytelling go beyond the conventional focus on product features and advantages. Instead, the emphasis shifts towards highlighting the benefits that will enhance customers' lives and illustrating how these products will work for them.

Survey methodology

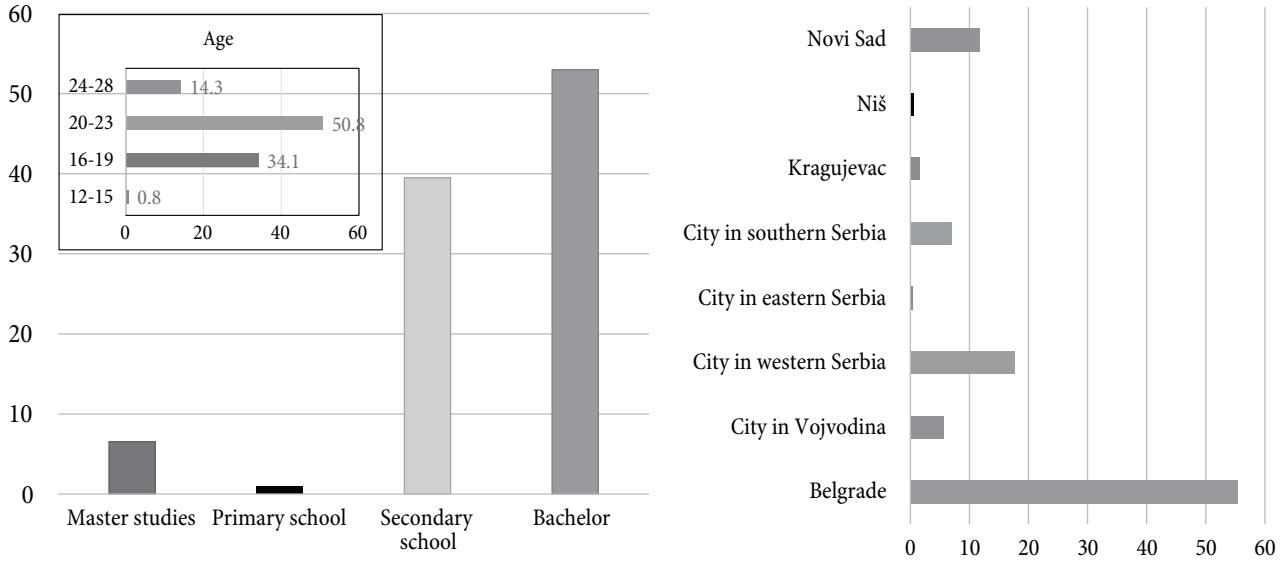
To capture value in a new economy, companies need to understand their customers. Business models are not only transitioning to become digital and data-driven but also the new entrants into the market are exceptionally digitally and tech-savvy compared to any previous generation [48].

To research those new customers, we conducted an online survey among 504 individuals from younger generations, spanning from December 2023 to the beginning of January 2024. Nearly 99% of the participants belong to Generation Z (born between 1995 and 2010), while, notably, we had a 0.8% representation from Generation Alpha (born after 2010) for the first time. The survey comprised 23 questions, primarily structured as closed-ended queries with pre-defined responses or rating scales. We ensured a balanced distribution between female (59%) and male respondents. The age distribution indicates that the majority falls within the 20-23 age group (50.8%), followed by 16-19 years old (34.1%).

Done by students at various levels of study, with more than half engaged in bachelor's studies, the survey drew participation primarily from individuals in Belgrade. However, it is important to note that the survey achieved regional diversity, with students from all Serbian regions contributing to the data collection process (see Figure 2).

As most respondents are currently students, many of them are not yet employed. Despite their lack of salary,

Figure 2: Where do you live, what level of education you have and how old are you



Source: Conducted survey

they autonomously make decisions regarding the products and services they use, showcasing distinct shopping habits and preferences. Consequently, our objective is to collect data that sheds light on the consumer behavior of younger generations and the expectations they hold towards the brands they engage with. In this context, we aim to compare the aspirations and demands of Generation Z and Alpha in Serbia with those of their global counterparts. To achieve this, the article compares survey results obtained from our conducted survey with similar surveys conducted by renowned organizations such as Deloitte.

Generations Z and Alpha as consumers

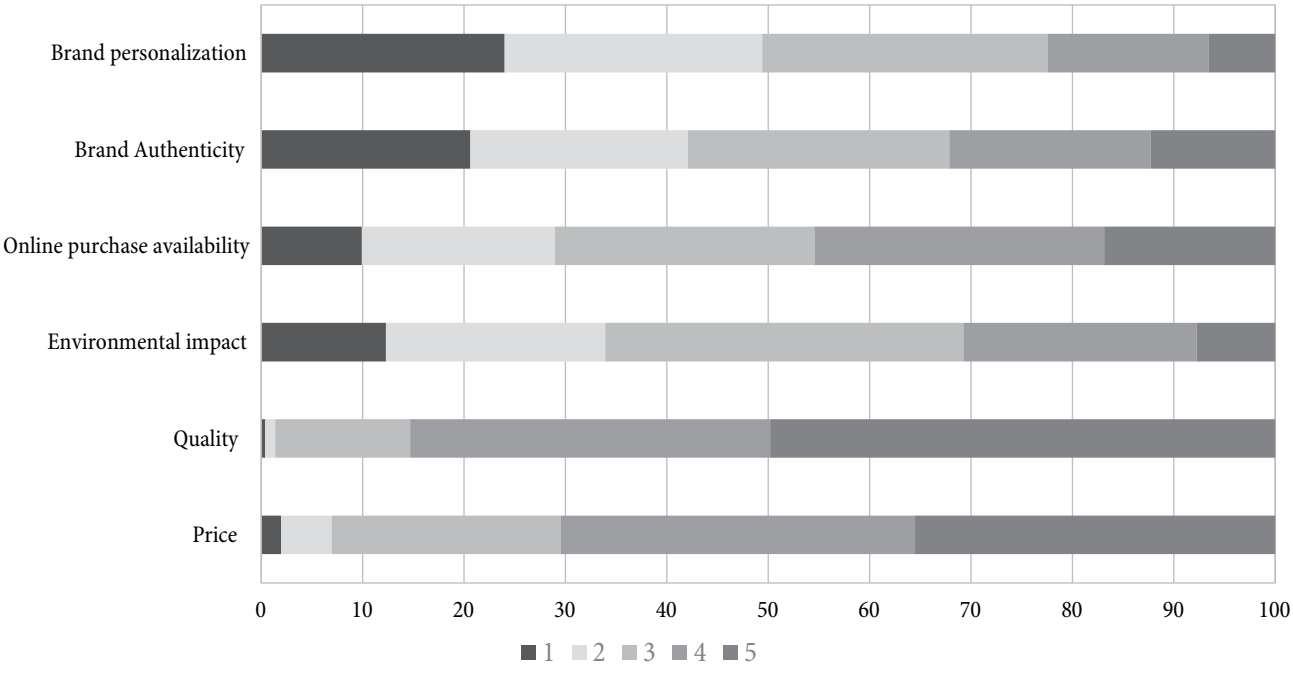
In the 60th year of the last century, Vogue magazine coined the term "youthquake" to encapsulate the transformative shifts in fashion and culture [34]. Today, this term can aptly be applied to illustrate the market impact brought about by new influencers, namely Generation Z and Alpha, together representing NextGen, also known as Zalphas.

In a previous article, we delineated the distinctive traits of Generation Z. This cohort, comprised of digital natives, stands as the most ethnically and racially diverse generation in history, exhibiting unique values, habits, and behaviors as they seek authenticity [39]. The next generation, the Greek Alphabet named Generation Alpha, is poised to become the largest and most diverse generation, being entirely born and shaped in the 21st century.

While Generation Z was predominantly raised by Generation X and late boomers, Generation Alpha's parents belong to the Millennial generation, individuals who embraced digital technologies during their teenage years rather than adulthood. Born and raised entirely in the current century, Generation Alpha emerges as a more digitally connected generation than any before, raised in the great screen age [42]. Significantly, they constitute the only living generation where a considerable number will witness the dawn of the 22nd century. Generations Z and Alpha, often described as NextGen, represent around 45% of the global population, and their earnings are about to hit $33 trillion by 2030, which is more than 25% of global income [46].

Despite the numerous similarities between these two generations, notable distinctions exist in key aspects. While Generation Z frequently experiences significant financial anxiety, Generation Alpha is poised to become the most financially prosperous generation in history [30]. Furthermore, Gen Z diverges in their approach to education, expressing a preference for studies that offer tangible, applicable knowledge for the labor market.

Figure 3: What is important to you when buying a brand?



Source: Conducted survey (1-not important at all, 5-very important)

Conversely, Generation Alpha appears more aligned with their parents, Millennials, who pursued fields of study based on personal interest rather than strict career applicability. There are expectations that 1 in 2 Gen Alpha members will have a university degree [49]. Alphas are anticipated to remain in education and reside with their parents for an extended duration compared to Gen Z. Additionally, there is some difference in their priorities when it comes to purchasing specific brands (see Figure 3).

For Generation Z, sustainability is a way of life, and they translated this to purchasing decisions as one way to protect the planet. Deloitte's global survey shows that climate change is the major stress for GenZ and Millennials, and they feel anxious about the environment [9]. Millennials raise Generation Alpha, and if in some cases not, then they often have Generation Z siblings. Therefore, we can expect this generation to be even more sustainably conscious than any other before.

NextGen (Z and Alpha) in Serbia said it appreciates the most quality and price when buying a brand. However, we see this as a result of the general demand sophistication of the Serbian economy (improving, but still below the EU average), as well as the influence of older who often spread the word about the importance of price/quality ratio. Upon delving into statistical data, we observe that 66% of respondents consider a brand's impact on the environment to be crucial or very crucial in influencing their purchasing decisions. Since they are tech-savvy, online purchase availability is also important to them. However, still, more than 80% of NextGen in Serbia is buying in-store and paying with cash or card, while around 18% are purchasing via Apple Pay, Google Pay, and Cash Pay. One intriguing aspect is the emphasis on brand personalization and authenticity, with a noteworthy correlation to age. As members of the NextGen cohort mature and further build their own attitudes, they increasingly prioritize the purchase of authentic brands (Table 1).

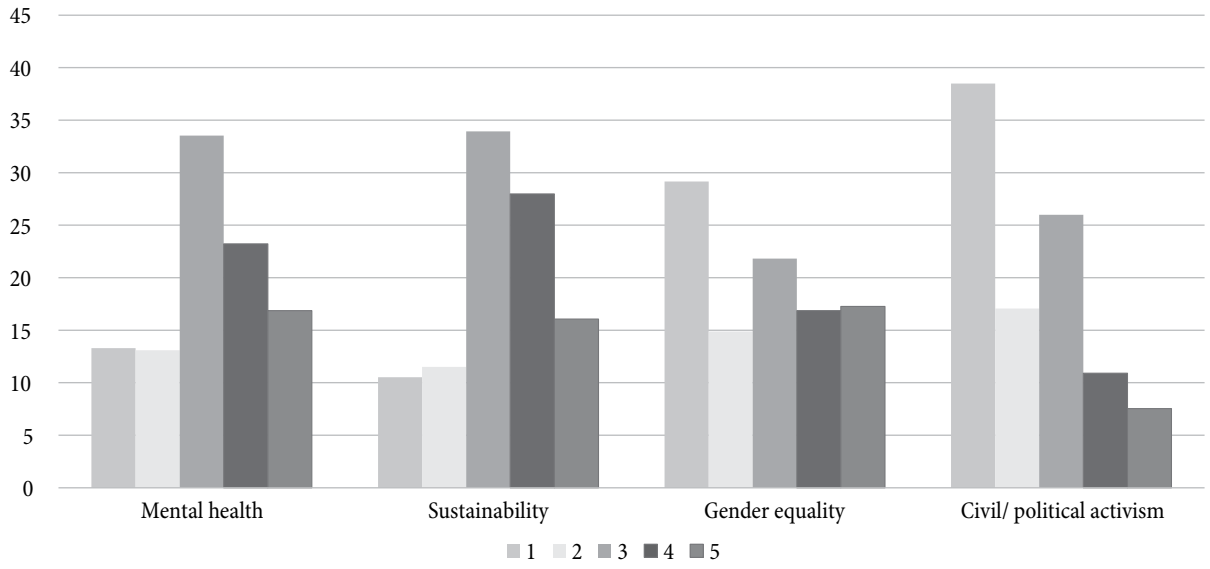
Table 1: % of NextGen members who find brand personalization and brand authenticity important (in %)

Age	12-15	20-23	24-28
Brand personalization	46.5	52.0	54.2
Brand Authenticity	60.5	55.5	61.1

Source: Conducted survey

In our previous article, we discussed the significance Generation Z places on employers prioritizing mental health [39]. According to the Deloitte Global Gen Z and Millennial survey, nearly half of Gen Z individuals (46%) report feeling stressed or anxious consistently. Gen Z anticipates that their employers will actively address mental health concerns, and a majority of Gen Z respondents (57%) affirm that their employers take mental health seriously [9]. This sentiment regarding the importance of employers fostering mental health is echoed by members of Generation Z in Serbia, aligning with the perspectives

Figure 4: To what extent do you value a brand's support the following:



Source: Conducted survey (1 not important at all, 5 extremely important)

of their counterparts worldwide. This also has spillover effects on expectations related to brands.

