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FOSTERING SERBIA'S ECONOMY THROUGH A MORE DIVERSIFIED INDUSTRIAL POLICY: UNLOCKING THE POTENTIAL OF INTERNAL SOURCES OF GROWTH

ABSTRACT: *Serbia has experienced an acceleration of its GDP growth rate in recent years, to a large extent thanks to strong inflows of foreign direct investment (FDI). Given that such favourable trends may not continue in the coming years as multinational companies move to other locations, it may be wise to reflect on a different type of industrial policy. Rather than relying predominantly on attracting foreign investors, Serbia could implement a more diversified industrial policy that would place major emphasis on internal sources of growth, in this way embedding recent economic successes into the local economy. Serbia's economic growth could be accelerated by implementing several groups of inter-related measures: increasing domestic investments while targeting priority sectors more efficiently; devoting major attention to R&D, innovation and education; offering more adequate support to local enterprises, particularly SMEs; and devising measures to facilitate the green and digital transitions. Deeply rooted institutional weaknesses must also be addressed through better governance within both state and non-state institutions.*

KEY WORDS: *Serbia, industrial policy, economic growth, investment, FDI, Western Balkans*

JEL CLASSIFICATION: O11, O20, P20, P27

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1. INTRODUCTION

Serbia has recently been praised for its economic growth performance. Despite the global downturn caused by the COVID-19 pandemic, Serbia registered only a mild 1 per cent drop in GDP in 2020, the lowest among all the Western Balkan (WB) countries (IMF, 2024).[1] During the post-pandemic recovery, Serbia's real GDP growth rate was a high 7.9 per cent in 2021, slowing down to 2.6 per cent in 2022, but increasing again to 3.8 per cent in 2023. In 2024, Serbia had a GDP growth rate of 3.8 per cent, the third highest among the WB countries (after Kosovo and Albania) (see Figure 1).

Despite these positive results, a slowdown in GDP growth to around 2 per cent is expected in 2025. Moreover, Serbia's growth record is less impressive if viewed from a longer-term perspective. During the period 2009–2020, Serbia was the only country in the region that had four years of negative GDP growth (in 2009, 2012, 2014 and 2020). One of the consequences is that until fairly recently, Serbia did not substantially reduce the income gap with respect to the average GDP per capita of the European Union (EU). Serbia's GDP per capita (in Purchasing Power Standards) practically stagnated during the 2013–2019 period, oscillating around 42 per cent of the EU average GDP per capita (Eurostat statistics). Faster convergence with the EU average income has been attained only recently, thanks to stronger growth, permitting an increase in Serbia's GDP per capita from 42 per cent of the EU average in 2019 to 51 per cent in 2024 (Eurostat statistics).

The Serbian economy has experienced an acceleration of GDP growth largely thanks to strong inflows of foreign direct investment (FDI), recently around 6–7 per cent of GDP annually. Such favourable trends may not continue in the coming years. The main external sources that have fuelled growth in Serbia in recent years, primarily greenfield FDI, could easily dry up in view of rising labour (and other) costs, reduced investment opportunities and the volatile nature of FDI. Serbia has indeed witnessed a continuous increase in net wages, from around €450 in 2018 to €900 in early 2025 (Nikolić, 2025). Multinational companies operating in Serbia are increasingly showing signs of "footloose behaviour",

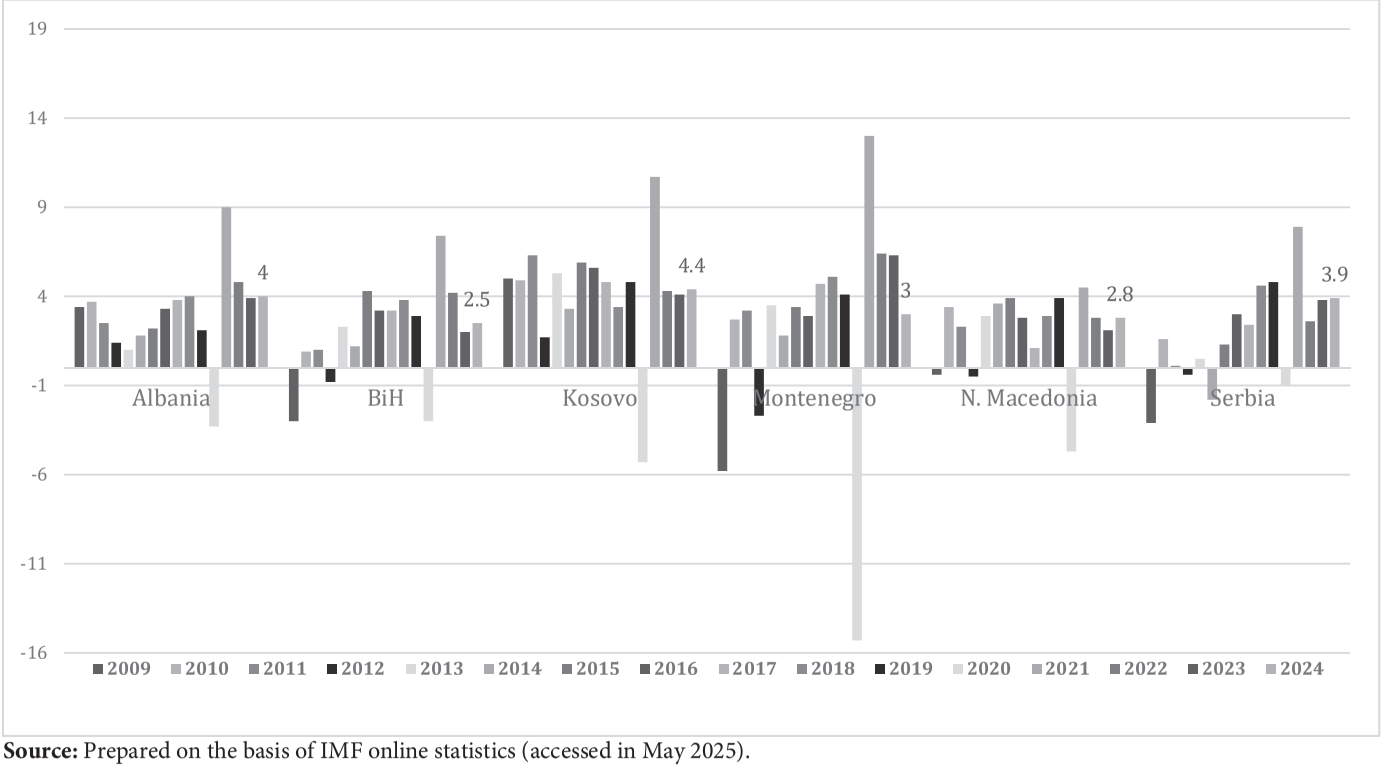
[1] The Western Balkans currently include six countries: Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia. Although Croatia was one of the Western Balkan countries, it will not be considered since it joined the EU in 2013.

defined as systematic divestments and relocations of investments (Gokh & Filippaios, 2021).[2] A number of foreign companies operating in Serbia have left, or have recently announced their intention to leave, the country (Radovanović, 2025). Especially today, in view of rising protectionism following the increase in customs duties announced in early 2025 by US President Trump, Serbia will increasingly need to protect its economic interests.

Rather than relying predominantly on FDI, the Serbian government should consider implementing a more diversified industrial policy that places greater emphasis on internal sources of growth. This paper outlines the key elements of such an industrial policy. In the next section, some definitions of key concepts of industrial policy are briefly recalled, given that the interpretations differ widely. Section 3 recalls the main achievements and setbacks of industrial policy in Serbia during the past decade. Section 4 proposes the most important elements on which Serbia's industrial policy should focus, while the last section contains the main conclusions.

[2] Gokh and Filippaios (2021) illustrate through several case studies how footloose behavior can be a matter of a company's survival; the footprint of the modern multinational enterprise does not stay still and is subject to constant change through new investments, changes in subsidiaries mandates but also relocations, divestment and closures.

Figure 1. Real GDP growth in the Western Balkans (annual percentage change), 2009–2024



Source: Prepared on the basis of IMF online statistics (accessed in May 2025).

2. THE MULTIPLE MEANINGS OF INDUSTRIAL POLICY

The rapid transformation of economies worldwide and of the related economic objectives has brought major changes in the conceptual framework of industrial policy used by governments in the national, EU and global context. Given the diverse interpretations found in the growing literature on industrial policy, it is useful to briefly recall some of its main definitions.

Industrial policy has two broad aims: (1) to improve the efficiency of individual firms and sectors, which normally involves restructuring and investment, and (2) to achieve structural change, using policies that favour more dynamic and productive activities generally, irrespective of the sector or industry in question (European Bank for Reconstruction and Development [EBRD], 2008). In both cases, industrial policies can be horizontal or vertical. *Horizontal policies* provide the framework in which firms and industries operate, and in which market mechanisms ultimately determine survival and prosperity. These policies include the protection of property rights, improvement of the business environment, major transparency of transactions, or more specific measures such as general incentives for attracting FDI, providing support to small and medium-sized enterprises (SMEs), or developing national research strategies. *Vertical policies* are targeted at specific firms or sectors and are used to support both failing industries or those considered to have potential for expansion. They include providing loans, infrastructure provision, tax incentives or trade protection for specific firms, sectors, or regions, but also the establishment of special economic zones or the provision of ad-hoc incentives for specific foreign investors.

The main motivation for pursuing horizontal industrial policy is the existence of market failures of different types. *Information failures* derive from a lack of information or discrepancies in access to information, which can result in a divergence between private and social returns. *Coordination failures* can appear whenever a project/industry requires large investments and high fixed costs that deter potential entrants, or when new activities bring wider spillover effects since some projects require simultaneous investment in different sectors. Market failures can also be the consequence of a *lack of knowledge spillovers*; for example, when markets do not provide sufficient incentives for private investment in research "because of the public-good, intangible character of knowledge and its

risky nature" (Tagliapietra & Veugelers, 2020, p. 24). In addition, private producers often require specific inputs, including legislation, accreditation, R&D and infrastructure that need to be provided by public authorities (EBRD, 2008).

A strong revival of interest in industrial policy took place after the global financial and economic crisis in 2007–2008. Most scholars today agree that the main objective of industrial policy is not to "pick winners", but to identify externalities and address market failures (see e.g. Greenwald & Stiglitz, 2013; Lin & Monga, 2010; Rodrik, 2004, 2014). Most recent studies acknowledge both the theoretical arguments in favour of state intervention rooted in market failures and the implementation difficulties rooted in government failures. Moran (2014) stresses the need for an interventionist state by introducing a mechanism for selecting industries and providing packages of public sector support to address coordination externalities. Rodrik (2014) argues in favour of a new industrial policy as a process of institutionalised collaboration and dialogue, rather than a top-down approach in which the government picks sectors or firms and transfers money to them. Bowles and Carlin (2020) stress that the private sector should be a stakeholder in such a collaboration, alongside government and civil society; in such a bottom-up policymaking approach, civil society, trade unions, activist groups, and citizens should be as engaged as the private and public sectors.

Mazuccato (2011) goes a step further to argue in favour of designing an industrial policy for activities that do not yet exist, introducing the concept of an "entrepreneurial state". The government and its agencies should not only resolve market failures but also act as market creators. She proposes a "mission-oriented" approach to industrial policy, citing the UN Sustainable Development Goals as examples of such missions (Mazuccato, 2018). Meeting these goals requires new policies that go beyond fixing failures in existing markets. This is in line with the new approach to development based on a "developmental state", which requires active state involvement to promote economic growth. A common factor in most definitions of industrial policy is that it targets a set of economic activities to achieve long-term benefits for society based on broader multi-dimensional objectives (Tagliapietra & Veugelers, 2020, pp. 13–14).