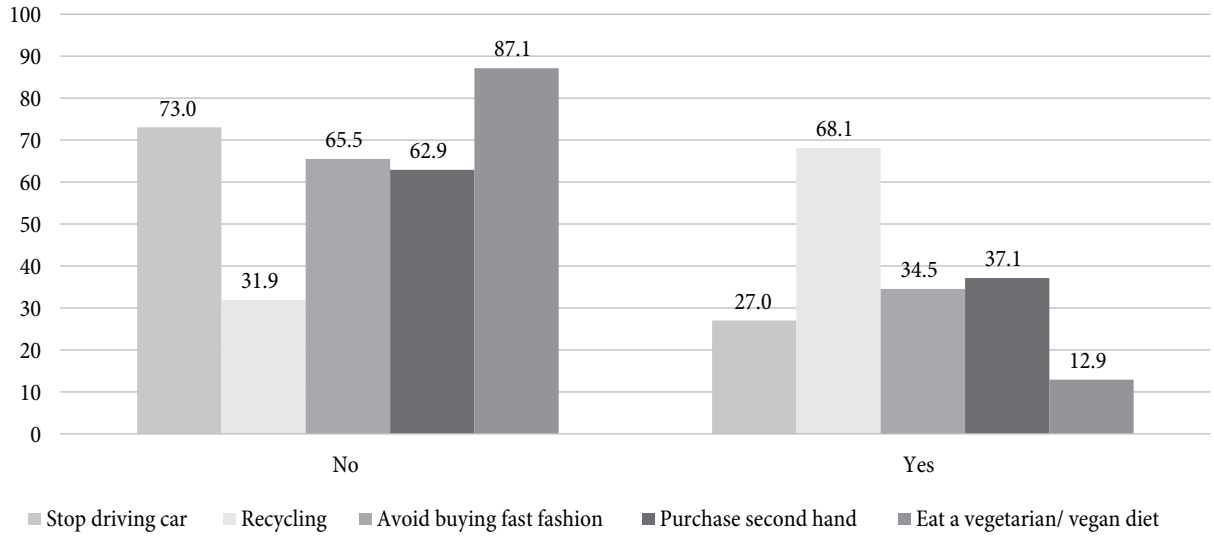
For NextGen, the paramount considerations are that a brand actively supports mental health and makes a positive impact on sustainability and the environment (Take a look at Figure 4). This inclination is consistent with the fact that over 60% of NextGen individuals consider a brand's environmental impact when deciding on a purchase. While issues like gender equality and civil/ political activism do not rank as high in brand loyalty as environmental and mental health concerns, approximately 20-25% of respondents still consider a brand's commitment to social-related issues to be important. Furthermore, they are actively engaging in tangible actions to address these concerns. Despite 52% of NextGen members expressing uncertainty about discontinuing product consumption if it doesn't align with their values, 45% have already refrained from purchasing a product due to a brand's stance on specific social issues.

Consumer habits and actions towards environmental protection – NextGen is sustainably conscious and more demanding in the purchasing process, paying great attention to sustainability [46]. Sustainability is becoming a lifestyle for this generation, and product purchase is one way to contribute to solving environmental issues.

The majority of survey respondents have conveyed their readiness to initiate recycling as a means of alleviating environmental impacts (see Figure 5). Beyond recycling, they also demonstrate a familiarity with the practice of reusing. The consumption of second-hand clothing has experienced a surge in popularity in recent decades, attracting extensive global efforts to understand the dynamics behind consumers' purchasing behaviors.

In Serbia, this trend is particularly pronounced among Generation Alpha, where 50% of respondents are willing to buy second-hand items to reduce environmental impact. Among Generation Z members also in Serbia, approximately 40% share this sentiment. Moreover, the NextGen cohort emphasizes the importance of avoiding fast fashion to contribute to climate action since, on average, we throw away over half of the cheaper items we buy in less than a year, which creates a whole lot of waste [32]. In Serbia, around a third of NextGen express a preference for steering clear of fast fashion as a means of supporting brands in their efforts to reduce environmental impact. Globally, the trend is consistent, with almost 33% of Generation Z already avoiding fast fashion and a quarter of them planning to do so in the future [9]. Discussing the realm of fashion, NextGen is poised to reshape the luxury industry. The concept of luxury, along with the markets for luxury brands, is undergoing a significant transformation to align with the preferences of the emerging generation of customers, Generation Z, whose purchasing power is on the rise. According to Bain & Company, it is projected that Generation Z will constitute 70% of luxury spending by 2026 [25]. One of the foremost challenges

Figure 5: Would you take any of these actions to reduce environmental impact and support a brand in doing this?



Source: Conducted survey

confronting luxury brands in the upcoming years stems from the markedly different value systems of Generation Z compared to previous generations such as Baby Boomers, Millennials, and Generation X. To both retain their existing consumer base and attract new customers, luxury brand manufacturers should swiftly adapt, transcending some established traditional notions of luxury – such as status, heritage, and prestige. Instead, they need to offer luxury freshly by embracing principles of inclusion, sustainability, transparency, technology, and innovation [25].

A distinctive aspect of Gen Z in Serbia is its approach to nutrition, differing from its global counterparts. Only 12.9% of Generation Z members in Serbia express a preference for a vegan/vegetarian diet to reduce environmental impact. Among those contemplating adopting a vegan lifestyle, a significant proportion falls within the 16-19 age group. This choice ranks among the least favored actions globally as well. However, 22% of Generation Z worldwide plan to adopt such dietary habits. Statista's data also reveals that over half of Generation Z in the United States follow at least a partially vegetarian diet. Those percentages should be even higher further with Generation Alpha since their parents are Millennials who are more nutritionally informed. However, this doesn't necessarily imply a complete shift to a vegan diet. Rather, it means making more informed choices, such as reading labels, opting for organic foods, consuming less meat, and avoiding additives [28].

On the other hand, Generation Z in Serbia shares a common stance with their global counterparts when considering abstaining from driving as a measure to reduce environmental impact; approximately 26% of both groups express a willingness to make this choice. Maturity once again emerges as a crucial factor influencing attitudes. In Serbia, our observations indicate that those individuals who already possess driving licenses are more inclined to take this particular action. On a global scale, Generation Alpha exhibits an intriguing perspective on mobility, as highlighted by Hyundai: "Self-charging electric cars and space travel via public transport rank at the forefront of the future mobility wish list among the younger generation." [13].

Generation Z and Generation Alpha places for gathering information. Generation Z and Generation Alpha are values-driven ones, with more than half of them in Serbia (54%) considering it crucial for a brand to align with their values. They stress the significance of honest communication from the brand, and they value individuals who endorse the brand to share the same values. There are 42% of NextGen members in Serbia who refrained from buying a product simply because it was endorsed by an individual whose values did not align with those of young people. These values revolve around honesty, commitment to sustainability, and addressing mental health issues.

However, when selecting the brand, they trust the most, young people turn to their closest connections – friends and family (see Figure 6). In essence, when gathering information about brands, young people highly value honest communication that presents both advantages and disadvantages and they appreciate connecting with users through authentically created content. Friends emerge as the most influential, with only 3.4% of respondents in Serbia relying on popular individuals or influencers for brand recommendations. More than influencers, the youth trust comments on social networks (14.1%), valuing the insights and experiences shared by those who have already tried a product or possess specific knowledge about a brand. Surprisingly, 64% of NextGen in Serbia do not follow their favorite brand on social media.

Studies conducted in the USA and China have highlighted a diminishing influence of paid influencers. Notably, micro-influencers (up to 50,000 followers) and nano-influencers (up to 10,000 followers) wield greater influence than mega-influencers (over 1 million followers). Young individuals are increasingly discerning the difference between sponsored posts by influencers and content generated by regular users [33]. Certainly, employing influencer marketing as a communication intermediary with influencers can foster a higher willingness among customers to share brand-promoting user-generated content (UGC) compared to paid social media advertising [20].

Upon first hearing about a brand and forming their initial impressions from family and friends, young individuals predominantly seek additional information through the brand's website (see Figure 7). Youth do not watch TV. McCrindle notes that Generation Z prefers consuming

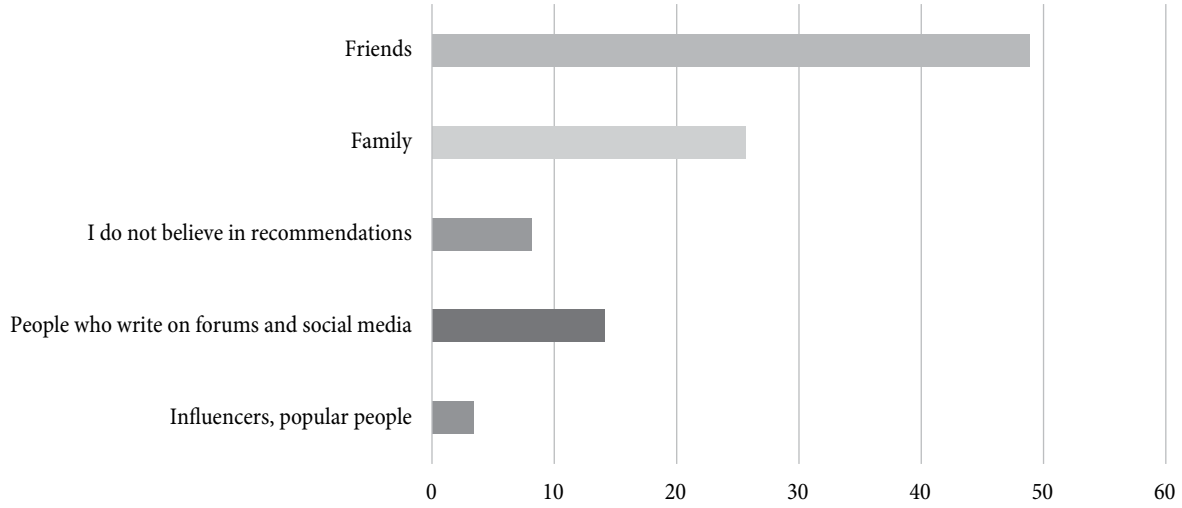
screen content via mobile devices, while Generation Alpha leans towards streaming [29]. Gen Z listens to music on platforms like Spotify, while Alphas favors smart speakers like Alexa [29]. Given that their parents and grandparents predominantly use Facebook, it's unsurprising that only 9.9% of Zalphas gather information about brands on this social media platform. Instead, Instagram and YouTube are more commonly used for brand recommendations than TikTok.

Socially, Generation Z is characterized by the Global Financial Crisis, while the impact of COVID-19 marks Generation Alpha. As a result, social media platforms are becoming even more integrated into the lives of Alphas and younger members of Gen Z.

When looking at social media usage in general, Instagram and TikTok dominate, along with YouTube, among all generations (see Figure 8). Younger generations use TikTok more than YouTube, but as we move toward older ones, the dominance shifts to YouTube. Facebook shows minimal signs of life among older generations.

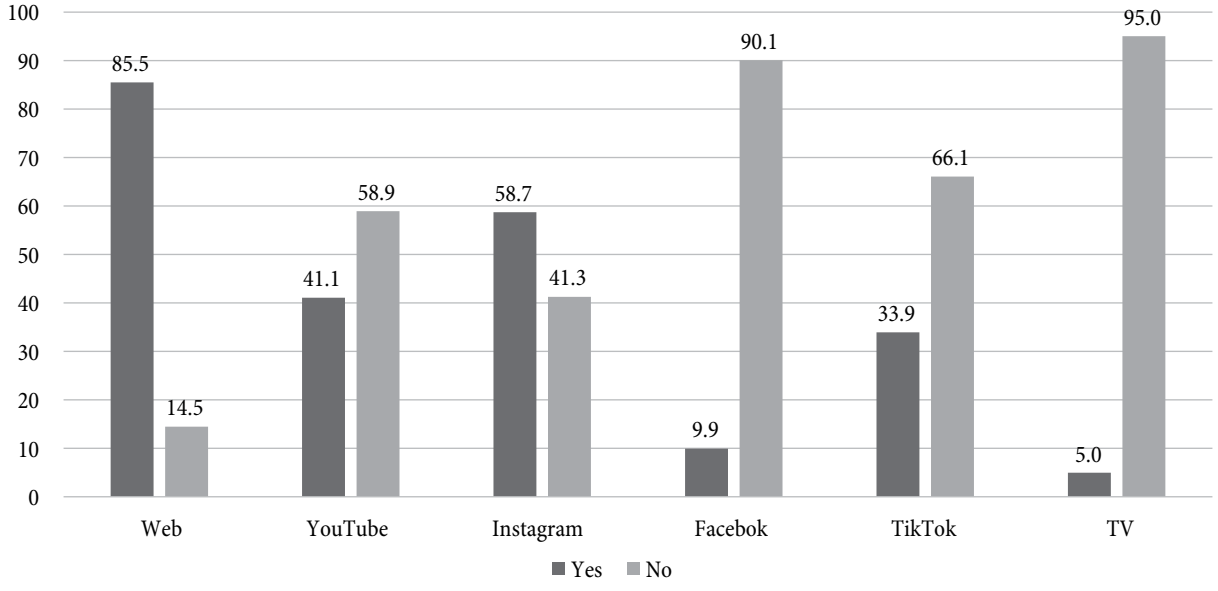
According to our survey results, the younger they are, the more time they spend on social networks. A significant portion of young people, with the highest percentage, spends between 1 and 3 hours on social networks. Notably, 10%

Figure 6: To whom do you trust the most when it comes to recommendations for some brands?



Source: Conducted survey

Figure 7: Where are you searching for more information about the brand?



Source: Conducted survey

of them, or every tenth young person, spend more than 5 hours on social media platforms. This trend is particularly pronounced among Generation Alpha, where 50% fall into this category, and 20% of the younger Gen Z individuals (aged 16-19) also spend over 5 hours on social media.

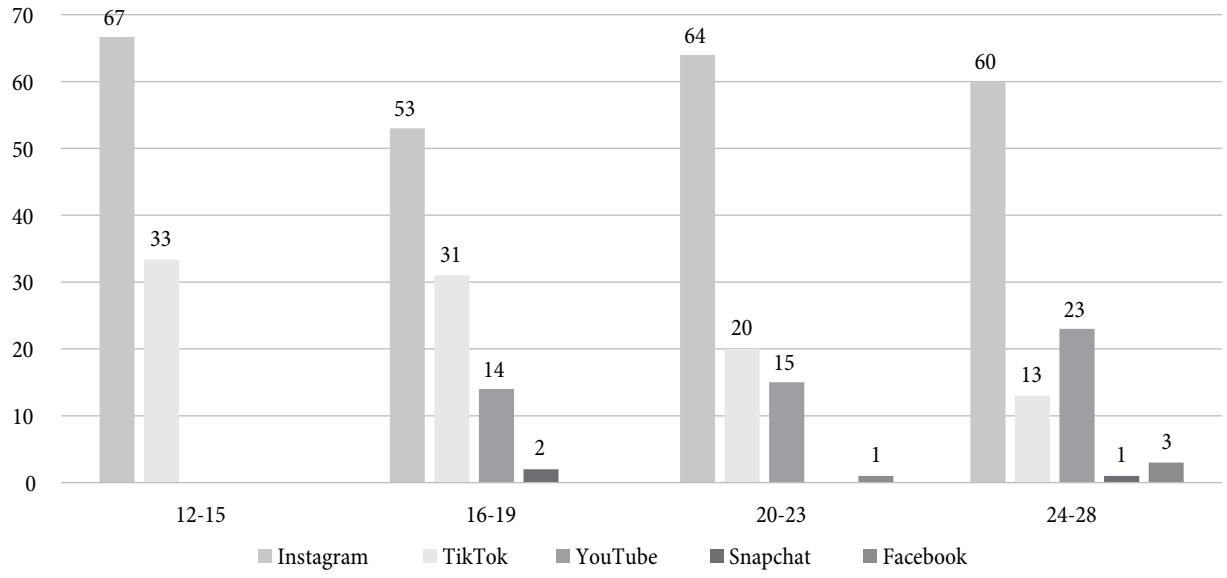
Globally, over 4 in 10 members of Generation Z have expressed that social media makes them feel lonely or inadequate [9]. However, the parents of Generation Alpha, being millennials and more tech-savvy, can provide a higher level of guidance and protection for their children in navigating the digital landscape. However, it remains an open question whether this will be the case, as Alphas are known to use certain platforms that their parents may not fully comprehend and, in some instances, even guide their parents in using them.

Considering all the findings, it can be inferred that companies in the process of developing brands should prioritize sustainability and strive to minimize negative environmental impact through initiatives like recycling and reusing. Additionally, they ought to focus on delivering personalization and authenticity within the brand, fostering honest communication. Brands should have a clear stance and implement concrete actions in support of mental health and social issues, such as gender equality. Being active on social media and maintaining websites that ensure optimal user experiences while making online purchases available. To do all of this, companies need to put customers in focus more than ever, and the customer-centric approach is there to help.

Customer Centricity and NextGen. Seeing that customer centricity, at its core, revolves around prioritizing customer needs, preferences, and experiences in all aspects of business strategy and operations, for the Next Gen era, that entails a profound understanding of 'how they tick' – what are their distinct characteristics, behaviors, and values. Unlike the generations that came before, Gen Z and Alpha are digitally native, socially conscious and have grown up in a world where instant gratification and authenticity are paramount, so it's only natural that as a customer segment, they require a nuanced approach that goes beyond traditional sales or marketing strategies, seemingly easily applied to their predecessors.

Businesses need to align their values with those of NextGen, fostering a genuine connection that goes beyond mere transactions. This understanding sets the stage for a deeper exploration of why customer centricity, particularly in the context of those generations, is not just a trendy buzzword but a strategic necessity and a priority for any company determined to survive and thrive. There's a quote attributed to Steve Jobs that says: 'Get closer than ever to your customers. So close that you tell them what they need well before they realize it themselves,' and those words resonate with the core tenet of customer centricity – an intimate understanding of customer needs, leading

Figure 8: Which social network do you use (by age groups in %)?



Source: Conducted survey

to the anticipation and fulfillment of latent desires. And one thing is clear – NextGen has an abundance of those.

In Serbia, the NextGen journey reflects a delicate balance between the ever-present global influences and reliance on various local nuances. Serbian NextGen is unique in its ability to blend global trends with a sense of local identity. Brands that understand this duality and authentically connect with the rich cultural medley of the region can create powerful resonance and cater to their needs on two fronts – one that emphasizes the importance of high-quality products and/or service in general and the other one – that focuses on tailoring that quality aspect to offer a seamless, yet highly personalized experience. In the era of data capitalism, companies need to be both prepared and willing to gather data about their customers in various ways to truly grasp their behavior and secure their own competitive edge. Understanding customer behavior goes beyond just knowing who, when, and where bought how many of the products. It's about delving into the why – the motives, values, and goals that drive a customer to choose a particular product. What role does that product play in the customer's life, what job gets done for them, and what values does it hold for them? For companies looking to connect with Gen Z and Alpha, the key is creating products that resonate with and support their values.

The research underscores the significance of environmental sustainability as a key aspect of brand value expected by NextGen. Hence, for companies aspiring to be truly customer-centric and stand out in today's cutthroat market, it's not just about developing a sustainable product - it's actually about aligning their entire business approach, organization, and processes accordingly.

Conclusion placement

We have opened a lot of questions and pointed out the key dilemmas that have arisen with entering the digital age. There are many open questions that the digital economy is looking for and will continue to seek answers to.

It would be pretentious to draw definitive conclusions at this point, but it is quite certain that the digital transformation that is taking place all around us should have three key dimensions:

- technical-technological, which develops through the fantastic achievements of the digital age;
- economic and financial, so that technological achievements using new business models make the best contribution to raising the well-being of the population and the position of consumers and
- the social-humanistic effects of the achievements of digital technologies and the potential risks to which consumers are exposed (on the one hand, a significantly improved position of consumers but, on the other hand, an open space for the abuse of technologies).

Only in the combination of these dimensions can a substantive but desirable digital transformation be achieved.

The digital age, with its modern technologies, has opened huge opportunities for prosperity, but in order to use all open opportunities in the best way, it is necessary to achieve full economic and financial effects but also the full social purpose of all these processes. The enormous technological achievements of digitalization open up questions to which we will seek answers further, and among them are from the point of view of companies that are today the purpose of business – the relationship between economic and social effects, and from the point of view of the individual what is his position – the role of consumers is strengthened, but also opens up space for the use of technologies that carry numerous risks.

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Nebojša Savić

is an emeritus professor at the FEFA Faculty, teaches Economics and Competitiveness and is a MOC affiliate faculty member of the Harvard Business School Institute for Strategy and Competitiveness. He was the President of the Council of the Governor of the National Bank of Serbia (2012-23). He has more than forty years of experience in company restructuring and institution building toward a market economy. Professor Savić was a member of top expert teams advising on economic reform policies in Serbia. He was a member of the Serbian National Competitiveness Council (2008-2012) and previously served as President of the Yugoslav Economists Association and Editor-in-Chief of Economic Barometer, the leading monthly business cycle publication on the Yugoslav economy. He was a member of the Board of Directors of Alpha Bank Serbia (2006-2012) and President of the Board of Directors of Komercijalna banka, Serbia (2003-2005). He holds a PhD and MA degree from the Faculty of Economics, University of Belgrade. Dr. Savić has authored seven books (including Savić, N. and Pitić, G., Eurotransition – Challenges and Opportunities, 1999) and more than sixty articles.

Jelisaveta Lazarević

is an assistant professor and Vice Dean at the FEFA Faculty. She is also a Chief Economy Producer at Bloomberg Adria. Jelisaveta is involved in the business development of the innovative company EM Analytic Solutions, which specializes in the application of AI and advanced analytics for the purpose of creating added business value in various industries. She started her career at the Center for Advanced Economic Studies, where she had the opportunity to work on a World Bank project for the Ministry of Economy: Employment and Competitiveness, where she specifically focused on the analysis of value chains in the sectors of the economy with the greatest development potential. She is a strong believer in inclusive innovation-driven development and for two years she was Head of corporate partnerships at All for All organization, where she is a board member. Jelisaveta completed her undergraduate and master's studies at the FEFA Faculty as a student of the generation. During her undergraduate studies, she was named one of the best economics students in Serbia by the Serbian Association of Economists. She defended her Ph.D. dissertation at the FEFA Faculty in the field of business economics on the topic: Essays on strategy and innovation. At the FEFA Faculty, she works on projects that contribute to the competitiveness of the economy, especially through the research of companies that are defined as "hidden champions". During her career so far, she has received several awards, such as being selected as a future leader of Europe by the France Ministry of Europe and Foreign Affairs.

Ana Jeličić

is a lecturer at the FEFA Faculty and teaches Design Thinking and Designing the Products. She is a partner of the global DesignThinkers Academy for Adriatic Region. Ana completed her master's studies at the Faculty of Philosophy, where she was inspired by the topic of continuing employee education in companies. Her career started in HR Agency, but her professional development continued in Innovation Agency where she got a chance to meet with different industries, projects and methodologies aiming to innovate processes, products or business models. At that time, she met for the very first time with design thinking methodology. She was gaining knowledge of the topic at HPI School, in Potsdam, Germany. As a certified Design Thinking Facilitator in recent years, she facilitated a variety of trainings, boot camps, open innovation challenges, and projects by implementing design thinking methodology. The facilitator's strength is to empower small and big teams to unlock their creativity for more business impact and to solve problems by using different approaches and tools.

Filip Grujić

is the coordinator of the Center for Career Development and a lecturer at the FEFA Faculty in Belgrade, where he has been teaching a course in Marketing since 2020. Filip is also engaged as Talent Pool Coordinator at DDOR osiguranje Novi Sad, as part of an HR department, where he works on various HR processes such as developing and monitoring activities targeting young and talented people in a company, and also works on building a strong relationship between company and universities and high schools. He participated in the Serbian Youth Leadership Program in the United States of America, where he was one of the best delegates of his group. He completed his undergraduate studies at the Faculty of Economics and Business in Belgrade, module: Management. Grujić holds a master's degree in Marketing management from the same faculty at the University of Belgrade. He started his career as an Associate at the Center for Corporate Relations at the Faculty of Economics, where he was part of the team that established cooperation with more than 400 companies and provided more than 1300 internships for students. From 2017 to the present, he has been engaged as a consultant in employer branding projects for several domestic and foreign companies. Co-author of Ahold Delhaize's Brand Ambassadors program in 2017. In October 2021, he started his PhD studies at FEFA Faculty. Filip has been a panelist and guest lecturer at many student conferences and conferences in the field of HR, marketing, employer branding and talent development.

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Dušan Vujović
Metropolitan University, FEFA
Belgrade

GENERATIVE AI: RIDING THE NEW GENERAL PURPOSE TECHNOLOGY STORM

Generativni modeli veštačke inteligencije – zauzdati još jednu tehnološku revoluciju

Abstract

Generative AI promises to revolutionize many industries (entertainment, marketing, healthcare, finance, and research) by empowering machines to create new data content inspired by existing data. It experienced exponential growth in recent years. In 2023 breakout year Gen AI impact reached 2.6-4.4 trillion USD (2.5-4.2% of global GDP). The development of modern LLM-based models has been facilitated by improvements in computing power, data availability, and algorithms. These models have diverse applications in text, visual, audio, and code generation across various domains. Leading companies are rapidly deploying Gen AI for strategic decision-making at corporate executive levels. While AI-related risks have been identified, mitigation measures are still in early stages. Leaders in Gen AI adoption anticipate workforce changes and re-skilling needs. Gen AI is primarily used for text functions, big data analysis, and customer services, with the strongest impact in knowledge-based sectors. High-performing AI companies prioritize revenue generation over cost reduction, rapidly expand the use of Gen AI across various business functions, and link business value to organizational performance and structure. There is a notable lack of attention to addressing broader societal risks and the impact on the labor force. Gen AI creates new job opportunities and improves productivity in key areas. Future investment in AI is expected to rise. Concerns about the potential AI singularity, where machines surpass human intelligence, are subject to debate. Some view singularity as a risk, others are more optimistic based on human control and societal constraints. Leading experts in Gen AI predict that the coming decade can be the most prosperous in history if we manage to harness the benefits of Gen AI and control its downside.

Keywords: *AI – artificial intelligence, AI singularity, GPT – generative pre-trained transformers, LLM – large language models, generative AI models, ChatGPT, ML – machine learning*

Sažetak

Generativna VI će revolucionisati mnoge delatnosti (zabavu, marketing, zdravstvo, finansije i istraživanje), omogućavajući mašinama da kreiraju novi sadržaj inspirisan postojećim podacima. Ona je doživela eksponencijalni rast u proteklim godinama. U 2023. prelomnoj godini modeli generativne VI doprineli su 2,6-4,4 triliona USD (2,5-4,2% globalnog BDP-a). Razvoj modernih modela zasnovanih na velikim jezičkim modelima (LLM) omogućen je poboljšanjima u domenu računarske tehnike, dostupnosti podataka i boljih algoritama. Ovi modeli imaju različite primene u generisanju teksta, vizuelnog sadržaja, zvuka i programskog koda u različitim oblastima. Vodeće kompanije brzo uvode generativnu VI za strateško odlučivanje na korporativnom nivou. Iako su već identifikovani rizici povezani sa veštačkom inteligencijom, razvoj mera za njihovo ublažavanje još je u ranoj fazi. Lideri u usvajanju generativne VI očekuju promene u kvalitetu radne snage i potrebe za prekvalifikacijom. Generativna VI se pretežno koristi za generisanje teksta, analizu velikih baza podataka i pružanje korisničkih usluga, sa najjačim uticajem u sektorima zasnovanim na znanju. Kompanije koje uspešno koriste modele VI u svom poslovanju prioritet daju generisanju prihoda u odnosu na smanjenje troškova, brzo šire upotrebu generativne VI na različite poslovne funkcije i povezuju poslovne performanse sa organizacijom i strukturom kompanije. Nedovoljno pažnje posvećuje se uticaju VI na radnu snagu i širim društvenim rizicima. Generativna VI stvara nove mogućnosti za zapošljavanje i poboljšava produktivnost u ključnim oblastima. Očekuje se da će investicije u veštačku inteligenciju rasti u budućnosti. Brige oko potencijalne singularnosti VI, gde mašine prevazilaze ljudsku inteligenciju, predmet su rasprave. Neki vide singularnost kao rizik, dok optimisti veruju u efikasnost ljudske kontrole i društvenih ograničenja. Vodeći stručnjaci predviđaju da za generativnu VI naredna decenija može biti najprosperitetnija u istoriji, ukoliko uspemo da iskoristimo prednosti generativne VI i kontrolišemo njene negativne strane.