The European Commission has continually changed its approach to industrial policy (see Bartlett, 2014; Tagliapietra & Veugelers, 2020). The initial period

(1950–1980) was characterised by interventionist policies, during which European governments mainly used vertical industrial policies to support selected industrial sectors. In the second half of the 1980s, government intervention was replaced by a *laissez-faire* approach within which industrial policy was to be limited to setting the appropriate general framework. The measures for the completion of the EU Single Market focused on competition policy and reducing state aid, while structural reforms such as privatisation were to diminish the role of the state along with the creation of a business-friendly investment climate (Bartlett, 2014). In the 1990s and 2000s, a consensus was built around the horizontal approach to industrial policy, whereby EU industrial policy was to ensure the right framework conditions through the Single Market, competition instruments, and the stimulation of R&D and innovation (Tagliapietra & Veugelers, 2020). The measures of horizontal industrial policy also included support for SMEs through the creation of decentralised business networks and industrial clusters, as well as regional innovation systems. At the European Council's meeting in Lisbon in 2000, a new strategic goal was defined in order to prepare the EU's transition to a competitive, dynamic and knowledge-based economy (European Council, 2000), what came to be known as the *Lisbon Strategy*. The development of a knowledge-based economy required knowledge transfers from public research and higher education institutions to the business sector as the basis for improving EU competitiveness, to be obtained through increased expenditure on R&D, promotion of information and communication technologies (ICT) and development of innovation poles linking regional centres, universities and businesses.

After the global financial and economic crisis, the European Commission announced a new approach to industrial policy (European Commission, 2010a). The *Europe 2020* strategy adopted in 2010, promoting smart, sustainable and inclusive growth, stressed the sector-specific dimension of industrial policy (European Commission, 2010a). In order to enhance the EU's global competitiveness, the Commission further called for reindustrialisation, noting the importance of manufacturing (Damiani & Uvalić, 2018; European Commission, 2012; European Commission, 2013; Uvalić, 2014). It proposed an EU-level industrial policy in an attempt to create European champions to compete against companies from China, India and other emerging economies. The new industrial policy is based on not only horizontal measures, but also

sector-specific policies, targeting industrial sectors that are regarded crucial for strengthening EU competitiveness, such as space technology, clean and energy efficient motor vehicles, transport equipment, healthcare, environmental goods, energy supply industries, security industries, chemicals, engineering, transport-equipment, agri-food and business services – industries that use advanced technologies and highly skilled labour (Bartlett, 2014).[3] The new objectives of industrial policy were further elaborated in more recent documents (European Commission, 2017).

Industrial policy has acquired an even more important role since the strong impact of the 2020–21 COVID-19 pandemic. The green and digital transitions, as key priorities on the EU agenda, have led to the emergence of a new economic, social and ecological paradigm. The new perspective further elevates the industrial policy discussions to include broader societal goals such as climate stability, health, poverty prevention, the creation of quality jobs and reduced inequality (Tagliapietra & Veugelers, 2020). As a response to the pandemic, the European Commission adopted *A New Industrial Strategy for Europe* in March 2020, which lays the foundations for an industrial policy that will support the twin green and digital transitions, make EU industry more competitive globally and enhance Europe's strategic autonomy (European Commission, 2020d). The Next Generation EU initiative is the cornerstone of the Union's industrial recovery from COVID-19, dedicating substantial resources to combating climate change and environmental damage. The EU's Green Deal (European Commission, 2019) will require addressing those market failures associated with climate change and environment degradation. The European Parliament's resolution adopted in November 2020 similarly stresses the need for a new industrial strategy in the EU in order to attain the objective of climate neutrality by 2050 and to support the dual green and digital transition. The new industrial strategy should strengthen Europe's global leadership and reduce the Union's dependence on other parts of the world in strategic value chains (European Parliament, 2020). Open Strategic Autonomy seeks to balance the EU's openness to international economic relations with the need to safeguard its autonomy, defined as independence from external control over strategic assets such as advanced technologies and critical resources (Mariotti, 2024). These objectives have gained even greater importance

[3] The new industrial policy draws on the provisions of the Lisbon Treaty, Art. 173 TFEU (Treaty on the Functioning of the European Union) on industrial policy (see Bartlett, 2014).

after Russia's attack on Ukraine in February 2022. The breakdown of trade relations due to EU sanctions imposed against Russia required new industrial policy measures in order to address EU's key energy challenges. In EU member states in Central Eastern Europe (CEE), where industrial policy has remained underdeveloped, the war in Ukraine has reinforced the imperative to transition to a new growth model (Zavarská et al., 2023).

There is growing empirical evidence that industrial policy is frequently implemented in both developed and emerging economies. An IMF dataset of the New Industrial Policy Observatory (NIPO) documents the emergent patterns of policy intervention in 2023 associated with the return of industrial policy (Evenett et al., 2024). The recent wave of new industrial policy activity is primarily driven by advanced economies, while subsidies are the most employed instrument. Industrial policy measures are concentrated among certain key players: China, the EU and the United States account for 47.7 per cent of measures in the database. Trade restrictions on imports and exports are more frequently used by emerging market and developing economies. The dominant motive behind governments introducing such measures is strategic competitiveness, in addition to climate change, resilience and national security.

Many countries are thus implementing industrial policy to boost innovation, raise productivity and long-term growth, but industrial policy is not a magic cure for slow growth (Dabla-Norris et al., 2024). A cost-effective way to boost innovation and growth is to implement a complementary mix of public funding for fundamental research, research and development grants for innovative start-ups, and tax incentives to encourage applied innovation across firms. According to recent estimates (Dabla-Norris et al., 2024), increasing public spending on fundamental research by about 0.5 percentage points of GDP annually could raise GDP by up to 2 per cent. In the less technologically advanced countries, governments can obtain larger productivity dividends with policies that promote the diffusion of technologies developed elsewhere, but they must invest in human capital and strategic infrastructure to reap the full benefit of technology inflows (Dabla-Norris et al., 2024).

The EBRD's *Transition Report 2024–25* is also dedicated to industrial policy (EBRD, 2024). The report shows how industrial policies, defined as strategic

interventions designed to promote structural change and reshape an economy's production structure, have experienced a remarkable global resurgence. Given that the EBRD has traditionally been an institution known for its support of a liberal market economy, this new emphasis on industrial policy is rather indicative of the general shift in economic thinking in favour of state intervention.

Within the literature on the Western Balkans, industrial policy has not attracted much attention until recently, if we exclude a handful of contributions (e.g. Bartlett, 2011, 2014; Cerović et al., 2014; Uvalić, 2010; Uvalić & Cvijanović, 2018). Regarding economic policies, it is the more liberal market interpretation of industrial policy that has been transposed to the WB countries as part of the process of EU integration. Emphasis has been placed on horizontal measures – creation of competitive market-based economies through market liberalisation, privatisation, anti-trust legislation, reduction of state aid and improvements in the business environment. This type of horizontal industrial policy has left the WB economies vulnerable to adverse spillover effects from the EU and has not facilitated their post-crisis economic recovery (Bartlett, 2014). The European Commission's recommendations to Serbia have continued to reflect the liberal approach to industrial policy until fairly recently (see European Commission, 2020e).

The policy framework recommended to the WB candidates changed primarily after the adoption of the European Green Deal, which sets targets in energy and climate-related areas. The EU's report *An Economic and Investment Plan for the Western Balkans* (European Commission, 2020a) supports the WBs through investments in sustainable connectivity and the twin green and digital transitions, providing €9 billion in grants over seven years and a guarantee facility to stimulate investments of an additional €20 billion (European Commission, 2020a; Bartlett et al., 2022). The EU secured an additional €1 billion in 2021 for the region's specific energy needs. At the Sofia Summit in November 2020, the six WB countries committed themselves to implementing the *Green Agenda for the Western Balkans*, which rests on five main pillars (European Commission, 2020c; Uvalić, 2022): protecting the climate through decarbonisation; moving to a circular economy; reducing pollution; promoting sustainable methods of food production; and protecting biodiversity and eco-systems. The new *Growth Plan for the Western Balkans* aimed at speeding up economic growth and convergence

with the EU (European Commission, 2023), which provides an additional financial package of €2 billion in grants and €4 billion in loans over the 2024–2027 period, also includes similar objectives that will require a more targeted industrial policy. A renewed interest in industrial policy in the WB countries has also emerged due to the smart specialisation strategies recommended by the European Commission (Jovanović & Vujanović, 2023), which are an attempt to identify the most promising industrial sectors in the WB countries that have the potential to upgrade the region's position. The six most promising sectors in the WBs selected on the basis of a wide range of criteria include agri-food, textiles, automotive, energy, IT and tourism.

3. INDUSTRIAL POLICY IN SERBIA: SOME ACHIEVEMENTS AND SETBACKS

Since the political changes in Serbia in 2001, industrial policy has long consisted mainly of horizontal-type measures. This is in part understandable, given that the adverse political and economic conditions that prevailed throughout the 1990s led to the postponement of many market-oriented economic reforms and the government maintained a very strong role in the economy. In the early 2000s, a hyper-liberal model seemed the safest way to radically break with the past and leave behind the negative legacy of the Milošević regime (Uvalić, 2010).

The liberal pro-market growth model after 2001 did not produce the desired results in some important areas. It was erroneously believed that economic liberalisation and privatisation, in a stable macroeconomic environment and supported by foreign investors and donors' financial assistance, would lead to rapid restructuring and modernisation of the Serbian economy (Uvalić, 2010). Privatisation was substantially delayed, leading to several extensions of deadlines, while the government continued to extend subsidies to non-privatised and strategically important state-owned enterprises. Anti-trust legislation was adopted only in 2005 and the Commission for the Protection of Competition, set up in 2006, was not given sufficient implementation powers. Serbia started attracting FDI after 2001, but inflows were much lower than initially anticipated (Estrin & Uvalić, 2014; Uvalić, 2010). Despite government policy continuously focusing on attracting FDI, recent comparisons have shown that Serbia was a regional laggard until at least 2015 (Avlijaš et al., 2023).

Many structural economic problems that accumulated in Serbia during the 1990s have proved difficult to resolve, including high trade deficits due to insufficient competitiveness on foreign markets, long-term problems on the labour market (high unemployment, low employment rates, a diffused informal economy), or rapid deindustrialisation (Uvalić, 2025). In line with the EU horizontal approach to industrial policy, the government mainly applied general measures to improve the business environment by removing administrative barriers. Serbia has registered steady progress in improving the business environment, as confirmed by the World Bank's last *Ease of Doing Business Report*, in which Serbia was ranked 44th among 190 economies (in 2019) – only North Macedonia had a higher rank among the WB countries (World Bank, 2020). Apart from horizonal measures, during this period, there were no attempts to prepare a longer-term strategy of economic development that would offer a clear vision of where Serbia is heading and what measures of industrial policy are needed to achieve the desired objectives (Uvalić, 2010).

In the meantime, Serbia signed a Stabilisation and Association Agreement with the EU in April 2008 (in force since 2013), obtained candidate status and started its accession negotiations in 2014 (Bonomi & Uvalić, 2019). As part of the negotiations framework, Serbia has been developing an industrial policy in line with its obligations, as defined in Chapter 20 on Enterprise and Industrial Policy of the EU Acquis Communautaire. After the severe impact of the global financial and economic crisis in 2009, the Serbian government adopted an ambitious *Strategy and Policy of Industrial Development for the 2011–2020 Period* in June 2011 (Government of the Republic of Serbia, 2011). This 200-page document proposed a new model of economic development based on three main objectives: (1) strong investment growth; (2) export orientation of industry; and (3) increase of employment in industrial sectors. Although some priority sectors were mentioned, the core of Serbia's industrial policy essentially remained of a horizontal type, consisting of various measures in 13 different areas.[4]

[4] The areas include corporate governance, education, technological development, research and development, information and communications technology, employment, competition, restructuring and privatisation, FDI, entrepreneurship, regional development, protection of the environment and energy efficiency.