Ključne reči: *VI – veštačka inteligencija, VI – singularnost, GPT – generativni unapred obučeni transformatori, LLM – veliki jezički modeli, generativni VI modeli, ChatGPT, ML – mašinsko učenje*

Introduction: The status of AI

Generative Artificial Intelligence (Generative AI or Gen AI) is defined as a subset of AI techniques, tools and models that involve/allow the creation of new data instances (text, images, sounds, music, …) that mimic or are inspired by preexisting data. Unlike traditional AI methods that focus on classification and/or prediction tasks, generative models aim to generate new data content that is indistinguishable from real data. Generative AI models have experienced exponential growth in recent years and have garnered significant attention due to their potential to revolutionize various industries, from entertainment and marketing to healthcare, finance, reasearch, and creative arts. By enabling machines to understand and create content, Generative AI opens up a plethora of opportunities for innovation and creativity.

Artificial Intelligence (AI) and Generative AI (Gen AI) models and tools have been showing unprecedented growth since 2017. A recent survey of Generative AI applications [29] has identified an exponential increase across a wide range of domains. Based on a comprehensive evaluation of more than 350 generative AI applications (as of June 2023), the survey provides a structured taxonomy of unimodal and multimodal generative AIs applicable to text, images, video, gaming, code, and brain information. By now, six months later, the number of similar applications could have doubled, and the number of users is now estimated at more than 200 million.

The explosion of generative AI models has attracted a lot of attention from businesses, governments and the general public, and triggered an enormous debate among tech scientists/specialists and academic researchers (including economists). Based on the latest Global Survey results on the state of Artificial Intelligence (AI), McKinsey [40] has labeled 2023 a breakout year for generative AI's development and application. In a separate report on economic potential of generative AI, McKinsey [41, p. 10] estimates its marginal global economic impact between 2.6 and 4.4 trillion USD for 63 new Gen AI use cases (across 16 business function). In addition, Gen AI is expected to increase labor productivity with a net value added impact of 6.1 to 7.9 trillion USD. When added to the value added contributed by existing AI-based advanced analytics, traditional machine learning, and deep learning, AI is expected to contribute a staggering total of 17.1-25.6 trillion USD (or 16.4-24.5%) to the global GDP (based on IMF forecast for 2023).

Leading world companies and organizations are rapidly deploying generative AI tools (gen AI or GAI), albeit still unevenly across business functions, industries, and locations around the globe.

Substantive improvements and explosive growth in Gen AI models, tools and programs have elevated AI issues from the level of IT and tech employees to the top layers of corporate executives. More than 25% of survey respondents confirm that AI tools are already being used in their boards to guide strategic and operational decisions, and 40% indicate an overall increase in AI investment triggered by recent advances in Gen AI.

AI-related risks are increasingly being identified but it is still too early to assess the quality of risk mitigating measures, even in areas where errors are obvious and relevant (i.e. inaccuracy of gen AI models). Organizations that are more advanced in traditional AI capabilities (high AI performers) are also leaders in adopting new GAI advances, further outpacing other companies. Most respondents anticipate workforce cuts in select areas and large-scale re-skilling/retraining efforts to respond to changing needs caused by GAI.

The expectation that Gen AI may have positive multiplier effects on the adoption of traditional AI tools has not been confirmed by the 2023 survey results: the overall use of traditional AI tools did not follow the gen AI explosion and remained stable and concentrated within a small number of business functions since 2022. The use of GAI tools by senior management levels ranged from 20% in developing and emerging markets to 24% in Europe and 28% in North America. By industry, the leaders are "technology, IT and media" companies with 33%, followed by financial services with 24%, and "business, legal and professional services" with 23% use of GAI tools.

- Most commonly used generative AI tools are modern "text functions" (27%) in producing first drafts and summaries of technical, legal and internal documents

and manuals – usually edited and finalized by qualified and experienced humans.

- The second most important area is the use of GAI tools for big data analysis (16%), to establish trends in customer needs and forecast service trends. A great majority of respondents (75%) expect that generative AI will have a significant positive and disruptive impact on their industry competition in the medium run (3 years).
- The third most frequent area for using generative AI tools is in customer-related services (14%), including personalized marketing, chatbots, and similar services.

Given the very nature of generative AI tools focused on language and analytical activities, the survey predicts that the impact will be stronger in sectors relying on knowledge work, leading to increased revenues (+9% in tech industry, +5% in banking and in medical/pharma industries, and +4% in education). Expectedly, manufacturing-based industries will have the least disruptive impact.

The survey shows an amazing speed with which high AI performers have moved from initial considerations of generative AI only a year or two ago to strategic questions of how to advance the use of GAI models across business functions through investment in hardware and software. The focus is now mostly on how to customize learning of GAI models and expand their use in a broader set of core business activities and strategic questions such as:

- defining the future governance and operating models,
- optimal management of third parties including cloud and LLM providers,
- managing a wide range of risks,
- understanding the implications of technological change on people and tech stack, and
- reaching clarity about finding the balance between near-term gains and developing long-term foundations needed to scale up.

On the downside, most respondents indicate that almost 80% of participating organizations are not yet adequately addressing potential risks of generative AI. Very few companies have developed clear policies governing the use of gen AI, and even when they have, the policies often took a narrow focus on protecting company's proprietary information (such as data, knowledge, intellectual property rights). Broader social, humanitarian and environmental risks, as well as unintended consequences of gen AI, have either been superficially addressed or ignored.

Despite huge public interest in the employment consequences of AI, only 34% of survey participants considered the impact of AI on labor force (displacement) to be a relevant organizational risk, and mere 13% indicated that their companies are working on mitigating that socially important risk.

Survey [40] shows that AI high performers (i.e. companies that attribute more than 1/5 of their profits to AI use) are using gen and traditional AI in growing number of business functions (product and service development and cycle-management, risk and supply chain management, modernizing products and enhancing services by adding new AI features, HR and performance management, and workforce deployment optimization). Most importantly, the top objective among traditional AI users is "core business cost reduction" (often through automation which leads to labor displacement), while the top objective among high gen AI performers is to create new lines of business and sources of revenue within which the existing product/service mix will get a higher valuation (i.e. profitability).

Gen AI has become an endogenous part of the AI high performing companies, and their main challenges lie in the further development of their own "AI models and tools" (24% of answers) and "the adoption and scaling" of AI models (19%). By contrast, traditional companies still debate how to use gen AI models (AI strategy received 24% of the answers) and pay much less attention to developing own "models and tools" (only 6%) and somewhat less to "adoption and scaling" (15%) of third party AI models. It should be noted, though, that even high AI performers use gen AI components (blocks and whole programs) developed by specialized companies whenever possible (35% of answers compared to 19% for traditional companies).

Comparison of McKinsey survey results over the past six years shows that high AI performers also tend to be more strategic in identifying key factors of success that allow them to stay focused on value and rewiring (restructuring) their organizations to capture that value.

The reason seems straightforward: The search for high-value opportunities for (both generative and traditional) AI models across all business domains acts as a diagnostic tool and reveals where the "value" is and will be in the future, as well as the structural organizational rigidities that stand in the way of optimally capturing the identified value. In other words, survey results confirm that high AI performers are also leaders in linking business "value" (profit in the broadest sense) to performance and to business organization and structure.

With Generative AI models and tools, company structure (organization) becomes endogenous in its technological and HR part. High AI performers do not necessarily focus on reduction in labor as part of cost minimization, but on matching skills to needs driven by value. Few years ago AI growth led to a predictable increase in the demand for and shortage of data, machine learning and AI engineers and scientists. Last year, survey respondents indicate a 25% drop in the difficulty of finding the right AI-related software engineers, but increased demand for sector specialists who could enhance the learning process of large language models (LLM) and other gen AI models.

The purpose of the paper is to provide an overview of the most revelavant aspects of explosive Generative AI development in recent years and highlight its multifaceted impact on jobs and employment, productivity, global economy, education, prevailing economic paradigm and economic research. The paper will also outline the likely general impact on economic growth and best policy responses to the challenges posed by the exponential expansion of Gen models and technologies.

Following the overwiew of recent survey results regarding the use of Gen AI models at corporate level, and the global economic effects, the remainder of the paper is structured as follows: the second section will provide a brief review of the history of present generative AI models and tools. The third section deals with a range of issues related to changes in jobs, productivity, and employment and income inequality. The fourth section briefly reviews the impact on economic research and applied economic analysis for policymaking. The fifth section concludes and highlights issues for further research regarding impact of Gen AI on economic growth and GDP measurement.

This paper also serves as a conceptual framework for detailed empirical investigation based on microeconomic (enterprise data) and survey-based analysis in Serbia. This analysis is already underway and will appear in the next paper, focused entirely on Serbia-specific challenges and responses to the explosion of generative AI. In addition, the next paper will build on previous work on the resilience of Serbian labor market [7], the modified workings of the of the O'Kun's law [39], and the nuanced impact of innovations on productivity and economic growth in the Serbian economy [56]. The central part of the forthcoming paper will be devoted to estimating job and occupanional exposure at the firm and sector (industry) level to automation and labor augmentation consequences of generative AI models. Last but not least, the next paper will utilize lessons learned from specific efucation, upskilling and re-skilling programs implemented in the past [34].

History and overview of Generative AI

The history of Generative AI models reflects a continued progression towards more powerful and versatile techniques for generating new data. From early probabilistic models to modern deep learning architectures, Generative AI has undergone rapid evolution and is poised to continue driving innovation in artificial intelligence. The history of Generative AI models is a fascinating journey marked by significant advancements and milestones.

Early decades of models preceding modern Gen AI

The origins of Generative AI can be traced back to the 1950s and 1960s when researchers began exploring early techniques for generating data. Early methods, such as random number generators and simple probabilistic models, laid the foundation for future developments in Generative AI.

- Researchers made significant progress in the development of probabilistic models for generating sequences of data (text and speech) using Markov models in the 1970s and 1980s.
- Restricted Boltzmann Machines (RBMs) of the 2000s are an important milestone in developing a powerful framework for training generative models.

RBMs as a type of neural network that can learn to represent complex data distributions and generate new samples, paved the way for more sophisticated deep learning models in Generative AI.

- Autoregressive Models which existed from the early 1980s and were used extensively in time-series analysis, regained popularity for generating sequential data (for images, audio, and text), one element at a time, conditioned on previously generated elements, allowing them to capture complex dependencies in the data distribution.
- Variational Autoencoders (VAEs) introduced in 2013 represent a more recent breakthrough in Generative AI development. Based on neural network architectures VAE can learn to encode and decode data while maximizing the likelihood of generating realistic samples with applications in text and image generation.
- Generative Adversarial Networks (GANs) introduced only a year later revolutionized the field of Generative AI. GANs consist of two neural networks, a generator and a discriminator, that compete against each other in a game-theoretic framework to generate highly realistic samples with a wide range of applications.
- GPTs (Generative Pre-trained Transformers) emerged in 2017 as state-of-the-art models for text generation and other natural language processing tasks. GPT models use self-attention mechanisms to capture long-range dependencies in the data to perform a wide range of tasks with impressive performance.
- Most recent (2019-2023) additions to the growing Transformer-based Models, such as OpenAI's family of Generative AI models, include large-scale pre-trained models, such as OpenAI's GPT-3, 3.5 and 4 which can generate highly realistic text across a wide range of domains. Future improvements will be based on increasing sample size and quality, ensuring scalability, and enhancing intuitive interpretability of model results, as well as expanding use cases to areas such as healthcare, education, finance, and scientific research.

Luk [38, p. 10] empasizes that it is imperative to define what we mean by "Generative AI" and how this is distinct from the broader concepts of Artificial Intelligence (AI) and Machine Learning (ML). He explains the difference between Generative models and discriminative models: generative models generate/create new data instances that are similar to the data they were trained on, whereas discriminative models discriminate/distinguish between different data classes/categories.

For example, generative models are like artists that have been trained in certain painting styles (e.g., Impressionism), and discriminative models are like art critics. Trained Gen AI models (like artists) would be able to create a new painting in the Impressionist style, whereas discriminative models (like art critics) would be able to tell whether a painting is Impressionist or not, but unable to create new paintings on their own.

Development of modern Generative AI models: ChatGPT

Artificial Intelligence (AI) and Machine Learning (ML) have been around since the mid-1950s. Despite continuous development of AI and ML models referenced above, there were very few tangible results until 2010. After that we have seen breakthroughs in the development of AI models in tandem with deep learning neural networks, greatly improved computing power, a huge expansion in learning databases facilitated by growing digital economy, and significantly better programs/algorithms. This enabled improved modeling of probability distributions based on ample training data, and better results: Gen AI models were trained on/learned enough data patterns to generate convincing "output samples" (i.e. responses to human questions).

The first GPT – Generative Pre-Trained Transformer was produced in 2017 [38, pp.13-16] based on the concept of "attention". It was less complex than previous models and included an "ability to be trained from past data." It paved the way for the creation of the first Large Language Model (LLM). LLM models are autoregressive causal models which treat text as vectors of numbers and try to predict the next word or token based on pre-trained sequences.

The next-generation GPT-2 model (released in 2019) was trained on a much larger data base and was able to learn natural language tasks without direct supervision.

GPT-3 model was released in 2020 followed by an improved version GPT-3.5 in 2022. The latest most powerful GPT-4 model was released in March 2023.

As indicated above, until June 2023 some 340 versions of GPT models and related tools have been produced and released, covering a wide range of uses in the area of text generation and processing, visual, audio, code and other digital content, with hundreds of use cases, business and personal functions, and specialized fields (law, fiction, non-fiction writing, visual arts, music, programming code, etc.).

Generative AI awakened concern: Are we sliding to Singularity?

Explosion of ever-improving Gen AI models based on equivalent improvements in computing power, digital data availability and powerful algorithms, awoke old real and fictional fears that the level of singularity may be looming upon us if these trends continue.

Experts predict that once we create generative AI tools and models matching human level of machine intelligence (HLMI), AI systems would be able to create a higher level of machine intelligence on their own, and yet another one, and so on until humans are left behind and possibly lose control. This may generate an accelerating rate of growth beyond human ability to manage and control and give rise to AI explosion. After that point, theory suggests that AI-based systems could move to superintelligence level quite fast, but with a considerable probability of 'bad' or 'extremely bad' outcomes for humanity, developed in excruciating detail in doomsday theoretical literature often seamlessly crossing from futuristic technological predictions (still science) to mass culture Sci-Fi hyper-production.

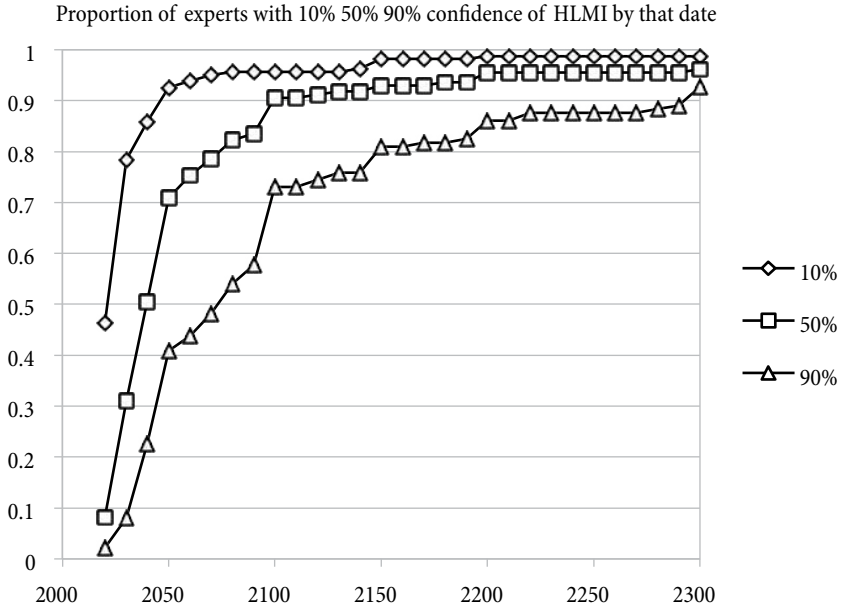
To avoid that trap and arrive at some rational answers regarding superintelligence and possible singularity, Muller and Bostrom approached more than 550 globally known scientists who did research, wrote on the subject of AI, and participated in leading conferences with an online survey seeking answers on two basic questions (see Figure 1):

- When will superintelligence be reached?
- How will things develop after that? What would be the impact and main (possibly existential) risks for humanity?

HLMI = 'high-level machine intelligence' that can carry out the professions most humans do at least as well as a typical human." The survey established three levels of human like interaction: Ability to pass a classic Turing test (language communication), pass a third grade school exam for 9 year olds, and do Nobel Prize level research.

Assuming the Turing test, the survey results show that half of the respondents (i.e. median value or line 0.5)

Figure 1: Reaching HLMI level machine intelligence by 2040



Source: Muller and Bostrom [42, pp. 11-19]

think that there is a 50% probability that HLMI level of machine intelligence will be reached by year 2040. And there is a 90% probability that HLMI will be reached around year 2075.

Based on a less demanding "third school grade test," the targeted HLMI level of machine intelligence would be reached ten years earlier (2030) and, under the most demanding Nobel Prize research test, five years later (2045).

After that point, although an immediate takeoff does not appear very likely, 75% of survey respondents expect, in line with theory, that AI-based systems could move HLMI to superintelligence in less than 30 years. And they also confirm a relatively high 30% probability of 'bad' or 'extremely bad' outcomes for humanity unless effective mitigation measures are put in place.

Regarding the overall long-run impact on humanity, respondents were fairly optimistic (see Table 1). Almost 54% expect extremely good or good impact, and another 18.5% expect neutral impact. Relatively large number (27.8%) expect bad outcomes, and within that, 14% expect catastrophic impact. It is interesting to note that respondents from tech AI groups are more optimistic than the respondents approaching AI issues from the theoretical point of view, most notably in expecting good long-term outcomes after achieving superintelligence (60.5% vs. 47.0%) and fearing much less catastrophic outcomes (7% vs. 14%).

Table 1: Attitudes towards the impact of Generative AI on humanity (survey results)

	AI groups		
	Theory	Tech	Total
Good outcomes	47.0	60.5	53.8
Neutral	17.5	19.5	18.5
Bad outcomes	35.5	20.0	27.8
in which catastrophic	*21.0*	*7.0*	*14.0*
Total	100.0	100.0	100.0

Source: Muller and Bostrom [42] and own calculations

Nordhaus [45] was intrigued by the same question and conducted elaborate tests with inconclusive results.

AI singularity is a hypothetical idea where artificial intelligence becomes smarter than people (reaches a level of superintelligence which humans cannot achieve) and continues to improve and develop technology exponentially. This leads to rapid technological advances impossible for humans to understand or control and causes significant changes in society, the economy, and technology.

Views on AI singularity are divided. Some experts consider singularity a genuine and present danger, while others dismiss it as pure science fiction, be it a rosy utopia or doomsday. As already summarized in the introduction and this section of the paper, recent surveys of qualified experts (from the theoretical and technical side) and leading business leaders are fairly optimistic regarding the future of Gen AI and AI in general. Formally meeting the old, quite dated Turing criteria, does not necessarily lead to a projected "rise of the machines" depicted in Sci-Fi literature and movies, as many other social constraints and control mechanisms in the hands of humans may prevent the undesirable developments before they get out of hand.

Impact of Gen AI on jobs, productivity, employment and income inequality

Impact on jobs and productivity

Academic papers/research focused on firm-level or micro-data measurement of AI occupational exposure (AIOE) depending on the tasks that could be performed using new Gen AI text or image creating models.

Felten et al. [26] developed AIOE method and first applied it to text oriented ChatGPT, and then to a combination of text and image enabled models [25]. The most exposed occupations are telemarketers and higher level teachers (of languages, history, law), while the most exposed industries include legal and professional advisory services which rely heavily on language- and communication-related abilities. The least exposed occupations are labor-intensive building and maintenance services.

Eloundou et al. [25] look at 1000 occupations in the US to measure the exposure to LLM-based Gen AI software (number of work activities that require at least 50% less time to complete with the use of Gen AI software). They find 15% direct exposure to GenAI and a 50% combined exposure after including other software using LLM-powered technology.

In both studies occupational exposure to AI does not distinguish between the labor substitution effect

(i.e. workforce displacement, bad for workers) and labor augmentation (improved productivity, good for workers).

On the experimental side, we select one illustration of ChatGPT productivity impact based on an experiment documented in Brynjofsson et al. [14]. Gen AI based conversational assistant was given to a sample of 5,000 customer support agents providing technical support to small business owners on behalf of a "Fortune 500 US company". Using OpenAI's GPT with additional ML algorithms fine-tuned on customer service interactions increased productivity (measured as number of technical issues resolved within an hour) by 14%.

McKinsey Survey results [40], [41] provide additional insights into the nature of workforce impact of AI. Traditional AI affects a small albeit important part of workforce with special skills (in machine learning, data science, and robotics) to build and enable the use of traditional AI models. These skills are often in short supply in the labor market. Generative AI also requires highly skilled specialists to build and train large models, but large number of users do not have to be IT, data science, or machine learning experts. Gen AI models promote decentralized and massive increase in the number of active users of key tools (such as ChatBot, ChatGPT etc.) just like personal computers overcame the constraints of centralized mainframe computing by providing everybody with a powerful productivity tool in a decentralized networked PCs as well as a base for increased organizational productivity.

Survey respondents predict that wide adoption of AI will reshape the roles and demand for the workforce. Regarding the number of employees, 30% expect the number to remain unchanged (i.e. +- 2%). Outside of that range, pessimistic expectations prevail as 25% percent expect a moderate decline in employment (between 3 and 10%) while only 8% expect an equivalent increase. Similarly, 18% of responses foresee a steeper decline (greater than 11%) and only 6% expect an increase greater than 11%.

Almost all respondents (93%) expect that re-skilling will be necessary: 55% expect that it will affect up to 20% of the workforce, and 38% expect that more than 20% of the resulting workforce will require re-skilling to match the demands of new AI models. A 73% majority of respondents from high AI performers expect re-skilling needs for more than 30% of the workforce in the next 3 years, compared to 21% of respondents from other companies.

Impact on employment and income inequality

Respondents expect the impact of AI on the number of employed across business functions to be uneven, from a net decrease (in "service operations") to a large expansion (in "risk", "product/service development", and "strategy and corporate finance"). Generative AI has opened new work opportunities, introduced new types of jobs (such as prompt engineering), and transformed the work process (how tasks get done). It confirms the perception of generative AI as a "labor augmenting tool" which complements rather than replaces labor. Companies leading the Gen AI explosion are focusing on pragmatic areas of improved processes and key corporate functions leading to increased productivity in production of goods and services, and faster research and innovation results. These trends are expected to continue in the future as more than 3/4 of survey respondents expect their organizations to increase investment in AI over the next 3 years. Traditional AI adoption and impact remain focused on one or few business areas, and, hence, remain important, albeit limited. The highest impact on operational cost reductions is observed in "Service operations", "Risk management" and "HR". Revenue increases attributable to AI are the highest in "HR" and "R&D for product and service development" (see Figure 2).

Historically, there was a lot of concern over potential adverse impact of technological progress on unemployment. That concern and common sentiment are best illustrated by Queen Elizabeth I of England refusal to grant a patent to an inventor of a mechanical knitting machine in 1589 out of fear that it may lead to unemployment among manual knitters. Today, leading managers seem to be less concerned about potential employment consequences. The course of the industrial revolution and developments in post-WWII period seem to indicate that significant technological improvements did not lead to permanent increase in unemployment as other positive factors (continued GDP growth, fast-growing services) prevail over the labor-saving impact of technological progress.

More importantly, global direct and indirect effects of AI on productivity referenced in the introduction approach 25% of global GDP.

We still have to address considerable disruptions likely to be caused by Gen AI and technological improvements in general. One is the massive re-skilling, upskilling, retraining and relocation of workforce to match the emerging labor demand patterns.

The second issue is the likely pressures towards growing income inequality at the company, industry, national and international level. Jobs/occupations/industries exposed more to Gen AI competition may experience declining wages relative to other occupations (with similar level of education) in the company and/or industry. Many authors have confirmed that the impact of Gen AI will be different from previous tech improvements as it will put most pressure on jobs performed by educated professionals in legal, administrative, programing, and a range of so called mid-level white collar jobs.

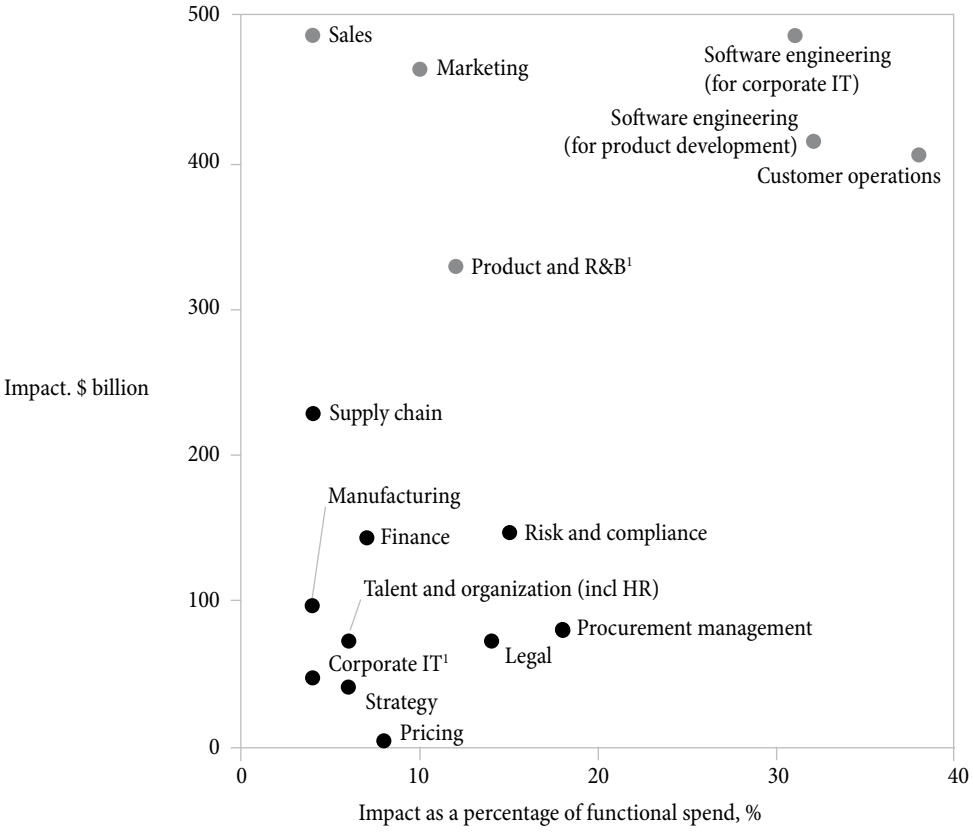
Lower and mid-level managers who have already been affected by massive relocation of jobs and incomes caused by globalization, may be further exposed to strong pressure. But this time it will be different. Managers are not likely to be replaced by Gen AI models and robots, but managers who do not use Gen AI models and tools are likely to be replaced with managers who do [15].