Industrial policy in Serbia has continued to consist of mainly horizontal measures of support to enterprises. Special attention has been dedicated to helping SMEs with measures of export promotion, information on foreign markets, and favourable loans and guarantees through joint programmes of government agencies and commercial banks, also supported by the European Investment Bank (see EIB, 2025). Serbia participates in the EU's Competitiveness for SMEs programme COSME, which provides financial support for the purchase of production equipment, start-ups and development projects (European Commission, 2020f). The Serbian government has created the Innovation Fund in 2011 that provides finance for innovative SMEs (Government of Serbia, Innovation Fund; Uvalić, Cerović, Atanasijević, 2020). In order to promote R&D, science and technology parks have been created in Belgrade, Novi Sad, Niš and Čačak (see Government of Serbia, Development Agency of Serbia – Razvojna Agencija Srbije (RAS) website). The Development Agency of Serbia (RAS) has set up a Supplier Development Programme in 2019 to facilitate the integration of local SMEs into global supply chains through their collaboration with multinational companies operating in Serbia (Government of Serbia, RAS website).

Despite all these measures, the dominant focus of industrial policy in Serbia has been to attract FDI through direct government subsidies (and other benefits) and the creation of special economic zones (called "free zones" in Serbia). Although by 2011 the earlier dominant view that rejected vertical industrial policy had been abandoned, in Serbia the focus was on attracting specific FDI deals, selling domestic companies and expecting that investors would do the restructuring job (Udovički, 2021). The Investment Law, adopted in 2015, aimed to additionally stimulate foreign investments by extending national treatment to foreign investors, allowing the transfer or repatriation of profits and dividends, providing guarantees against expropriation, providing customs-duty waivers for imported equipment and enabling foreign investors to qualify for government incentives (Bartlett et al., 2019). The free zones, established as export-processing zones within duty-free areas, have attracted a relatively large amount of new FDI. Various municipalities have established such zones, competing for investors by offering a range of incentives (Avlijaš & Bartlett, 2011). By late 2024, there were 15 active free zones which host 254 multinational companies and account for 13

per cent of Serbia's total exports (Government of Serbia, Development Agency of Serbia website)

Government investment subsidies, extended through the Development Agency of Serbia depended on the size of investment, the number of jobs created and level of development of the municipality. An additional subsidy was available for labour-intensive companies that employed more than 200 workers. Subsidies in the manufacturing sector could be granted for investment projects valued above €100,000 that employ at least 10 workers. All large investors could benefit from an investment subsidy package. Investors that have negotiated agreements with RAS received an average subsidy of €9,000 per job created in 2014, €7,000 in 2015 and €5,000 in 2016 (see Bartlett et al., 2019).

The 2023 legislative framework is similar, providing various types of investment subsidies for domestic and foreign firms, paid from the government budget through the Serbian Development Agency (Government of the Republic of Serbia, 2023). The subsidy depends on the cost of an investment project and the number of newly employed workers, further differentiated depending on the region where the company is located (Beograd, Vojvodina, Šumadija and Western Serbia, South and Eastern Serbia).[5] Two main types of investment subsidies are available: those for wages and those for material and non-material costs. Subsidies for wages of newly employed workers vary depending on the region in which the company is located.[6] Subsidies for material and non-material costs can cover up to 10 per cent of these costs in the Belgrade region, 15 per cent in the Vojvodina region and 30 per cent in the other regions. The subsidy can be increased by 10 per cent for labour-intensive projects employing at least 100 new workers, by 15 per cent if employing more than 200 and by 20 per cent if employing more than 500 new workers. A company applying for an investment

[5] The eligibility conditions for investment in Belgrade as the most developed region is that an investment project's minimum cost is €500,000 and the number of newly employed workers at least 50; these two criteria are lower in Vojvodina (€400,000 minimum cost and 40 newly employed workers) and lowest in the two least developed regions (€300,000 minimum cost and minimum 30 newly employed workers).

[6] In the Belgrade region, covering 20% of costs of gross wages up to a maximum of €2,000 for each newly employed worker; in Vojvodina covering 25% of costs of gross wages, up to a maximum of €3,000 for each newly employed worker; and in the other regions up to 30% of costs of gross wages, up to a maximum of €5,000 for each newly employed worker.

subsidy may receive a higher amount in specific cases (e.g. if the project contributes to higher value-added productive capacities in the manufacturing sector or to exports of manufactures, or if it has a low impact on the environment). The new provisions introduced in 2023 aimed to reduce the large disparities in economic development among Serbian regions by favouring investments in less developed regions, which are now offered stronger incentives than more developed regions. Other state incentives for investments remain in various forms, such as reduced taxes and social security contributions on net salaries, relief from corporate income tax, and the option of delaying the payment of taxes over the next five years (Zakić, 2024).

The Serbian government therefore uses a wide range of industrial policy instruments that are important for attracting foreign firms. The focus of Serbia's development strategy has not changed, as it aims "to provide the best business conditions and a stable macroeconomic and political environment to foreign investors through various incentives" (Zakić, 2024, p. 422). The use of subsidies for newly created jobs, as an incentive to attract FDI, has been openly criticised by the European Commission because it is not consistent with the industrial policy goal of better integrating Serbian SMEs into domestic and international supply chains (European Commission, 2024a).

What have been the overall results of such an industrial policy in Serbia? Table 1 presents an overview of the Serbian Government's projected objectives set in 2011 in the *Strategy and Policy of Industrial Development for the 2011–2020 Period* and their actual fulfilment by 2017, as reported in the official government document (Government of the Republic of Serbia, 2011). Although the table inadequately compares the projected objectives for the whole 2011–2020 period with their fulfilment only until 2017, it can still illustrate the strategy's over-ambitious targets. Only the growth rates of manufacturing employment and of exports had reached the projected targets by 2017, while none of the other objectives had been fulfilled. Particularly striking are the setbacks during the period 2011–2017 regarding the effective GDP growth rate, which was only one sixth of that projected; the growth rate of the manufacturing industry was less than one half of that projected; and the investment rate was one quarter of the projected rate (see Table 1). Although the underperformance of growth indicators was strongly influenced by exogenous factors – the unfavourable external environment caused

by multiple crises in the EU – other countries in the region also had similar problems but had higher GDP growth rates than Serbia.

Table 1. Serbia's strategic objectives, 2011–2020 (projected and realised)

Objectives	*Projected average growth rate (%), 2011–20*	*Realised growth rate (%), 2011–2017*
GDP	5.8	0.9
Investment	9.7	2.4
Domestic final demand	4.7	0.5
Consumption	3.5	0.1
Exports of goods	14.2	10.7
Manufacturing industry	7.3	3.3
Construction	9.7	0.0
Employment in manufacturing (total)	18,0	0.4% per annum

Source: Government of the Republic of Serbia (2020b), p. 15.

The Serbian government also set unrealistically high targets regarding FDI, as can be seen in Table 2 (again taken from the above official government document). Although attracting FDI was one of the government's top priorities, by 2017 the total net FDI, as well as FDI in manufacturing, amounted to about half the value of the projected FDI for the whole 2011–2020 period. Nevertheless, net FDI annual inflows represented a respectable 5.3 per cent of GDP during the period 2011–2017, only slightly lower than that projected for the whole period.

Table 2. FDI objectives (projected and realised)

Indicator	*Projected, 2011–2020*	*Realised, 2011–2017*
Net FDI – total (€bn)	22.7	12.7
Net FDI – average annual share of GDP (%)	5.8	5.3
FDI in manufacturing industry – total (€bn)	9.1	4.5
FDI in manufacturing (% share of total)	Over 40 (by 2020)	31.1

Source: Government of the Republic of Serbia (2020b), p. 17.

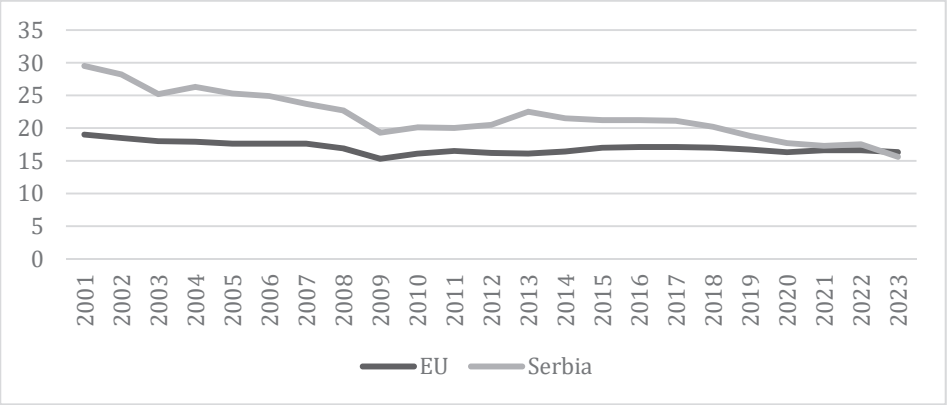
The Serbian government has prepared a new *Strategy of Industrial Policy for the 2021–2030 Period* (Government of the Republic of Serbia, 2020b) which aims to replace the current model of competitiveness based on a cost advantage derived from cheap low-skilled labour with a model based on a skill-based advantage and knowledge-based industries. The strategy explicitly recognises that industrial policy should incorporate both horizontal and vertical (sectoral) policies. Horizontal measures target the development of SMEs, entrepreneurship and competitiveness, focusing on education, innovation, digital transformation, investment, infrastructure, internationalisation, the circular economy and the business environment. Vertical policies should be based on the *Smart Specialisation Strategy* adopted in February 2020 (Government of the Republic of Serbia, 2020a) and will include the following priority areas: (1) food for the future; (2) information and communication technologies (high-knowledge-content services); (3) future machines and manufacturing systems (mid-tech manufacturing such as metal processing, machine construction, rubber/plastics); and (4) creative industry (Government of the Republic of Serbia, 2020a). A new Action plan of the *Strategy of Industrial Policy* for the 2024–2025 period was adopted in April 2024 (Government of the Republic of Serbia, 2024). The new programme of support for domestic industrial enterprises in the chosen target sectors should enable their greater integration into global supply chains. The planned measures also aim to increase the efficiency of the instruments for the implementation of the *Smart Specialisation Strategy* and provide better coordination of industrial policy among Serbian line ministries.

Some of the main achievements of Serbia's industrial policy include the steady inflow of FDI, on average more than 6 per cent of GDP per annum during the 2011–2021 period. Serbia has become a leading destination for foreign investors in the WB region, ranking first in greenfield investments in Europe in 2019 according to the *Financial Times* (Zakić, 2024). Net FDI has been particularly impressive since 2020, amounting to 6.5 per cent, 7.3 per cent, 7.3 and 6.5 per cent of GDP in 2020, 2021, 2022 and 2023, respectively (Maksimović et al., 2024). FDI inflows have also fundamentally contributed to strong export growth, since foreign companies are Serbia's top exporters (Nikolić, 2025). Serbia's ratio of exports of goods and services to GDP has doubled during the past decade, increasing from 32 per cent of GDP in 2010 to 64 per cent of GDP in 2022 (though falling slightly to 60 per cent of GDP in 2023) (World Bank, n.d.). The arrival of

foreign firms, attracted by generous subsidies for newly created jobs, has facilitated the positive trend in employment growth. Foreign firms have also contributed to transfers of know-how and technology, at least in some sectors. FDI has been important in covering Serbia's current account deficit, which has been entirely covered by net inflows of FDI since 2015 (Zakić, 2024).