Impact of Gen AI on economic research and applied analysis for policymaking

Korinek [36] provides a comprehensive overview of a wide range of issues where Gen AI will likely impact economic research. He identifies six types of use cases relevant for economic research where generative AI models, tools, and related applications can have a profound impact:

- Generation/creation of research ideas and providing/receiving feedback on these ideas before research,
- Background research using various data, text, and image sources,
- Data collection, manipulation and analysis,
- Writing various stages of research documents, from initial notes to final papers and books,

Figure 2: Gen AI global impact on productivity (in bn USD, and % of spending per function)



Source: McKinsey Corporate and business function database and various other databases

- Writing computer code, and
- Mathematical modeling and derivations.

He provides a very useful summary of key features of LLM models, the single most important tool to be used by all research economists and offers a very useful illustrations on how to productively and professionally engage LLM GPT transformers through Chat to obtain meaningful answers related to the chosen research topic. He gives a range of useful suggestions on how to engage Gen AI in improving research productivity (in conducting background searches, data collection, review of literature, etc.) and in novel areas (generating research ideas). Most importantly, he also demystifies the technical side of preparing algorithms, writing computer code, formulating mathematical models and performing formula derivations, and conducting big data analysis.

Gen AI models will unleash productivity in conducting timely and accurate applied economic analysis on a range of relevant issues, informing public debate and decision-making in the area of macroeconomic policy making, budgeting, and public investment. These models will also help overcome some of the long-standing paradigm gaps between various economic schools and align them in accordance with their relevance for the public and economic issues in question.

Conclusion – and policy recommendations

Generative AI models have great potential to change job content, revolutionize the mode of operation in many industries, fundamentally change the concepts of research and creativity in writing (prose and poetry, fiction and non-fiction,…), music, visual arts, movies, TV, etc. Most of all they have the potential to deeply reshape all our interactions, directly or indirectly, based on digital content or formats. As Gen AI models expand and grow at hyper-speeds, driven both by deliberate improvements in hardware and software and indirectly by human interactions from millions of uses/sessions, they offer unprecedented capabilities to businesses, public institutions, non-profit organizations, IFIs and individuals in content creation, problem-solving, and decision-making. Their capacity to generate text, realistic images, audio, video and other data modalities unlocks novel opportunities for innovation and growth, while also enabling more personalized and efficient experiences. It is crucial to address the ethical implications and potential pitfalls associated with the use of Gen AI technology and models.

Brynjolfsson, one of the most influential researchers and prolific writers in the field on Generative AI and AI in general, concluded [14], [15] that large language models (LLM) at the heart of modern Gen AI models, are affecting almost every part of the economy and can contribute to more widely shared prosperity. If we play our cards right, the next decade could be some of the best 10 years ever in human history. We must free ourselves from a failure of imagination, narrowly expecting that AI will help us produce the same things but with fewer workers and, hence, create unemployment. Throughout history, most technologies ultimately complement humans rather than displace them.

Gen AI technology can both imitate and complement humans in its creative ability. When it imitates humans it tends to drive wages down, and when it complements humans, it tends to drive wages up. So we should not be making machines that are close images of ourselves, but as different as possible and capable of doing new things. This change in attitude may have a profound impact on the labor-displacing and labor-augmenting consequences of Gen AI technology, as emphasized by Acemoglu and Restrepo [2], [3], [4].

Preparing labor re-skilling, upskilling and retraining programs is crucial to meet the relocation needs triggered by the expected changes in the structure and skill mix of the future workforce, especially in sectors under a direct impact of Gen AI tools and models.

As Acemoglu and Johnson [1] concluded based on a thorough review of technology from Neolithic times to the ascent of artificial intelligence, technology is not our destiny. Even at this age of relentless expansion of generative AI systems, concentration of power and wealth, and seemingly unstoppable descend into technological singularity, their new book "Power and Progress" is an essential reminder that we can, and must, take back control and secure the best future for mankind.

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Dušan Vujović

is a professor of Economics at FEFA Faculty, Belgrade, and a World Bank consultant in the areas of macroeconomic policy, fiscal and governance reform, and innovation for growth. Dr Vujović is a member of WAAS (World Academy of Arts and Sciences). He chairs NALED (National Alliance for Local Economic Development) Research Council and provides consulting services to various Serbian and international research and policy institutes. From April 27, 2014 – May 16, 2018 Dr. Vujović held three ministerial positions in the Government of Serbia: Economy April 2014 - September 2014, Finance August 2014 - May 2018, and Defence February - March 2016. He received the best Minister of Finance in Eastern and Central Europe award for 2017. He was a USAID consultant on budget and fiscal reform issues, and a research fellow at CASE Institute, Warsaw. Dr Vujovic past career includes various positions at the World Bank, such as Country Manager for Ukraine, and Co-Director of the Joint Vienna Comprehensive program for government officials from the transition economies, Lead Economist in the World Bank ECA region and in the Independent Evaluation Group. He authored and co-authored a number of publications on macroeconomic policy, development, and institutional reform and transition issues published as papers in domestic and international journals, and chapters in books published by The World Bank, Oxford University Press, North Holland, Edward Elgar, etc.

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Goran Petković
University of Belgrade
Faculty of Economics and Business
Department of Business Economics and Management

Aleksandra Bradić-Martinović
Institute of Economic Sciences
Innovation Economics Department

Milena Lazić
Institute of Economic Sciences
Digital Economics Department

SKILLS DEVELOPMENT AS AN INDICATOR OF THE SERBIAN TOURISM DIGITALIZATION PROGRESS

Razvoj veština kao indikator napretka digitalizacije srpskog turizma

Abstract

In the tourism and hospitality sector, digital skills become one of the critical factors as they enable organizations and professionals to effectively utilize and adapt to the latest technological developments, improving the overall travel experience and/or operational efficiency of service providers. Based on the previous, this paper aims to evaluate the digital skills of supply-side stakeholders in Serbia's tourism and hospitality sector and to determine the main factors that influence their level of proficiency. By analyzing primary data from 418 respondents, the findings indicate a notable gap in advanced digital skills, which is particularly emphasized among administrative officers, primarily tourist inspectors. Additionally, multinomial logistic regression shows that the education and employment sector (catering, tourism agencies, tourism guides, tourism organizations, tourism inspectors and administrative officers) are factors associated with the level of digital skills. The results allow stakeholders to review the possibilities for improving skills, especially in the public sector, to address current skills gaps and prepare the workforce for future technological developments to ensure the sector's resilience and competitiveness in the global market.

Keywords: *digital skills, tourism and hospitality sector, Digital Skills Indicator, Serbia*

Sažetak

U sektoru turizma i ugostiteljstva, digitalne veštine postaju jedan od kritičnih faktora jer omogućavaju organizacijama i pojedincima da efikasno iskoriste najnovija tehnološka dostignuća, poboljšavajući ukupno iskustvo putovanja i/ili operativnu efikasnost pružalaca usluga. Cilj ovog istraživanja je procena digitalnih veština zainteresovanih strana na strani ponude u sektoru turizma i ugostiteljstva Srbije i identifikacija glavnih faktora koji utiču na nivo veština. Nakon analize primarnih podataka 418 ispitanika, nalazi ukazuju na primetan jaz u naprednim digitalnim veštinama, što je posebno naglašeno među administrativnim službenicima, pre svega turističkim inspektorima. Dodatno, multinomalna logistička regresija pokazuje da su obrazovanje i sektor zapošljavanja (ugostiteljstvo, turističke agencije, turistički vodiči, turističke organizacije, turistički inspektori i administrativni službenici) faktori povezani sa nivoom digitalnih veština. Rezultati omogućavaju zainteresovanim stranama da preispitaju mogućnosti za unapređenje veština, posebno u javnom sektoru, kako bi prevazišli nedostatke i pripremili radnu snagu za budući tehnološki razvoj, sa ciljem da osiguraju otpornost i konkurentnost sektora na globalnom tržištu.

Ključne reči: *digitalne veštine, sektor turizma i ugostiteljstva, Indikator digitalnih veština, Srbija*

Introduction

Monitoring digital progress within an organization can be done efficiently by following the established phases of technology integration, particularly digitization and digital transformation [20]. The first phase, technology integration, involves converting analog data into digital formats. Subsequently, the second phase, digitalization, introduces a paradigm shift that involves redesigning processes, changing working methods, and even shifting cultural values. The third phase, characterized by its disruptive nature, leads to a comprehensive business model restructuring, hence the term "digital transformation". Within the tourism industry context, this sector is actively transitioning into the third phase by leveraging digital technologies to generate novel experiences that offer enhanced value for visitors. It can be argued that the initial two stages are already comprehended, and now is the time when developing a new user experience can yield a competitive edge.

To facilitate this process, organizations and individuals must take collective responsibility for acquiring the knowledge and skills necessary to proficiently utilize the emerging digital tools. The speed at which new platforms and tools enter the business realm is unprecedented in the history of tourism. The main difficulty for government, individual market players, and employers is to accurately identify the emerging requirements and subsequently hire suitable professionals or upgrade the skills of current employees to meet the digital requests and needs of contemporary travelers. It is critical to regularly assess and track digital skillset of individuals involved in developing tourism services at state-level, economy-wide level and within specific business organizations. It is crucial not only to assess general digital skills but also to thoroughly assess expertise in particular areas, especially those advanced skills that are not integrated into the formal education system and are acquired through the independent engagement of individuals in the tourism industry. OECD [30] also emphasized the importance of digital skills, anticipating that digitalization in the tourism and hospitality (T&H) sector will be focused on marketing, product development, and the role of government.

The Serbian tourism industry is becoming an important part of the economy due to its capability to capitalize on the country's rich cultural heritage and natural landscape, attracting a growing influx of international and domestic tourists [23]. The increase in tourism not only increases foreign exchange earnings but also encourages investment in local infrastructure and stimulates economic growth in the region. The hospitality industry, an integral part of tourism, creates numerous employment opportunities, thus contributing to economic diversification and strengthening economic resilience. In addition, the expansion of this industry shows that Serbia has successfully integrated into the global tourism market and established itself as an essential player in this sector [2]. On the other hand, the introduction of digital technology in Serbian tourism at the individual and national level signifies considerable progress in improving the competitiveness and attractiveness of the sector [6]. This process includes the integration of online platforms, mobile applications, social media, and considerably more into strategies for promoting tourism and attracting visitors. For Serbian tourism to be effectively digitalized, it is essential to have a workforce with adequate digital skills.

The author's research aims to determine the primary strengths and weaknesses of the Serbian T&H sector, focusing on acquiring essential digital skills [32]. In order to initiate the advancement of effective action plans for the implementation of tourism development strategies at both national and destination levels, the first crucial step is to identify the areas where the biggest gap exists between the existing and necessary digital skills [34]. It is vital to close this gap, as the digital components of marketing and management in the tourism industry are fundamental to all strategies and plans in this area. The significance of the aforementioned can be seen in the EU's agenda and announcement for 2023, which entails a substantial investment of 42 million euros in education, particularly in the domains of digital skills and digital security [16].

This research also addresses certain ambiguities in the literature related to the factors influencing the acquisition and proficiency of digital skills, such as education, employment in the private or public sector, and other related factors presented further. Although it

is commonly assumed that higher levels of education are correlate with elevated levels of digital skills, the dynamic nature of the digital domain presents a challenge. Officially defined educational programs tend to change at a reduced pace, while self-taught individuals have more freedom to identify and learn new skills. Similarly, it could be expected that individuals working in the private tourism industry, such as tour guides, agents and those involved in marketing and sales in the hospitality industry, have a higher level of adaptability and entrepreneurial spirit, making them more inclined to acquire new digital skills fast. On the other hand, government officials with access to specialized educational resources and learning time are more likely to acquire new digital skills. The research questions in this analysis are based on these dilemmas.

The research initially outlines the theoretical underpinnings of the dilemmas being studied and subsequently conducts an empirical examination of the stakeholders in the T&H sector in the Republic of Serbia.

Literature background

In today's landscape, a high level of digital maturity is essential for service providers to deliver innovative and personalized experiences [14], while technological resilience is a critical factor for their sustainable development [27]. Even small businesses leverage technology to improve decision-making, customer engagement and overall operational optimization [37]. The emergence of the digital society and digital technologies not only opens up new opportunities but also grants individuals unprecedented freedoms and rights that allow them to transcend physical and geographical boundaries and social positions. In the T&H sector, which has been an early adopter of digitalization of its business processes [26], significant changes have been observed in the roles of individual players in the value-creation process [22]. This has blurred the lines between human values and technological services and challenged the fundamental nature of hospitality and tourism experiences [12].

Digital transformation in the T&H sector goes beyond the mere improvement of specific processes in the creation and delivery of customer experiences; it involves the adoption of cutting-edge technology for innovative experiences [14]. The sector leverages digital technologies to optimize business transactions, facilitate trade and disseminate product information to consumers. Digital technologies not only facilitate efficient communication between tourists and service providers by enabling real-time updates, feedback and quick problem resolution [43], but also improve the overall customer experience [7] through offering tailored suggestions derived from individual preferences and travel history. This helps tourists make informed decisions, promote satisfaction and build loyalty. In addition, digital technologies improve marketing strategies by collecting and analyzing customer data, allowing for targeted promotional efforts tailored to specific demographics [24]. The integration of online reservation systems in the sector streamlines the booking process and provides travelers with convenient ways to plan and book trips [1]. Furthermore, digital technologies in the hotel industry play a crucial role in effectively managing employee productivity [18] and hotel revenue [8], [28].

As one of the largest industries worldwide, the ICT market is estimated to reach a volume of EUR 6 trillion in 2023 [17]. To remain competitive in the technological race, countries must invest in advanced digital technologies, technological infrastructure and the development of digital skills and competencies. Acknowledging the critical role of technological leadership in global competitiveness, the European Union has introduced a comprehensive blueprint guiding all digital-related actions – the Digital Decade. This framework encompasses the Digital Decade policy program, targets, objectives, transnational projects, and the rights and principles of the Digital Decade [15], all designed to ensure that technology and innovation align with people's needs. Europe's Digital Decade is fundamentally people-centric, focusing on equipping everyone with the skills necessary to navigate everyday technology. Consequently, one of the key areas of the Digital Decade relates to digital skills, intending to ensure that at least 80% of the EU residents possesses basic digital skills by 2030.