Despite many positive effects of FDI, heavy reliance on foreign investors has also rendered the Serbian economy exceptionally vulnerable to external shocks, as suggested by the four recessions it has had during the post-2008 period. Serbia's industrial policy has not prevented the further de-industrialisation of the economy, despite manufacturing industry being one of the government strategic priorities after 2011 (see Table 1 above). Contrary to the set objectives, the share of manufacturing value-added in GDP was further reduced from around 30 per cent in 2001 to a low 15.6 per cent in 2023 (only from 2009 to 2013 was there a mild increase) (see Figure 2). Today, Serbia's share of manufacturing value added is lower than the EU27 average (16.3 per cent), as well as below that of several older EU member states (e.g. Ireland, Germany, Austria) and most Central Eastern European member states of the EU (the Czech Republic, Slovakia, Slovenia, Poland, Hungary, Lithuania). Serbia's structural changes during the past 25 years support Chenery's (1960) structuralist hypothesis, which posits a reverse relationship between the level of GDP per capita and the share of manufacturing in GDP, but the decline in manufacturing in Serbia seems to have been premature, considering the country's still relatively low level of economic development (Damiani & Uvalić, 2018). The strong process of deindustrialisation in Serbia can be attributed at least partly to ad-hoc policies regarding FDI and domestic investments more generally.

Figure 2. Manufacturing value-added in Serbia and EU27 (% of GDP), 2001–2023



Source: Prepared by the author on the basis of Eurostat statistics.

The structure of FDI has not favoured fast technological upgrading of the Serbian economy. During the 2001–2008 period, foreign firms invested predominantly in the non-tradable service sectors – retail trade, banking, telecommunications, real estate – thus contributing only indirectly to the restructuring of Serbia's industry (Estrin & Uvalić 2016; Uvalić, 2010). Since 2012, FDI in the manufacturing sector has significantly increased, but most of it has been directed into low- and medium-low technology and labour-intensive sectors that produce low complexity products, such as cable production and rubber products (e.g. tyres) (Atanasijević, Vasiljević, et al., 2021; Radovanović, 2025).

Serbia's recent industrial policy focusing strongly on attracting FDI has been associated with various other negative side-effects, including transfer pricing, market monopolisation, significant influence of the legal and political environments, increased competition for domestic SMEs, and the use of state incentives to attract capital of foreign investors, which tends to leave the country soon afterwards (Zakić, 2024). There are a number of foreign companies that withdrew from Serbia once state incentives expired, or have recently announced their intention to leave the country. Among the best-known cases are Gierlinger Holding (Austria), Spilit (Russia), Geox (Italy), Benetton (Italy), Dräxlmaier (Germany), Johnson Electric (China), the global technology company Aptiv and Jura (South Korea) (Radovanović, 2025). There have also been concerns

regarding the environmental impact of FDI. Chinese companies, such as Hesteel Smederevo and Zijin Mining, have been accused of negative effects on the environment due to the technologies employed (Zakić, 2024). Further complaints regard labour conditions, since some Chinese companies in Serbia pay their workers only minimum guaranteed wages or do not fully respect workers' rights guaranteed by law. Despite recent legislation to stimulate investments in the less developed parts of the country, FDI has been concentrated around the major cities, not contributing to more balanced regional development in Serbia (Zakić, 2024).

3.1 Towards a more diversified industrial policy in Serbia

Rather than focusing predominantly on attracting foreign investors, the Serbian government could consider applying a more diversified industrial policy that would rely more on internal sources of growth (Uvalić, 2021). Moving away from the FDI-dependent model would require redirecting resources from subsidies offered to foreign investors towards major support of other sources of growth. In order to strengthen Serbia's internal sources of growth, industrial policy could consider giving more weight to the following objectives:

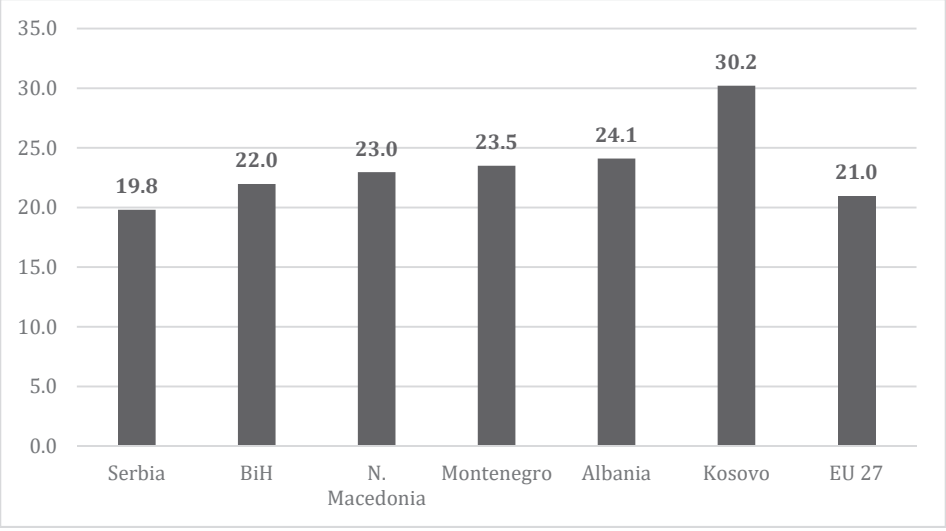
(1) higher domestic investments and better targeting of priorities;
(2) investment in human capital (innovation, R&D, education);
(3) more adequate support of domestic enterprises, particularly SMEs;
(4) further encouragement of networks between domestic and foreign companies;
(5) promotion of the energy and the digital transitions;
(6) improved governance based on the concept of a developmental state.

(1) Increasing the investment rate and better targeting of priorities

Neoclassical growth theory and many theories of economic development indicate a minimum rate of investment as the key condition for fast economic growth. This has been confirmed by extensive empirical evidence from many countries worldwide. Socialist Yugoslavia achieved very fast economic growth for over thirty years (until the early 1980s), to a large extent thanks to very high investment rates, well over 30 per cent of GDP (Uvalić, 1992). By contrast, Serbia has had a relatively low investment/GDP ratio, well below the 25 per cent of GDP that is considered the threshold for sustained high growth and below the 30 per cent

recorded by emerging market economies at similar levels of development (Kekić, 2018). During the 2013–2023 period, Serbia had the lowest average investment rate among all the WB countries – 19.8 per cent – which was also lower than the average rate in the EU27 (see Figure 3). Only after 2019 did Serbia's investment rate increase somewhat, to 23–24 per cent of GDP. A higher investment rate could have a strong multiplier effect on GDP growth in Serbia, as shown by recent estimates (Labus, 2019).

Figure 3. Average gross fixed capital formation (% of GDP), 2013–2023



Source: Prepared on the basis of Eurostat online statistics (accessed in mid-November 2024).

Ranđelović and Đorđević (2024) have compared Serbia with a group of fast-growing economies (FGE) during the period 1990–2019, showing that total investments in Serbia amounted to 15.9 per cent of GDP on average, substantially below the FGE average of 25.6 per cent of GDP. During this period, FGE have relied relatively little on FDI: the ratio of FDI to gross fixed capital formation was 16.6 per cent on average, while in Serbia it was 21.1 per cent. If we exclude the 1990s when there were no FDI and consider only the post-2000 period, Serbia has indeed relied heavily on foreign investors to sustain its investment rate: during the period 2000-2023, FDI represented on average 32 per cent of total gross fixed capital formation (see UNCTAD, 2025).

One of the unintended side-effects of the growth of FDI in Serbia from 2010 to 2017, as shown by recent estimates, was the crowding out of domestic investments (Labus, 2019). Although the current investment law does not officially discriminate against domestic firms, there is ample evidence that foreign investors continue to receive generous government support, while domestic firms, particularly SMEs, are in a much less favourable position (CEVES, 2024; Stojsavljević, 2024; Zakić, 2024). The privileged position of foreign firms vis-à-vis domestic firms has been a strong disincentive for local firms to invest. It has often been argued in public debates that domestic private enterprises should be offered tax incentives to invest their profits locally, as used to be the case before 2012, and other favourable provisions (e.g. lower energy prices).

Higher investment rates in Serbia should be achieved in both the public and private sector. Between 2011 and 2015, public investment was extremely low, on average 2.3 per cent of GDP (Bajec, 2018), but recently it has increased to 6–7 per cent of GDP. During the whole 1990–2019 period, the share of public investment in total investment was much lower in Serbia (only 14 per cent) than in fast-growing economies (31 per cent) (Ranđelović & Đorđević, 2024).

Within vertical measures of industrial policy, it is advisable to give Serbia's sectoral priorities greater weight, since investments in various sectors have a different impact (Labus, 2019; Atanasijević, Vasiljević, et al., 2021). Influencing the sectoral structure of investment could facilitate faster structural changes towards higher value-added and higher productivity sectors, facilitating technological upgrading of the economy. Governments that want to use FDI to diversify and upgrade their production and export base should not simply wait to see what international market forces bring, since sector targeting by investment promotion agencies can double FDI flows into the chosen sectors and result in higher unit-value exports (Moran, 2014). Although vertical industrial policy is explicitly stressed in Serbia's *Strategy of Industrial Policy* (Government of the Republic of Serbia, 2020b), it seems to have been largely neglected in some important government documents. Somewhat surprisingly, in Serbia's Reform Agenda approved by the European Commission in October 2024 (European Commission, 2024b), which is the basis for receiving the EU financial assistance over the next three years envisaged by the *Growth Plan for the Western Balkans*

(European Commission, 2023), the country's smart specialisation strategy is not mentioned.

(2) Investing in human capital (R&D, innovation, education)

Serbia's economic growth also depends on the development of a knowledge-based economy, requiring more investment in science, innovation, R&D and education at all levels. These are the most important sources for increasing productivity and economic competitiveness in the long run, as stressed in many EU documents and the economic growth literature (European Council, 2000; European Commission, 2010, 2013, 2017; Romer, 1986; Lucas,1988). Although the EU's *Lisbon Strategy* (discussed earlier) has not achieved some of its desired targets, such as increasing expenditure on R&D to 3% of GDP by 2010, it has drawn attention to the importance of the "knowledge economy" and the "knowledge triangle" – research, innovation and education – leading to the adoption of specific policies and programmes. Similar objectives are included in the more recent *Europe 2020* strategy within measures to promote "smart growth", that requires the development of an economy based on knowledge and innovation (European Commission, 2010). These policy areas are also at the centre of the most recent reports prepared for the European Commission proposing measures for increasing competitiveness and productivity of the EU economy (Draghi, 2024; Letta, 2024).

The importance of "smart growth" has been increasingly recognised in Serbia, but the policies implemented have not been applied consistently. Measures to support innovation have contributed to Serbia being classified among the "moderate innovators" in 2019 in the EU's *Innovation Scoreboard 2020,* but by 2025, the country was again placed in the last group of "emerging innovators" although ahead of the other WB countries (European Commission, 2020, 2025). Serbia's expenditure on R&D has gradually increased, from 0.92 per cent in 2019 to 0.97 per cent of GDP in 2022, but it is still half of the EU27 average (2.24 per cent). The level of public spending on education in Serbia in 2022 was 3.2 per cent of GDP, below the EU average of 4.8 per cent (European Commission, 2024). Despite radical reforms in higher education, qualification standards for higher education have yet to be developed and linked with quality assurance procedures (European Commission, 2024). There is still a lack of skills for certain professions and a mismatch between educational profiles of graduates and labour demand

(OECD, 2022; Uvalić & Bartlett, 2016). Without the right labour skills, the Serbian economy will not have the absorptive capacity to attract future investments and develop higher value-added sectors. Some companies in Serbia, such as FIAT in Kragujevac, have established a training centre for their workers, but many other companies provide training for their workers abroad, such as the chain producer Rosa Catena in Smederevo, which sends it operators to Italy for training (Krasniqi et al., 2022). Serbia still does not have an organised well-defined system to stimulate wider research networks between enterprises and universities.

(3) More adequate support of domestic enterprises, particularly SMEs

An obvious potential source of growth in Serbia are domestic enterprises, particularly SMEs. Although the state budget for measures supporting SMEs has grown, it remains modest (European Commission, 2024). The government should consider redirecting budgetary resources from FDI subsidies towards additional measures to support SMEs. SMEs represent more than 99 per cent of Serbian enterprises, but they represent a considerably lower share of employment (65 per cent), value added (59 per cent) and exports (39 per cent) (OECD, 2022).