While the evolving global technological landscape underscores the ongoing and growing demand for digital skills to meet the dynamic demands of the market, it is notable that the academic literature largely neglects

the character of work and the potential role that digital skills may participate in the digital transformation of the T&H sector [31]. Instead, academic literature has predominantly concentrated on three types of digital skills needs: fundamental computing skills for daily activities, for the broader workforce and advanced ICT expertise for specialized tech experts [19]. In the context of T&H, however, policy discussions mostly emphasize the need for a new skill mix and the need for 're-skilling' and 'up-skilling' to address the skill gaps and shortages. According to Parsons et al. [31], skills gaps refer to the mismatch between the skills required and those possessed by the current labor pool. This concerns people who are already working in the tourism industry. In contrast, skills shortages refer to a limited external supply of skills to fill vacancies due to staff turnover, newly created jobs or changing job requirements. Recruiters often encounter a persistent shortage of these skills among applicants due to an insufficient supply on the external labor market.

A comprehensive review of the main academic databases identified several studies that analyze the importance of digital skills in the T&H sector for the future development of the industry. The key findings of these studies are summarized below.

Asonitou and Kottara [3] investigated business skills that need to be strengthened in the Greek tourism sector in order to meet the evolving demands of digitally savvy customers. The identified skills in need of improvement include knowledge in tourism marketing and e-tourism marketing, expertise in the planning, advancement and implementation of e-programs and digital marketing initiatives, and competencies in marketing analytics and reporting. To close these skills gaps, the authors advocate for collaboration between the market and the country's education and research communities. Catia et al. [10] studied tourism and hospitality professionals in northern Portugal and highlighted the growing importance of personal and interpersonal skills alongside the necessary technical skills in the digital age. The authors believe that these skills not only add significant value but also enable hotel businesses to stand out from the competition. Maingi & Wachira [27] investigated the importance of digital skills in the post-COVID recovery of Kenyan small and medium-sized tourism businesses. Their findings highlight the imperative of establishing a well-structured vision, roadmap, and tourism strategy for integrating digital skills and fostering technology robustness in the T&H field as critical factors for ensuring future sector success.

In their research across six case study countries, Parsons et al. [31] found that a significant degree of policy inertia hinders effective policy development for digital transformation in tourism. A predominant concern was the lack of robust intelligence on digitalization and its associated skills needs. Notably, little consideration was given to proof of digital competency evolution in different sectors. Zaragoza-Sáez et al. [44] investigated the disparity between current and future digital skills requirements and training requirements for 2030 in Spanish tourism organizations. The study reveals that digital skills continue to challenge tourism organizations. While employees express their willingness to navigate environments in which technology plays an increasingly important role, organizations believe there is still much to be done before employees reach the required level of digital skills needed to work effectively in the tourism area.

Sanchez-Rivero et al. [38] concentrated their research on gender-related aspects of digital abilities and the intensity of ICT usage within tourism (accommodation) enterprises in Extremadura, Spain. The study reveals a digital divide in specific dimensions between male and female-run businesses in Extremadura. Typically, ICT specialist roles are more prevalent among employees in companies led by men. Male managers use platforms such as reservations and more regularly studying online comments. However, there are no discernible gender differences in managers' ICT skills. Moldovan [29] recognized the need to improve the level of knowledge of teachers providing tourism expertise to foster entrepreneurial learning and social entrepreneurship among learners – an important factor for the sector's future development. The author has described eight key competencies to create a learning outcomes framework for the T&H sector. These competencies are subsequently categorized into four distinct clusters, one of which is specifically dedicated to digital skills.

In contrast to other researchers, Carlisle et al. [9] identified the critical digital skills essential for the

sustainable development of the sector. These encompasses skills in digital marketing and communication, social media utilization, MS Office proficiency, navigating operating systems, and monitoring online feedback. The study is based on the results of a cross-sectional survey of almost 1700 companies from different sectors in eight European countries. The most significant disparities between present and prospective skill levels were discovered in artificial intelligence (AI), robots, augmented (AR), and virtual (VR) reality. Surprisingly, these talents, along with coding, were rated as the least critical digital skills. In addition, the geographic location, sector and size of the company influenced respondents' perceptions of current and future skill levels, as well as the perceived skills gap. Although the study was done before the COVID-19 pandemic, the findings are still appropriate.

In line with the above, it can be presumed that investing in the digital skills of employees in the T&H sector is imperative [33]. Supporting this, Sigala [39] contends that failing to keep up with innovations makes individual businesses and sectors uncompetitive, restricting productivity gains within organizations and across value chains.

Considering Serbia's strategic commitment to becoming a member of the European Union, the importance of investing in sophisticated digital technologies and AI has become one of the strategic priorities of the Government of the Republic of Serbia and has been incorporated into the national legal framework. The Strategy for the Development of Digital Skills in the Republic of Serbia for the period 2020-2024 [40] regulates the promotion of digital skills linked to the usage of ICT in order to improve the quality of life, promote employability, increase operational efficiency and, consequently, stimulate economic growth in society. In addition, the Program for the Empowerment of Women in the Field of Information and Communication Technologies for the period 2019-2020 [35] was developed to address gender issues. This program outlines specific goals for increasing women's participation in the ICT industry, as well as measures and activities aimed at reducing the gender gap, improving the regional representation of women in the sector and promoting their social and economic empowerment. Digitalization is also an important cornerstone of the Strategy for the Development of Tourism in the Republic of Serbia for the period 2016-2025 [41].

Although the necessity to develop digital skills in the Serbian T&H industry has been acknowledged as crucial for the future expansion of the sector, research-based proof regarding digital skill levels of the sector's stakeholders in Serbia is limited. Some authors [4], [5], [26] underline the crucial role of digital transformation and particularly emphasize the need to develop digital literacy and improve the digital skills of employees in the T&H sector. Bradic-Martinovic et al. [5], for example, see this strategic orientation as a proactive measure to mitigate the progressive scarcity of natural and tourism resources. Examining data from the Statistical Office of the Republic of Serbia, the authors found a notable deficit in basic and advanced digital skills among employees in the Serbian T&H industry. Moreover, the recorded skill levels were discovered to be consistently lower compared to European Union countries.

The study carried out by Lazic et al. [26] is one of the few studies that deals with measuring the digital skills of employees in Serbia's T&H industry and identifying the factors that influence this level. This pilot study demonstrates that, on average, T&H employees possess fundamental digital skills that empower them to execute basic to more complex activities within a digital setting. The results indicate that the identified level of digital skills in the T&H industry is insufficient to ensure robust long-term growth and development. In addition, the findings suggest that there are significant correlations between digital skills levels, education and occupational status. As a result, the study highlights the need for targeted training programs and educational initiatives to enhance digital skills among T&H sector employees. It emphasizes that investing in continuous learning and upskilling can help bridge the gap and enable the sector to adapt to the rapidly evolving digital landscape.

The research in this paper leverages global developments and aligns with the strategic direction of both the European Union and the Republic of Serbia [14]. It addresses identified gaps in the literature by quantifying the digital skills of T&H stakeholders at the sub-sector level and identifying

the influencing factors. Consequently, the paper builds on Lazic et al.'s [26] research by expanding the sample size and including all sector stakeholders, not just employees. While the focus is on measuring the digital skills of key stakeholders in the Serbian T&H sector, the use of a standardized methodology such as the DSI index ensures international comparability and raises the importance of the topic beyond Serbia's borders.

To obtain a thorough understanding of this significant yet insufficiently studied field, the following research questions were raised:

RQ1: Is there a distinction between the skillsets required for certain aspects of digitalization in T&H in Serbia, and which skills are overlooked?

RQ2: Do stakeholders in Serbia's T&H sector differ in their level of digital skills?

RQ3: What factors are associated with relevant digital skills?

Methods

Study design

In creating the new Serbian strategy for the tourism development, a comprehensive research was undertaken to assess the digital skills of supply-side stakeholders (individuals employed in catering, tourism organizations, tourism agencies, travel guides, tourism inspectors and administrative officers). To enhance stakeholder diversification, we categorized administrative staff and included employees in tourism organizations, tourism inspectors and officials at national and local (municipality) levels. The decision was based on a complementary research study by Van Deursen & Van Dijk [42].

To collect primary data, an online survey was conducted using the Microsoft Office 365 Forms tool. The Ministry of Tourism and Youth of the Republic of Serbia distributed the questionnaire to stakeholders (as presented in Table 1), through local authorities and internally among the Ministry's employees. The data was collected between March 01 and April 14, 2023. The sample comprises 422 participants from a total of 119 cities and municipalities. After the initial analysis, four outliers were identified, namely one participant with a primary school degree and three participants who were over 65 years old. After excluding the outliers, the analysis was performed on 418 responses. The survey was anonymous and voluntary to participate in.

Measures and variables

The presented research is based on the Digital Competences Framework – DigComp 1.0 methodology [36], which is used to evaluate the digital skills of the European Union, including components for assessing individuals' proficiency in digital abilities. The core component of the concept is the Digital Skills Indicator (DSI), which encompasses four dimensions: Information Skills (IS), Communication Skills (CS), Problem Solving Skills (PSS) and Software Skills for Content Manipulation (SSCM) [21]. To maintain the comparability of statistics across Europe and for practical purposes, EU countries, including those in the process of accession, collect annual data from a representative sample of individuals aged 16-74. The acquired results are subsequently utilized to compute the DSI, whose progression has been tracked since 2015. The process of completing the questionnaire entails a self-assessment of the participants' digital skills but also encompasses a substantial quantity of inquiries that are not included in the DSI. For this research, only those questions included in the DSI were extracted from the original questionnaire, as presented in Table 3, with data about gender, age, education, and T&H sector.

Statistical analysis

Statistical analysis in this research encompasses both descriptive analysis and multinominal logistic regression. Descriptive statistics are employed to examine the personal attributes of stakeholders, while logistic regression aims to estimate associations between participant's characteristics (predictors) and the level of digital skills (dependent). The EU DSI methodology [21] is employed to quantify the level of digital skills. However, to gain a more comprehensive understanding of potential relationships, the analysis utilized the sub-indicator values for IS, CS, PSS, and SSCM.

Multinomial logistic regression is a statistical model used to predict the outcome of a dependent variable when there are multiple categories to choose from.

Unlike binary logistic regression, which applies to binary outcomes, multinomial logistic regression is used when the dependent variable is nominal and has three or more levels. Furthermore, multinomial logistic regression models the probability of each category of the dependent variable as a function of the independent variables (in this case, participants' characteristics). It is particularly useful to understand the relationship between predictor variables (like age, education, etc.) and a categorical outcome (level of digital skills). This model calculates the probabilities of each potential outcome of the dependent variable based on a given set of independent variables. The logistic regression results are presented as odds ratios (ORs) and adjusted odds ratios (AORs) with 95% confidence intervals (Cis). A $p<0.05$ indicates statistical significance. Stata version 16.0 was used for the statistical analysis.

Results

Table 1 comprehensively describes the attributes of the individuals who completed the online survey.

Table 1: Sociodemographic characteristics of the sample

Characteristics	Categories	*n* (%)
Gender	Female	244 (58.4)
	Male	174 (41.6)
Age	16-28	23 (5.5)
	29-45	246 (58.9)
	46-65	149 (35.6)
Education	Secondary	71 (17.0)
	Higher	270 (64.7)
	Master or PhD	149 (35.6)
Supply-side stakeholders	Catering	101 (24.2)
	Tourism organization	156 (37.4)
	Tourism agency	33 (7.9)
	Travel guide	24 (5.8)
	Tourism inspector	32 (7.7)
	Administrative officer*	71 (17.0)

* Include persons employed in municipalities in the tourism sector and the Ministry of Tourism and Youth RS

Within the study sample, women (58.4%) outnumber men (41.6%), while the proportion of participants aged 29-45 is also predominant (58.9%) compared to participants aged 45-65 (35.6%) and 16-28 (5.5%). The highest percentage of participants have a bachelor's degree or above (64.7%), followed by those with a master's or doctorate degree (35.6%), and the lowest percentage have only completed high school (17.0%). Finally, most participants are employed in Tourism Organizations (37.4%) or the Catering sub-sector (24.2%). A smaller percentage hold positions as Administrative Officers (17.0%), work in Travel Agencies (7.9%), serve as Tourism Inspectors (7.7%), or operate as Tour Guides (5.8%).

Evaluation of the DSI's Dimensions and Individual Indicators

The following part of the research focuses on analyzing four fundamental dimensions that enable the calculation of the DSI. These dimensions are IS, CS, PSS, and SSCM. Table 2 illustrates the distribution of respondents based on their proficiency levels in specific dimensions and sectors of employment.

From the given sub-indicator values, it is clear that the respondents have attained a high level of proficiency in IS and CS. Nevertheless, the administrative officer shows a minimal requirement for enhancement in Information skills, with only 5.6% of respondents indicating that they have not mastered all the skills in this category. Similarly, CS also has a relatively low percentage of respondents in the same sector (1.4%) who do not possess mastery in all the skills in this category.

However, the scenario changes when more sophisticated skills are considered – in particular, PSS and SSCM. Within the PSS dimension, an average of 18% of respondents lack

Table 2: Sector-specific frequencies of digital skill dimensions (%)

Sector	IS		CS		PSS		SSCM	
	Lack	Possess	Lack	Possess	Lack	Possess	Lack	Possess
Catering	1.0	99.0	1.0	99.0	15.8	84.2	42.6	57.4
Tourism organization	0.0	100.0	0.0	100.0	12.2	87.8	23.1	76.9
Tourism agency	3.0	97.0	0.0	100.0	18.2	81.8	36.4	63.6
Travel guide	0.0	100.0	0.0	100.0	8.3	91.7	25.0	75.0
Tourism inspector	0.0	100.0	0.0	100.0	40.6	59.4	46.9	53.1
Administrative officer	5.6	94.4	1.4	98.6	14.1	85.9	38.0	62.8
Average	1.6	98.4	0.4	99.6	18.2	81.8	35.3	64.8

the necessary skills, with Tourism inspectors (40.6%) being particularly notable in this regard. The situation is even worse when looking at the dimension that includes the necessary skills to manage software that enables users to create content. Of all respondents, 35.3% need more skills in almost every sector. In particular, 46.9% of Tourism inspectors and 38.0% of Administrative officers are not sufficiently skilled.

Table 3 presents the frequencies of individual skills grouped into corresponding dimensions of the DSI indicator, providing a more precise understanding of the specific skills lacking among the respondents.

Based on the obtained values, there are no skills in the first two dimensions (IS and CS) that would cause difficulties for participants in the hospitality and tourism sector, except for using the internet or cloud storage to store digital content. Almost 50% of participants lack this particular skill. In the field of PSS, the situation is not highly favorable, as a considerable proportion of respondents lack the skills needed to modify software settings, such as those of the operating system or security programs (51.7%), participate in online sales (64.2%), utilize online learning resources (59.2%), and engage in internet banking (64.0%). In the realm of SSCM, a comparable scenario is witnessed where respondents demonstrate a deficiency in the requisite expertise for utilizing spreadsheet programs (41.5%) and the more advanced functionalities of spreadsheets to organize and analyze data (58.5%). Almost all respondents (92.7%) have a deficiency in knowledge regarding programming code writing.

The associations between characteristics of employees in the T&H sector and the level of digital skills in selected dimensions

Based on the self-assessment results of the respondents, who indicated room for further improvement in skill acquisition in two of the four dimensions – PSS and SSCM, a more in-depth multinomial logistic regression analysis was conducted to examine the factors associated with the possession of the relevant skills, within confidence interval CI 95% (see Table 4 and Table 5).

Adjusted odds ratios (AORs) show that two (Education and Employment) of the four characteristics included in the logistic model are associated with the level of PSS, while at the same time, Gender and Age are not associated with skills. Individuals who have completed higher school and faculty are 2.5 times more likely to possess higher level of PSS relative to respondents with secondary education, which is a reference category (AOR = 2.46; 95%, CI: 1.24-4.85; $p < 0.05$). Furthermore, individuals with a master's or Ph.D. level of education are even 3 times more likely to have higher levels of skills compared to the same

Table 3: Distribution of respondents according to individual indicators within the DSI dimensions

Dimensions and indicators	Skills		Dimensions and indicators	Skills	
	Lack (%)	Possess (%)		Lack (%)	Possess (%)
Dim. 1. IS			**Dim. 2. CS**		
• Relocate files or folders (copy or move)	11.6	88.4	• Exchange email messages	1.7	98.3
• Store documents in cloud storage	49.3	50.7	• Engage in online social platforms	14.5	85.5
• Access data from government agencies' online portals	19.7	80.1	• Make voice or video calls via the internet	36.5	63.3
• Search for products or services online	10.2	89.8	• Post original content online for sharing	27.1	79.1
• Search for medical or wellness information	35.8	64.2			
Dim. 3. PSS			**Dim. 4. SSCM**		
A – Problem solving			*A – Basic*		
• Move data across different devices or computers	11.1	88.4	• Utilize text editing applications	11.6	88.4
• Set up programs and mobile applications	37.9	62.1	• Employ spreadsheet applications	41.5	58.3
• Modify configurations for various applications, including OS and security software	51.7	48.3	• Engage in multimedia editing with software for images, videos, or audio	33.2	66.6
B – Familiarity with online services			*B – Above basic*		
• E-commerce in last 12 m (buy)	21.6	78.4	• Develop documents or presentations incorporating text, images, and graphical elements	39.1	60.9
• E-commerce in last 12 m (sell)	64.2	35.8	• Leverage complex spreadsheet features for data management and analysis, including sorting, filtering, formula application, and charts	58.5	41.5
• Utilize web-based educational materials	59.2	40.8			
• Conduct financial transactions online	64.0	36.0	• Authored code using a programming language	92.7	7.3

reference category (AOR = 3.23; 95%, CI: 1.17-8.94; p < 0.05). Additionally, the findings suggest that respondents classified as Tourism inspectors are five times less likely to have a satisfactory level of these skills compared to respondents in the reference category, which in this case is Catering (AOR = 0.17; 95%, CI: 0.06-0.47; p < 0.05).

AORs in the case of SSCM show the same associations (Education and Employment sector) as for PSS. Individuals with a master's or Ph.D. level of education are 2 times more likely to have a higher level of skills compared to those with only a secondary level of education, which serves as the reference category (AOR = 3.23; 95%, CI: 1.17-8.94; p < 0.05). It can be concluded from this that even in this dimension of digital skills, respondents with a Higher level of education are almost twice as likely to have a satisfactory level of skills compared to the reference category, even if the OR value for Higher education is statistically significant, while the AOR value for the same category is not (OR = 1.72; 95%, CI: 1.01-2.94; p < 0.05). Finally, respondents employed in Tourism organizations are also two times more likely to have a sufficient level of SSCM compared to those who are engaged in the Catering sector, which is a reference category in this case (AOR = 1.83; 95%, CI: 1.02-3.30; p < 0.05).

Discussion and conclusion

In the last twenty years, the Republic of Serbia has made significant investments and strategic endeavors to foster the growth of the T&H sector, which includes the use of digital technologies. The research in this paper has shown the supply-side stakeholders' capacity to contribute to this

Table 4: Factors identified with assessed level of digital skills of stakeholders in PSS dimension, logistic regression results

Characteristics	Categories	OR (95% CI)	AOR (95% CI)
Gender	Female (Ref.)		
	Male	0.8307 (0.4835 - 1.4270)	0.7375 (0.4058 - 1.3404)
Age	16-28 (Ref.)		
	29-45	1.9265 (0.6666 - 5.5674)	2.0359 (0.6696 - 6.1901)
	46-65	1.1018 (0.3779 - 3.2121)	1.5936 (0.5107 - 4.9728)
Education	Secondary (Ref.)		
	Higher	1.9220 (1.0086 - 3.6625)*	2.4630 (1.2493 - 4.8556)*
	Master or PhD	1.8602 (0.8023 - 4.3129)*	3.2386 (1.1731 - 8.9412)*
Employment sector in tourism	Catering (Ref.)		
	Tourism organization	1.3734 (0.6690 - 2.8194)	1.0077 (0.4666 - 2.1761)
	Tourism agency	0.8571 (0.3045 - 2.4125)	0.6323 (0.2125 - 1.8810)
	Travel guide	2.0952 (0.4469 - 9.8220)	1.5832 (0.3425 - 7.3172)
	Tourism inspector	0.2783 (0.1147 - 0.6753)*	0.1703 (0.0604 - 0.4799)*
	Administrative officer	1.1619 (0.4930 - 2.7379)	0.7912 (0.3227 - 1.9394)

Table 5: Factors identified with assessed level of digital skills of stakeholders in SSCM, logistic regression results

Characteristics	Categories	OR (95% CI)	AOR (95% CI)
Gender	Female (Ref.)		
	Male	1.3699 (0.9078 - 2.0671)	1.2162 (0.7868 - 1.8802)
Age	16-28 (Ref.)		
	29-45	1.216 (0.4938 - 2.9940)	1.2182 (0.4770 - 3.1111)
	46-65	0.8857 (0.3526 - 2.2247)	1.1041 (0.4184 - 2.9133)
Education	Secondary (Ref.)		
	Higher	1.7259 (1.0125 - 2.9417)*	1.6101 (0.8979 - 2.8871)
	Master or PhD	2.2974 (1.1487 - 4.5945)*	2.3398 (1.0755 - 5.0903)*
Employment sector in tourism	Catering (Ref.)		
	Tourism organization	2.4137 (1.3994 - 4.1632)*	1.8364 (1.0289 - 3.3037)*
	Tourism agency	1.2672 (0.5615 - 2.8596)	1.0670 (0.4541 - 2.5072)
	Travel guide	2.1724 (0.7937 - 5.9459)	1.8195 (0.6483 - 5.1064)
	Tourism inspector	0.8206 (0.3684 - 1.8279)	0.5757 (0.2411 - 1.3746)
	Administrative officer	1.1800 (0.6328 - 2.2004)	0.8867 (0.4512 - 1.7422)

process with their knowledge and digital skills and enable full inclusion in digital tourism, which would promote the sector's growth and enhance competitive advantages.

The analysis shows a clear distinction in the digital abilities required for various aspects of digital technology use and points out to stakeholders' groups with the lowest level of skills. Information and Communication skills are generally well-developed, indicating a solid foundation in basic digital literacy. However, there is a notable deficiency in more complex skills like Problem solving and Software skills for content manipulation.

These results are aligned with those of Lazic et al. [26], who suggest that Serbian T&H employees possess enough digital skills to do basic tasks but, on average, do not have advanced skills, which may pose a considerable obstacle to the deployment of modern digital innovations. Carlisle et al. [9] also found that the largest gaps between current and future skill levels are in the areas of AI, robotics, AR and VR, which are considered more advanced. Further, according to Cedepof report [11], irrespective of industry (tourism included), over 85.0% of positions require at least basic digital skills to perform routine tasks that do not need interaction with other humans. More advanced skills are necessary for more complex tasks and activities, which, on the other hand, is expected in tourism, as a service sector characterized by a large number of contacts with clients.

When examining the individual stakeholder groups, tourism inspectors show the least advanced digital knowledge, particularly in Problem solving skills. This greatly limits the ability to effectively analyze and plan (managerial skills), thus endangering the effective monitoring of activities on the tourist market. Nevertheless, when examining Software skills for content manipulation, the results are unfavorable for most stakeholder groups. Tourist inspectors are again in the least favorable position, but there is also evident among individuals employed in the catering industry and administrative officers. The results also offer an understanding of the specific skills that have the most potential for improvement in terms of knowledge, which are familiarity with online services, including the use of the cloud and skills for utilization of basic and advanced functions in spreadsheet applications.

Additionally, two primary factors are associated with the level of digital skills – level of education and the employment sector. Education was also discovered to be a significant influence factor in the inquiry conducted by Lazic et al. [26]. In contrast, Carlisle et al. [9] found that geographic location, sector, and company size influenced respondents' perceptions of current and future skill levels, as well as the perceived skills gap. Higher educational attainment is strongly correlated with higher levels of digital skills, particularly in Problem solving skills and Skills for software manipulation. This indicates that formal education plays a crucial role in equipping individuals with the necessary digital competencies. Furthermore, the type of employment within the tourism sector also influences digital skill levels. The logistic regression analysis results confirm that individuals employed in certain sectors, notably tourism inspection, show a lower level of advanced digital skills than those in other sectors like catering or tourism organizations.

The study provides a critical understanding of the present condition of digital skills in the Serbian tourism and hospitality industry. It underlines the importance of targeted measures to close skills gaps, especially in the advanced digital areas, especially for the public sector. This could mean revising curricula to provide more in-depth digital training and providing continuous upskilling opportunities for those already in the workforce. The aim should be not only to address current skill gaps but also to prepare the workforce for future technological developments to ensure the sector's resilience and competitiveness in the global market [29]. Subsequently, it is essential to overcome the limitations of this research and investigate in more detail the indications that administrative officers have a certain level of ignorance of information skills, especially of saving content on cloud storage, which can be linked to weaker abilities to place self-created content on a website.

Finally, the main limitation of this study lies in the methodology of data collection, although self-assessment is the predominant form of competence assessment in science. However, assessing digital skills is challenging, and the process of knowledge determination can be expensive and time-consuming. Since the European Union has been conducting regular self-assessment polls

among European residents for the past fifteen years, which serve as the foundation for calculating the DSI, it seems reasonable to use the same method. We propose that subsequent investigations should focus on introducing experimental method or performance test to achieve more precise results, in line with Van Deursen & Van Dijk [42].

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Goran Petković

is professionally engaged at the Faculty of Economics and Business, University of Belgrade. His teaching and research interests include marketing channels, retail marketing and management, as well as tourism. Goran Petković is author of two books ("Positioning of Trade Companies" and "Models for Decision-Making in Trade"), coauthor of sections in six relevant books, and author of many chapters in other books and proceedings. In addition to this, he is also author and coauthor of more than fifty articles in domestic and international scientific journals.

Aleksandra Bradić-Martinović

is a senior research associate at the Institute of Economic Sciences. Her scholarly pursuits are predominately centered on innovations, digital competencies, and skills within the tourism industry. As a researcher and data analyst at Horwath HTL Beograd, she contributed to developing several national and regional tourism-related public policies. Aleksandra assumed the leadership of the national scientific infrastructure for collecting, archiving, and disseminating primary research data, the Data Centres Serbia in Social Sciences (DCS), in 2014. In addition to serving as the national representative of the Republic of Serbia in the Consortium of European Social Science Data Archives (CESSDA ERIC), she is the author of professional papers concerning data management and preservation. She participated in numerous projects financed within the EC program frameworks (FP7, H2020, and Tempus), as well as other international organizations (GIZ, SCOPES, RRPP, RCC).

Milena Lazić

received her PhD in Economics in 2021. She is a research associate at the Institute of Economic Sciences in Belgrade (since October 2021) and a visiting professor at the Belgrade Banking Academy – Faculty of Banking, Insurance and Finance (since February 2022). Her research interests revolve around digital transformation and digital skills, tourism and hospitality, macroeconomics and competitiveness. Milena has been involved in several research and development projects, projects involving collaboration with industry and higher education capacity-building projects at national and international levels. She has more than ten years of experience in teaching at the university level. Her publications include articles in renowned journals and thematic collections dealing with key aspects of the above-mentioned fields. She is a member of the Serbian Scientific Society of Economists, the Serbian Marketing Association and the Society of Belgrade Economists.


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