The SME sector continues to face institutional, financial and competition barriers (Atanasijević, Corradin, et al., 2021; CEVES, 2024). Improvements in the business environment have contributed to attracting FDI, but conditions have improved primarily for large foreign investors, discriminating against small firms, both domestic and foreign, and domestic "political outsiders" (Udovički, 2021). Borrowing costs in banks are significantly higher for SMEs than for large companies, and so they are reluctant to borrow to undertake new investments. SMEs need more appropriate technical assistance, market information and help in accessing external markets and internationalisation. SMEs lack the capacity to invest in greening businesses, which is limited by lack of awareness and skills as well as the additional costs involved (OECD, 2022). SMEs in Serbia are also strongly constrained by competition barriers, as they face unfair competition from large and foreign companies that maintain strong market power in certain sectors (Atanasijević, Corradin, et al, 2021). SMEs also face strong competition from the informal economy, where unregistered entrepreneurs, by avoiding the obligation to pay taxes, have a competitive advantage over firms in the formal sector.

(4) Cooperative networks between local and foreign firms

FDI has not had significant spillover effects on value added, employment and exports in the manufacturing sector of the WB economies, including Serbia (Estrin & Uvalić, 2016). One of the reasons is that there are not many linkages between foreign companies and domestic firms in Serbia, resulting in limited technology spillovers from foreign firms to the Serbian economy (Atanasijević, Vasiljević, et al., 2021; Bartlett et al., 2019; Krasniqi et al., 2022). The top 15 exporters in Serbia are mainly foreign-owned firms (Maksimović et al., 2024) that continue to import parts and other inputs from abroad. Krasniqi et al. (2022) report the findings of the Regional Cooperation Council's Balkan Barometer surveys, that show that a very small proportion of the sales of domestic firms in Serbia are made to foreign multinational companies based in the country: only 6.1 per cent, on average, during the 2015–2020 period. In Kragujevac (Serbia), where FIAT has a large factory producing motorcars, foreign firms have become the major suppliers of components to FIAT, thus limiting the potential for domestic SMEs to become engaged in supplying inputs to the factory (Krasniqi et al., 2022).

As mentioned earlier, the creation of cooperative networks between foreign companies and domestic firms has been stimulated by the Serbian government through the Supplier Development Programme launched in 2019, but the programme led to the conclusion of a very small number of contracts between SMEs and multinational companies – 19 in 2019, 13 in 2020, and only 9 in 2021 (OECD, 2022). For 2022 and 2023, SMEs that were to become suppliers of multinational enterprises were set at 9 and 12, respectively (OECD, 2022). These numbers seem extremely low and certainly insufficient to achieve the development of collaboration networks between multinational companies and numerous SMEs in Serbia.

For the SMEs to match the high-quality requirements of foreign companies, they need more adequate capacity building and training activities in order to improve skills of the local labour force (OECD, 2022). Stronger incentives for collaborative networks and specific programmes that would assess the needs of foreign investors and facilitate contacts with local suppliers are needed (Atanasijević, Vasiljević, et al., 2021). Strengthening such local-international networks would facilitate the integration of Serbian firms in global supply chains through their

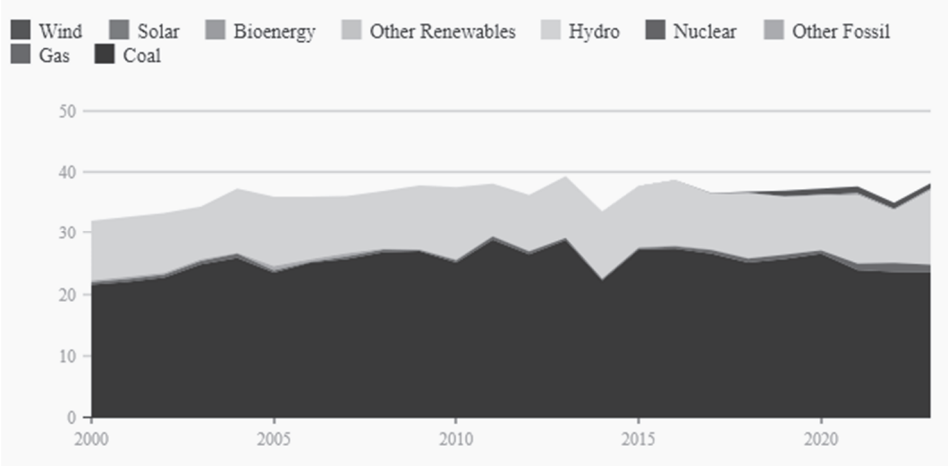
multinational partner companies, thus making better use of local sources of growth. Despite the importance of these measures, it is worth noting that the export potential of the Serbian economy has strengthened independently of foreign enterprises operating in the country. Since 2008, some SMEs in Serbia which did not have direct linkages to localised FDI have successfully internationalised, becoming non-FDI based drivers of exports (Avlijaš et al., 2023).

(5) The green and digital transitions

Industrial policy will be crucial in achieving the aims of the green and digital transitions in both the EU and the WBs. The Green Agenda for the Western Balkans (European Commission 2020b) will require the modernisation of enterprises, investments in the industrial eco-systems and innovation, adoption of additional export prerequisites and development of skills. Serbia should make the best use of EU assistance offered through the *Economic and Investment Plan for the WBs* (European Commission, 2020a) and the new *Growth Plan for the Western Balkans* (European Commission, 2023). In order to fully benefit from the investment packages, Serbia should adopt specific policies in these areas that would strengthen the competitiveness of firms on EU markets.

Serbia's competitiveness is hampered by a polluting and inefficient energy sector, characterised by high carbon intensity, outdated infrastructure, intensive use of coal and low energy efficiency. The energy sector is the main source of pollution in Serbia, responsible for 80 per cent of the country's greenhouse gas emissions and for the poor air quality. About 66.4 per cent of domestic electricity production in Serbia comes from coal (lignite), 28.4 per cent from hydropower, 4.2 per cent from wind, small hydro, biomass and solar energy, and 1 per cent from gas (European Commission, 2021). These proportions have marginally changed over the past five years (see Figure 4).

Figure 4. Serbia electricity generation by source (in Terawatt hours), 2024



Source: Ember Electricity Data Explorer, ember-energy.org (accessed online, Nov. 2024).

Some associations in Serbia have been involved in developing greening policies by providing information and guidance to firms on environmental norms, but this must be done on a much larger scale. Substantial technical support and incentives need to be offered to firms to start implementing measures that would enable greater use of renewable resources, the adoption of more appropriate environmental norms and engagement in the training and development of skills of their workforce (Uvalić, 2022). Banking staff also need technical training on the environmental impact of projects in order to be able to apply appropriate selection criteria when extending new loans to firms. A more critical attitude towards foreign investors is necessary, requiring an environmental impact analysis and stricter norms regarding environmental standards of firms.[7] SMEs' access to finance for green projects should be further facilitated by including green criteria in existing financial instruments. Although two dedicated SME

[7] Not only Chinese and Asian companies, but also firms from the EU have sometimes ignored environmental standards in Serbia. One of the alarming stories is from Beočin, where a cement factory was sold to the French company Lafarge in 2002; this was at that time considered one of the most successful privatisations in Serbia (see Uvalić, 2010, p. 189). In the meantime, Beočin has become one of the most polluted Serbian towns, since the company decided to substitute natural gas with the cheaper but highly health-damaging cox petrol, with the result that the town has seen an increasing number of deaths due to cancer (see Ivanović, 2021).

credit guarantee schemes were established in 2020, such schemes should expand their scope (OECD, 2022).

In the area of digitalisation, the national broadband infrastructure should be developed further, particularly in rural areas, contributing to economic development of less developed regions. Serbia has a well-developed legislative e-commerce framework in place, but the uptake of e-commerce practices among SMEs remains low (OECD, 2022). According to the Serbian government (2020b), many SMEs do not plan projects in the area of digital transformation, mentioning as the main reason their low profitability due to limited demand for digital products on the domestic market and lack of labour skills needed for sales on international markets.

(6) Improved governance

For the above policies to be successful, Serbia needs a deep transformation of government institutions. The new role of the state requires not just *less* government, but *a different role* of the government (Uvalić, 2010). The quality of government institutions is essential for enforcing laws, collecting taxes and supervising the financial sector; the quality of non-state institutions is, however, also important. Markets will not function well if they are not competitive, if competition authorities do not ensure fair competition, or if there are barriers to firm entry and expansion; enterprises will not function well if corporate governance is poor, or minority investors are not protected by a well-functioning judiciary and legal system. The World Bank's recent governance indicators – including the rule of law, government effectiveness, political stability and control of corruption – illustrate Serbia's institutional shortcomings and weak regulatory functions of the state rather well. Over the past decade, Serbia has registered a continuous deterioration in some of these indicators (e.g. control of corruption) (see World Bank's governance indicators).

The current "predatory state" pursuing narrow interests of the minority in power must be transformed into a "developmental state" (or an "entrepreneurial state", see Mazzucato, 2011), in which the state's pursuit of economic growth would be guided primarily by national interests to the benefit of all Serbian citizens. There are examples worldwide that have shown that a combination of a predatory state and weak governance institutions can be detrimental for firm performance and

economic growth in the long run (Estrin, 2020). When institutions are weak and governance is ineffective, agency problems will also beset private firms, which may suffer from managerial aggrandisement and dominant shareholders expropriating minority shareholders (Estrin, 2020). In Serbia, too, institutions that address market and coordination failures are key for economic growth and development.

Following proposals on a bottom-up approach to industrial policy (see Section 2 above), governance mechanisms could be improved by more actively involving all stakeholders in Serbia – business associations, SMEs, trade unions, activist NGOs, academic community, citizens – in the process of discussions and preparations of new economic policy proposals on industrial policy, especially in areas where they are likely to have a more profound knowledge than government officials (e.g. the green transition). Although Serbian law envisages such participation of the wider community in discussing and commenting on new policy proposals prepared by the government, in practice this principle is not always respected.

5. CONCLUDING REMARKS

Instead of a growth model that has relied primarily on foreign investors to fuel investment and structural change, Serbia needs a different approach based on a more diversified industrial policy that would rely much more on internal sources of growth. Relying so strongly on FDI to increase the country's investment rate and to restructure and modernise its economy has been a risky and short-sighted policy that has not led to the much-needed technological upgrading of the Serbian economy and fast catching-up with more developed countries in Europe. FDI has also led to the crowding out of domestic investments, contributing to relatively low levels of gross fixed capital formation/GDP ratios over the past decade, in this way additionally reducing the country's growth potential. Foreign investors are already leaving Serbia to move to other regions that offer lower labour costs and other non-cost advantages.

The potential contribution to Serbia's faster long-term economic development should be sought in the parallel implementation of different instruments of industrial policy: measures to increase domestic investments, better targeting of priority sectors, higher quality education, major alignment between labour

supply and demand, stronger incentives for entrepreneurship and innovation, better financial, technical and other conditions for SMEs, stronger linkages between local firms and multinational companies, and measures to stimulate the energy and digital transitions. A necessary ingredient for achieving positive results from the proposed measures of industrial policy in Serbia is more efficient governance, which could be achieved by redefining the role of the state and improving the quality of public and private institutions. In the discussions about future industrial policy, the inclusion of all relevant stakeholders (policy makers, enterprises, NGOs, academia, citizens) would be highly desirable. Today presents a good opportunity for Serbia to implement a more diversified industrial policy aligned with both its own development objectives and current EU targets that would accelerate its growth rate and enable faster economic development.

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THE EFFECT OF ECONOMIC COMPLEXITY ON INCLUSIVE GROWTH IN DEVELOPING COUNTRIES

ABSTRACT: *This study examines the effect of economic complexity on inclusive growth from 2000 to 2021 based on a sample of 68 developing countries. Applying the two-stage least squares approach (Lewbel method), we find that economic complexity has a significantly positive effect on inclusive growth. This result is robust with quantile, Tobit, Poisson, and negative binomial methods, applied per continent. Our results challenge the conventional focus on economic growth as the sole policy objective and highlight the importance of considering the quality and distribution of growth. Specifically, the findings suggest that countries with a more complex economic structure tend to experience higher levels of inclusive growth, emphasising the need for policies that foster economic diversification and sophistication. Additionally, factors such as government spending, taxation, and public debt are identified as key determinants that can either support or hinder inclusive growth in developing countries. This study contributes to the ongoing debate on inclusive growth and provides valuable insights for policymakers promoting sustainable and equitable development strategies in developing countries.*

KEY WORDS: *developing countries, economic complexity, inclusive growth, Lewbel 2SLS.*

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1. INTRODUCTION

The importance placed on economic growth by policymakers and researchers around the world has withstood the test of time and has as such consolidated its place as the best yardstick of the economic health of countries since it is in most cases associated with a high employment rate (Ben-Salha & Zmami, 2021; Haider et al,. 2023; Meyer, 2017), a low poverty rate (Balisacan, 2000; Mulok et al., 2012; Suryahadi, 2012), improved standards of living (Clark & Senik, 2011; Kenny, 1999;), among others. Thus, given this importance, studies have in the past been particularly focused on how countries can fast-track their growth processes by studying the determinants of economic growth (Barro 1999, 2003; Chirwa & Odhiambo, 2016; Ciccone & Jarociński, 2010; Cuaresma et al., 2014; Iqbal & Zahid, 1998). Recently, a new strand of literature has emerged questioning the need to focus entirely on growth as a policy objective without giving as much value to the quality or the ingredients of economic growth. This is because economic growth (measured using GDP) offers a blanket view of the level of population welfare in a given country. Consequently, this has led to the emergence of the concept of inclusive growth (McKinley, 2010) as a form of growth that is distributed fairly across society and, above all, one that creates opportunities for all, by including all members of the society both in the generation and the distribution of the benefits that accrue.[1]

The increased importance of inclusive growth saw the creation of the Inclusive Growth Index (IGI) in 2022 by the United Nations Conference on Trade and Development (UNCTAD). This index has since served as one of the main indicators of countries' economic performance since it not only indicates the increase in overall GDP per capita but also how the citizens participate in the growth process and share the resulting benefits equitably. Thus, the concept of inclusive growth, as measured by an index of inclusive growth, has grown in significance recently as it goes beyond traditional economic metrics such as GDP to incorporate indicators of living conditions, equality, environmental sustainability, and other important macroeconomic dimensions of national well-being (McKinley, 2010).

[1] See https://www.oecd.org/inclusive-growth/

This value accorded to inclusive growth has led to a plethora of empirical studies that have particularly focused on its determinants, intending to provide policymakers with the necessary perquisites for inclusively attaining fundamental macroeconomic objectives. The literature on the determinants of inclusive growth can be divided into several strands, such as those studies that focused on cross-country determinants (Alekhina & Ganelli, 2023; Angulo-Bustinza et al., 2023; Jalles & de Mello, 2019; Kumeka et al., 2023; Tella & Alimi, 2016) and country-specific determinants (Anand et al., 2019; Feshari & Valibeigi, 2017; Ghosh & Dinda, 2022; Hazmi et al., 2022; Rini & Tambunan, 2021). Several studies have likewise examined the effects of economic complexity on inclusive growth (Mbiankeu Nguea & Kaguendo, 2023; Stojkoski et al., 2023). Economic complexity is defined as the composition of a country's productive output, reflecting the structures able to hold and combine knowledge (Hausmann et al., 2014; Hidalgo & Hausmann, 2009). Economic complexity has received a lot of attention both from policymakers and researchers as the best indicator of the level of knowledge production in a given country and the degree of an economy's sophistication and diversification, with the potential to influence other key aspects of the economy (Doğan et al., 2021; Hartmann et al., 2017; Nguyen et al., 2021). The two countries with the highest levels of economic complexity, Japan and Switzerland, have indices of 2.06 and 1.94, respectively, and are considered as having the best-performing economies; in contrast, those with the lowest index are mostly Sub-Saharan African countries, such as Benin with an index of −0.61 and Chad with an index of −1.93, which mainly export raw material goods with limited export diversification.

This study makes a modest contribution to the literature on the role of economic complexity in fostering inclusive economic growth. Specifically, it makes the following contributions to the existing knowledge in the area of inclusive economic growth and economic complexity. First, empirically, the study focuses on 68 developing countries spanning the period 2000 to 2021, a broader sample than in previous studies (Stojkoski et al., 2023; Nguea & Kaguendo, 2023), enabling us to take into account more country-level heterogeneities; Second, this study adopts robust estimation techniques that control for potential problems of endogeneity and other related issues, unlike prior works of this kind. In particular, the two-stage least squares (2SLS) technique is our main means of correcting for endogeneity.

The application of this technique shows that economic complexity, captured using the economic complexity index, positively and significantly affects inclusive economic growth in the sampled countries. These results were found to be robust after the application of alternative estimation techniques (Tobit, quantile regression, Poisson regression, and a negative binomial regression) and region-specific analyses (the Americas, Africa, Asia, and Europe). Importantly, while 2SLS is our main means of addressing endogeneity, the other estimation methods serve as robustness checks for distributional assumptions, rather than corrections for endogeneity.

The rest of this paper is structured as follows: The next section presents the theoretical and the empirical literature review; section three focuses on the methodology; section four outlines the results and interpretation and the last section concludes and provides policy recommendations.

2. THE RELATIONSHIP BETWEEN ECONOMIC COMPLEXITY AND INCLUSIVE GROWTH: A REVIEW OF THE LITERATURE

2.1. Conceptualisation of economic complexity and inclusive growth

The analysis of inequality, and therefore inclusive growth, in relation to economic development in general is based on the seminal work of Kuznets (1955). Linking the dynamics of industrialisation and democratisation with labour mobility shifts, from agriculture to industry and rural to urban areas, Kuznets' (1955) inverted U-shape illustrates the rise and fall of income inequality alongside economic development. Although his work does not deal explicitly with inclusive growth, it does provide a basis for analysing it. Inclusive growth cannot be addressed without incorporating issues of inequality. In this line, Bourguignon (2003) proposed bidirectional causation in his poverty-growth-inequality triangle. The link between growth and inequality emphasises the role of "development strategies". In a similar study, Molero-Simarro (2016) also found evidence of bidirectional causation linking growth and inequality, highlighting the need for balanced economic growth policy measures to ensure social stability and sustainable development.

Economic complexity can be defined as the amount of productive knowledge embedded in an economy. It is usually exhibited in terms of the sophistication

and the diversity of the products an economy competitively exports (Baliamoune-Lutz, 2019). Economic complexity captures both the range of goods a country produces and the capabilities required to produce them, indicating the economy's underlying knowledge systems, institutions, and industrial structures (Hidalgo & Hausmann, 2009). Hidalgo and Hausmann (2009) stated that countries with higher economic complexity, as measured using the economic complexity index developed by these two authors, possess deeper technological capabilities and are better positioned for sustained economic growth and development. Hausmann et al. (2014) argue that economies with greater complexity are more resilient and innovative, capable of transitioning into more advanced industries that offer higher wages and productivity. Furthermore, Lall (2000) emphasises the importance of technological and human capital development in building competitiveness, which is central to increasing economic complexity. As such, economic complexity is increasingly recognised as a key driver of long-term, inclusive, and innovation-led development.

According to Lopez (2004), there is an emerging consensus that growth accompanied by progressive changes in the income distribution is better than growth without. This argument highlights the need for countries to move away from economic growth objectives towards those of inclusive growth. However, there are a variety of definitions, concepts, and methodologies used to assess the level of inclusivity, depending on whether they are based on monetary indicators (such as poverty or income inequality) or non-monetary indicators (such as inequality of opportunities), as well as factors that explain the differences in levels of inclusive growth observed around the world. For instance, Dollar and Kraay (2002) adopt the "relative pro-poor growth" approach, which defines inclusive growth as a situation where the income of the poor grows at a faster rate relative to the average income of the entire population. Ravallion and Chen (2003), on the other hand, introduce the concept of "absolute pro-poor growth," whereby growth is considered inclusive as long as it leads to an absolute improvement in the well-being of poor individuals. In contrast, Ali and Son (2007) propose a definition of inclusive growth that focuses on the increase in a social opportunity function which takes into account both the average opportunities available to the population and the distribution of those opportunities among individuals. For Rauniyar and Kanbur (2010), inclusive growth is that which is accompanied by lower income inequality, so that the increment of income accrues

disproportionately to those with lower incomes. This approach is consistent with the definition of Grinspun (2004), who defined inclusive growth as economic growth that involves both inequality and poverty reduction, where inequality reduction implies that growth should benefit those with low incomes more than those with high incomes. However, Klasen (2010) does not share this view and considers inclusive growth to include all stripes of society, including the poor, the near-poor, middle-income groups, and even the rich.

2.2. Theoretical underpinning

Existing theories posit that economic complexity plays a key role in enhancing the inclusive growth of nations through its role in influencing income distribution, structural transformation, and labour market dynamics. It is argued that countries with high economic complexity (highly sophisticated countries) exhibit greater levels of innovation and technological progress, which in turn generate higher productivity and income growth (Hidalgo & Hausmann, 2009). Ali and Son (2007) underlined the fact that economic complexity contributes to a more equitable income distribution since it enables the transition from low-skilled, low-wage employment to high-skilled, high-wage jobs. This aligns with the inclusive growth framework, which emphasises broad-based participation in economic development and equitable sharing of benefits.

Economic complexity also affects inclusive growth by promoting sectoral diversification and enhancing resilience to economic shocks. McMillan and Rodrik (2011) highlight that economies with more diversified industrial bases are better positioned to absorb external shocks and create stable employment opportunities for various income groups. This diversification mitigates the risks associated with over-reliance on a single sector, particularly in resource-dependent economies, thereby promoting social and economic stability. Moreover, as countries develop more sophisticated industries, they attract investment in education and skill development, leading to improved human capital accumulation and greater social mobility (Hausmann et al., 2014). This process reduces long-term structural inequality and fosters sustainable, inclusive growth.

Another theoretical perspective underscores the role of institutions in mediating the relationship between economic complexity and inclusive growth. Acemoglu

and Robinson (2012) argue that inclusive institutions – those that provide equal access to economic opportunities, protect property rights, and support innovation – enhance the positive effects of economic complexity on inclusive growth. When institutions effectively channel resources into productive, high-complexity industries, the benefits of economic development reach a broader segment of the population. Conversely, in the absence of strong institutions, economic complexity may exacerbate income disparities by disproportionately benefiting elites. Thus, policy interventions aimed at improving institutional quality can amplify the inclusivity effects of economic complexity, ensuring that economic progress translates into broad-based prosperity.

2.3. Summary of empirical works

Empirical analysis of the determinants of inclusive growth reveals a diversity of factors, including financial inclusion, human capital, innovation and technological advances, and economic growth. For Raheem et al. (2018), investment in human capital and education are key factors for inclusive growth. According to these authors, human capital refers to individual knowledge, skills, and health that contribute to productivity and economic growth. Indeed, education is an important component of human capital because it provides individuals with the knowledge and skills they need to succeed in the workplace (Karambakuwa et al., 2020). Research has consistently shown that investment in education is positively related to economic growth, as well-educated individuals can earn higher incomes and contribute to overall economic development (Oketch, 2006). By investing in human capital and education, countries can promote inclusive growth by providing people from diverse backgrounds with the tools and resources they need to succeed and contribute to their economies (Aghion et al., 2021)

Furthermore, technological progress and innovation appear in the literature as major factors in inclusive growth through the reduction of inequalities (Adejumo et al., 2020; Korinek et al., 2021). Growth driven by competition and innovation is critical to driving productivity improvements and supporting broad-based growth. From this perspective, Adejumo et al. (2020) rely on the neo-classical growth model and show that in Sub-Saharan Africa, the penetration of new information and communication technologies improves inclusive growth through employment, reduced inequality, and growth in GDP per capita.

According to Korinek et al. (2021), new technologies and innovations can create new industries, products, and services, thereby creating jobs and increasing economic activity. By promoting innovation and technological progress, countries can create opportunities for everyone, regardless of background or socioeconomic status. Furthermore, innovation helps increase efficiency and productivity, thereby increasing wages and improving living standards for all. In their study, Anand et al. (2013) apply the microeconomic concept of a social mobility function at the macroeconomic level to measure inclusive growth for a sample of 143 countries over the period 1970–2010. Their empirical results suggest that trade openness, fixed investment, moderate inflation, and output volatility positively and significantly impact inclusive growth in the sample countries. Using schooling in primary, secondary, and tertiary education, they also show that an educated workforce is significantly beneficial for inclusive growth.

In their study, Alekhina and Ganelli (2020) analyse female labour force participation and financial inclusion led by digitalisation (proxied by the number of mobile cellular subscriptions per 100 people) as two structural drivers of inclusive growth in a sample of eleven developing countries.[2]. Applying a standard empirical panel cross-country regression model from 1990 to 2017, their results suggest that fiscal redistribution, female labour force participation, productivity growth, FDI inflows, digitalisation, and savings significantly drive inclusive growth. Previously, Ostry et al. (2014) and Aoyagi and Ganelli (2015) also concluded that the combined direct and indirect effects of redistribution are on average pro-growth and that the redistribution impact on inclusive growth could be sizable in emerging Asia.

Furthermore, inequality and poverty can lead to social unrest and instability, harming economic development and progress. By reducing income inequality and poverty, countries can promote inclusive growth by ensuring that all people have access to the resources and opportunities they need to thrive and contribute to the economy (Adejumo et al., 2020). This can be achieved through measures such as progressive taxation, social safety nets, and targeted investments in education and health care. According to Aghion et al. (2021), most developing

[2] In their sample, the authors introduce six ASEAN countries members: Indonesia, Malaysia, Philippines, Lao PDR, Thailand, and Vietnam.

countries have followed comprehensive liberalisation policies since the 1980s to let markets emerge, mostly by tackling price controls, lowering tariffs, and deregulating capital and financial markets to promote more inclusive economic growth. However, the existing literature does not exhaustively explore the factors that explain inclusive growth in the context of these countries, in particular, the impact of economic complexity for the specific case of African countries where inequalities and poverty remain preponderant. Based on the literature review showing the role of economic complexity on inclusive growth, we propose the following lone hypothesis:

H1: Economic complexity positively and significantly affects inclusive growth in the context of developing countries.

3. DATA AND METHODOLOGY

3.1. Data

This study aims to assess the relationship between economic complexity and inclusive growth. To do this, we use a sample of 68 developing countries over the period 2000–2021. The choice of this period is conditioned by the availability of data that can be obtained simultaneously for all the countries in the sample. Most of the countries excluded are transition countries, which do not have data on the economic complexity index. The data we use to construct the inclusive growth index are mainly taken from the World Development Indicators (WDI) of the World Bank (2023), with the exception of the diversification index taken from the United Nations Conference on Trade and Development (UNCTAD, 2023), and data on life expectancy taken from the World Health Organization database (WHO, 2023). The control variables (external debt, public spending, inflation, entrepreneurship, and foreign direct investment) are taken from the World Bank databases (2023).

i. Dependent variable

Our dependent variable is the index of inclusive growth quality (IGQI). The economic literature has generated considerable debate on the measurement of inclusive growth. Indeed, this measure is based on several aspects and relies on several dimensions (Cha'ngom et al., 2020; McKinley, 2010; Mlachila et al., 2014). In the same vein, the International Monetary Fund (IMF) provides six major

aspects to be taken into account to better reflect inclusive growth. These six aspects can be grouped around two main dimensions. Firstly, the fundamental economic indicators include: (i) sustainability, captured by the growth rate of GDP per capita; (ii) economic stability (or volatility), measured by the inverse of the coefficient of variation of the level of growth (Ramey & Ramey, 1995); (iii) economic diversification, captured by the diversification index; and (iv) openness to the rest of the world, of which net foreign demand is a good approximation. Secondly, the social dimension of growth includes two aspects: (v) access to healthcare (long life and good health), measured by healthcare expenditure; finally, and (vi) education, for which completion rates at the primary school level reflects growth for all.

However, the literature omits several social benefits, such as access to electricity and technological gadgets (access to mobile phones). The externalities of globalisation should benefit all social strata. Indeed, the issue of redistributing the externalities of growth to benefit everyone, including the most disadvantaged, has long been a key concern in the debate. The search for this social balance through policies focused on improving people's incomes and purchasing power has given rise to two main models of economic growth (GDP) in the literature: Romer's endogenous growth model (1986) and the exogenous growth model advocated by Solow (1956). From these, the multidimensional standard of living should see a clear overall improvement, and poverty should decline significantly. Thus, under the terms of Sustainable Development Goal 7 (SDG7), each country must guarantee access for all to reliable, sustainable, modern, and affordable energy services. This premise of sharing the fruits of growth implies eliminating any inability of households to meet their basic energy needs. Fundamentally, access to electricity can help achieve several sustainable development goals, ranging from (i) freedom from poverty; (ii) freedom from hunger; (iii) good health and well-being; (iv) quality education; (v) gender equality; (vi) decent work and economic growth; (vii) industrialisation and innovation (International Energy Agency, 2017). In addition, technology can enable greater inclusion through the creation of new ways of working, for example: digital work platforms, the removal of barriers to employment (such as long commutes), and changes in work performance. Not taking such social details into account when calculating the inclusive growth index would contribute to distorting reality.

The relevance of the calculation of this index as proposed in this article arises from the fact that there is a distinction between the reference years and differences in the territorial breakdown of countries, which makes any international comparison of inclusive growth indicators and regional disparities in these indicators questionable. Each region has its own realities. Our index therefore quantifies the ratio of the variables used to their reference values.

Therefore, to calculate a complete and more inclusive index of the quality of inclusive growth, over and above the traditional variables in the literature, the variables mentioned above are aggregated using the principal components analysis (PCA) technique (Hotelling, 1933; Pearson, 1901). Theoretically, the calculation of the index makes it possible to unite several geometric results which are very different in nature. For example, the theorems of Gauÿ-Bonnet-Chern, Hirzebruch, and Riemann-Roch-Hirzebruch, which essentially consider compact differential varieties of even dimension, and the polynomial integration of curvature, are unified by the Atiyah-Singer theorem (Atiyah & Singer, 1963). PCA draws its essence from the theory of variance, according to which the variance of a random variable measures its dispersion around the mean. Thus, PCA uses the covariance matrix to identify the principal components that explain the maximum variance of the data, thanks to the eigenvectors and eigenvalues of this covariance matrix. By these means, PCA reduces the dimensionality of the data (by identifying the principal components that explain the maximum variance) but also ensures orthogonality (i.e. the non-correlation of the principal components) and maximum variance (because the principal components are such that they explain the maximum variance in the data).

PCA is one of the most frequently used methods for analysing multivariate data and for aggregating different variables. It is relevant and widely used in the context of studying multidimensional data sets for quantitative variables. This technique allows observations to be projected from a q-dimensional space with q variables to a k-dimensional space (where $k < q$) in such a way as to preserve and conserve the maximum amount of information (information is measured here by the total variance of the dataset) from the initial dimensions. Generally speaking, when the information associated with the first 2 or 3 axes represents a sufficient percentage of the total variability of the scatterplot, these observations could be represented on a 2- or 3-dimensional graph to facilitate interpretation. PCA is

thus a data mining method because it makes it easier to extract information from large data sets, as is the case in our sample of developing countries.

We use the PCA method to summarise the indicators of inclusive growth. The use of this index captures the underlying trends in the data, the portion of the total variance in the data used for its calculation, and takes into account the weight of each variable in each component. Indeed, inclusive growth in a developing country context must take into account not only trends in per capita income, access to electricity, and many other trends mentioned in Figure 1. This calculation is based on GDP/capita, economic volatility, the diversification index, external demand, adequate healthcare, quality of education, access to electricity, and access to new technologies. We standardise these variables to give them the same importance, using the following model:

$$Z_{i\,j} = (X_{i\,j} - \overline{X_j})/\hat{\sigma}_j \;\text{; (i=1, …, n; j=1, …, p)}\,, \tag{1}$$

such that $\overline{X_j}$ represents the mean and $\hat{\sigma}_j$ is the estimated standard deviation of column *j*. On this basis, PCA finds synthetic indices that best summarise the standardised information.

The first synthetic index, Y_{ij}, is defined in accordance with the following constants:

- Linear combination of centred variables:

$$Y_{ij} = \beta_{11}\mathrm{X}_{i1} + \beta_{21}X_{i2} + \beta_{31}X_{i3}; \tag{2}$$

- The coefficients β_{ij} are such that:

$$\beta_{11}{}^2 + \beta_{21}{}^2 + \beta_{31}{}^2 = 1; \tag{3}$$

- The coefficients β_{ij} have minimum variance Y_{ij} .

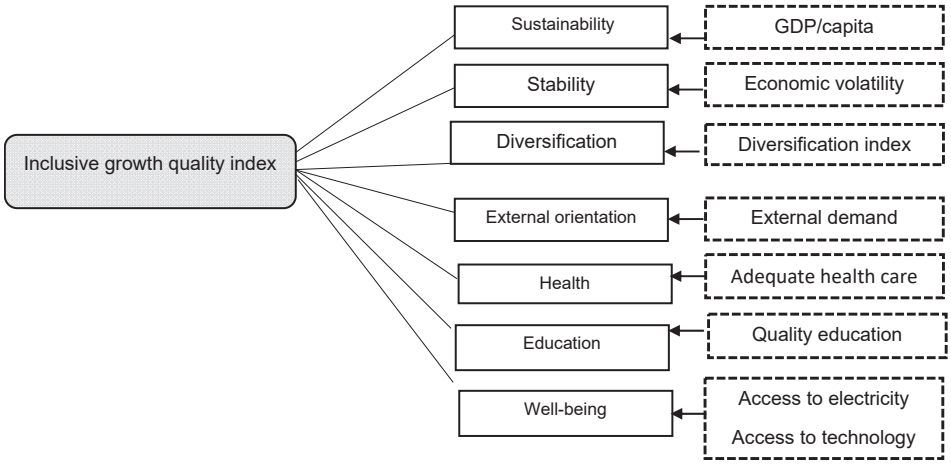
In the context of our study, the inclusive growth index can be assessed as a function of the value of the Kaiser–Meyer–Olkin quantity (KMO) defined as follows:

$$KMO = \frac{\sum_S r_{ij}^2}{\sum_S (b_{ij}^2 + r_{ij}^2)}, \quad (4)$$

where $S = (i, j, i \neq j)$, r_{ij} captures the correlation between variables *i* and *j*, while b_{ij} captures the images of these correlations. The KMO test value is validated if it is at least equal to 0.60 (Kaiser, 1974). This method differs from that used by the IMF and adds other variables that the IMF does not take into account, such as access to electricity and technology, the lack of which are key impediments to development in developing countries.

Figure 1 shows schematically the different components taken into account in the calculations.

Figure 1: Dimensions of Inclusive Growth Quality Index (IGQI)



Source: Authors

The advantage of PCA decomposition lies in the fact that this method favours the construction of an indicator capable of describing a single variable. This variable has a common component that federates the movements of other variables, making it possible to obtain weightings that effectively reflect the variability of the data. This helps to reduce data complexity by identifying principal components that explain maximum variance, visualise data more clearly and concisely, and identify data structure. Furthermore, the PCA method is based on

empirical weights resulting from a phenomenon endogenous to the data, which governs the overall movement of the data. Baccini (2010) advises using a standard PCA because the variables come mainly from different sources and would have been measured based on heterogeneous dimensions. However, in addition to using weights that capture more of the existing variability between heterogeneous data, this method makes it possible to capture the individual weights of each variable used in the construction of the inclusive growth index, as well as the propensity of this indicator to vary according to changes in each value of its composition.

We have opted for a PCA specific to all developing countries, which is better suited to conceptual considerations underlying our index. However, for analyses by region, we retain this global index, which could be a limitation of the analyses. However, the fact that these regions are also made up of the developing countries whose common variables we use means that the use of this global analysis of the inclusive growth index is justifiable.

Table 1 presents the PCA of the eight economic growth indicators selected in this study, with the aim of establishing an indicator of the quality of inclusive growth (IGQI). The significance of Bartlett's test, reported in Table 1, suggests that the null hypothesis that the variables are not correlated is rejected. Beyond the validity of this hypothesis, the KMO value (generally between 0 and 1), which is 0.69, makes it possible to deduce the average quality of the sample considered. Based on the values of Cronbach's alpha test, the Kaiser–Meyer–Olkin (KMO) test, and the Bartlett test, we conclude that there are factors common to the indicators of inclusive growth, which supports the validity of the PCA method.

Table 1: Eigenvalues of the PCA

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.696	0.477	0.337	0.337
Comp2	2.219	1.181	0.277	0.614
Comp3	1.038	0.280	0.129	0.744
Comp4	0.757	0.262	0.095	0.839
Comp5	0.496	0.139	0.062	0.901
Comp6	0.357	0.102	0.045	0.945
Comp7	0.254	0.072	0.032	0.977
Comp8	0.182	–	0.023	1.000
Cronbach's α				7.43e+20
Kaiser–Meyer–Olkin (KMO)				0.693
Bartlett sphericity test (χ^2)				857.624***

Source: Authors

Note: *** p<0.01. The null hypothesis for the Bartlett test suggests that the variables (inclusive growth variables) are not intercorrelated.

From Table 1, three components meet the selection criteria in terms of their eigenvalues. In fact, their eigenvalues are greater than 1. Thus, these components explain approximately 74.42% of the potential variations to be observed in the IGQI. Our statistical estimation of the IGQI will therefore be based on components 1, 2, and 3 (GDP per capita, economic volatility, and economic diversification), according to the PCA analysis.

Table 2 shows the oblique rotation of the different saturation elements of the principal component (PC). These rotations determine the number of variables included in each PC (Fabrigar et al., 1999). By rotating the weights of the PCs, it is possible to detect in each component the different patterns of how the components interrelate with the inclusive growth variables (i.e. GDP/head growth rate, net external demand, diversification index, economic volatility (i.e. the inverse of the coefficient of variation [1/cv]), health care expenditure, primary education completion rate, access to technology and access to electricity). Looking at the factor loadings (FL > 0.30), we can see that variables such as access to electricity, external demand, GDP/head, education, health, and use of mobile

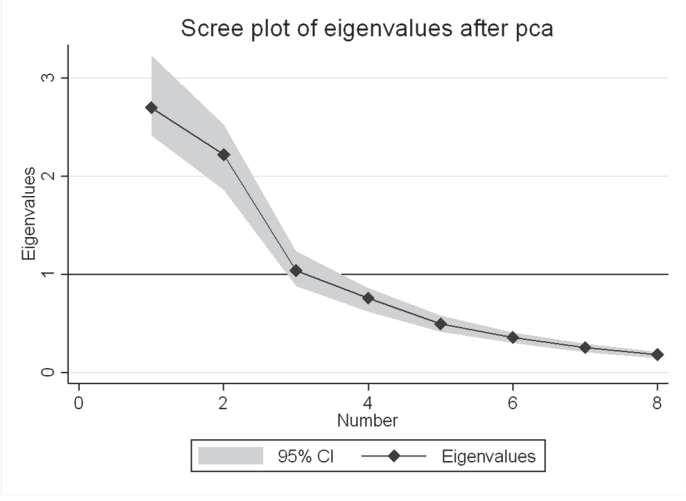
phones are the major components of principal component 1 (PC1). On the other hand, GDP per capita, external demand, and healthcare explain more of principal component 2 (PC2). However, principal component 3 is largely explained by economic volatility and economic diversification.

Table 2: Principal component loadings for exploratory component analysis with oblique rotation

Variable	PComp1	PComp2	PComp3
GDP/capita	**0.3891**	**0.4480**	0.0343
External demand	**0.4015**	**0.4192**	-0.0179
Diversification index	-0.2799	0.2660	**0.3514**
Economic volatility	0.0186	-0.0491	**0.9271**
Adequate health care	**0.3304**	**0.3990**	0.0245
Education	**0.3851**	-0.4067	0.0961
Mobile cellular	**0.3552**	-0.3304	0.0757
Access to electricity	**0.4341**	-0.3415	0.0043

Source: Authors
Note: Factor loadings > 0.30 are in bold.

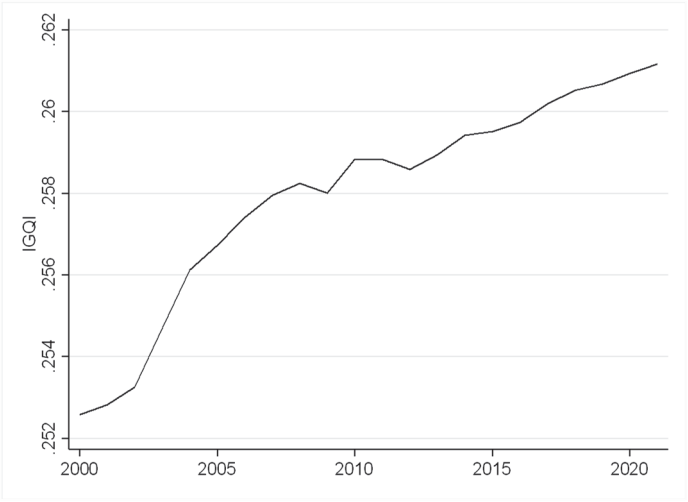
Figure 2: Graphical evolution of eigenvalues (scree plot)



Source: Authors

Figure 2 shows the evolution of the eigenvalues derived from the construction of the IGQI, using PCA. This graph confirms the presence of three indicative variables that can be included in the calculation of the IGQI, the eigenvalues of which are greater than 1.

Figure 3: The average trend in inclusive growth



Source: Authors

Figure 3 shows the evolutionary dynamics of the index of the quality of inclusive growth in developing countries over the period from 2000 to 2021. The figure shows an increasing trend in the overall IGQI. However, this continuous increase in inclusive growth has two general sequences, the first between 2000 and 2008 and a return to the trend from 2012. However, this drop in inclusive growth between 2008 and 2010 can be explained by the various crises that most developing countries experienced, particularly those in Africa.

ii. Variable of interest

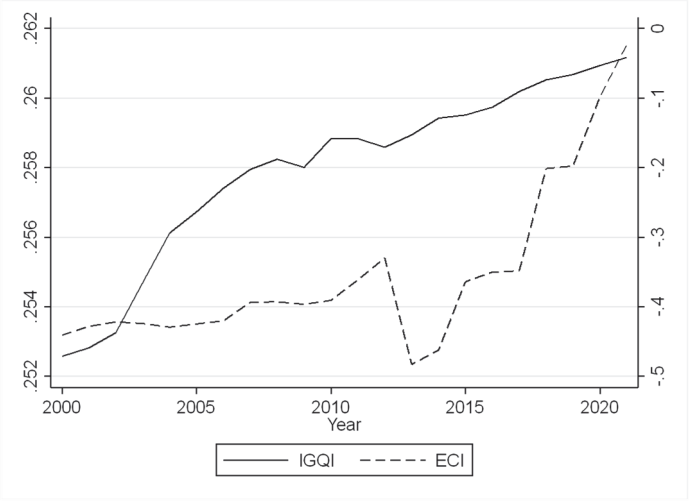
The Economic Complexity Index (ECI) variable in our model is captured with data from the Observatory of Economic Complexity[3], derived from Smith's seminal definition (1776) and taken up by Hidalgo and Hausmann (2009) and

[3] See (https://atlas.media.mit.edu)

Hausmann et al. (2014). This index is calculated on the basis of over 5,000 products, including petroleum products. However, the ECI focuses on the complexity and diversity of a country's export basket and therefore captures only one dimension of economic structure – export sophistication – while omitting the domestic, non-tradable, and service sectors. Recent literature has moved towards a multidimensional approach, recognising that the structure of an economy is not limited to business activities (see Stojkoski et al., 2023; Juhász et al., 2024). Taking this into account, our study focuses on only one dimension of the structure of the economy, which may not fully capture the complexities involved. Indeed, our measure of the ECI may be incomplete in light of this recent literature, but it is also sufficient because data on a multidimensional measure are not available for all the countries in our sample of developing economies.

These authors (Hausman et al., 2014; Hidalgo & Hausmann, 2009; Smith, 1776) argue that inclusive growth implies both the accumulation of knowledge by a society, distributing a tiny fraction to each individual, and the ability of that society to mobilise that knowledge. In practice, goods that account for a larger share of world trade will have a higher volume of exports than goods that account for a smaller share. However, the optimal situation would be for macroeconomic policies to be geared towards promoting economic development.

Figure 4: IGQI vs ECI trends for developing countries



Source: Authors

Figure 4 shows three major periods in the evolution of the IGQI and the ECI based on their computed averages for each 5 year interval. The first, from 2000 to 2002, shows that both the ECI and the IGQI rise slightly. In the second period, from 2002 onwards, inclusive growth displays a steadier upward trend, while economic complexity remains relatively stable until it experiences a sharp decline around 2012 and a sharp rise from the beginning of 2014, marking the start of the third period. This situation continues until 2021 when the ECI grows more rapidly than the IGQI. Furthermore, given the positive correlation, we find that there is a strong presumption of co-integration between economic complexity and inclusive growth in developing countries.

iii. Control variables

Following the variable of interest illustrated above, we include several control variables, to account for potential confounders in the ECI–inclusive growth relationship, strengthening model robustness:

- Inflation: Inflation disproportionately affects the poor through a reduction in their real income, thereby reducing their purchasing and widening income inequality (Easterly & Fischer, 2001). The inflation variable comes from the World Bank (2023). It is captured using the consumer price index. This is a good approximation of inflation insofar as it takes into account the prices of both local and imported goods. According to Akobeng (2016), the consumer price index is a relevant indicator for measuring variations in electricity purchases, to which the poor are more exposed. Although a relationship between inflation and economic growth has been established (Phillips, 1958), inflation is often feared for its costs and is presented by Fisher (1983, 1993), Barro (1991), and Bruno and Easterly (1998) as having a harmful effect on growth, while others (Mallik & Chowdhury, 2001) emphasise its potential positive effects on growth.
- Public spending: Expenditure on education and health care is vital for the development of human capital, which in turn enhances inclusive growth (Olayinka Kolawole, 2016; Barro, 1990). This variable is presented in the new growth theory as reaffirming the economic role of the state. For example, the acute weakness of public infrastructure in the United States in the early 1990s showed that public spending is an overly neglected supply factor but plays an important role in the context of endogenous economic growth (Barro, 1990).

The state manages externalities. The private return on accumulation is lower than the social return, and public intervention would improve well-being.

- Foreign Direct Investment (FDI): FDI contributes to job creation, knowledge transfer, and industrial diversification, which can enhance inclusive growth if it promotes local employment and skills upgrading (Borensztein et al., 1998). The variable is captured as a percentage of GDP. The interest shown in FDI in the literature generally relates to its ability to attract technology transfers, the improvement in local management capacity, the impact on growth, and the contribution of financial resources. Monterrey (2002) shows that the alternative to the limits of international financing is FDI, given the levels of indebtedness in developing and transition countries, and the level of unemployment in these countries (Asongu & Odhiambo, 2021; Ofori & Asongu, 2021).
- Entrepreneurship: Entrepreneurship development fosters innovation, creativity, and economic dynamism, which are essential elements of inclusive growth, especially through the reduction of income disparities (Acs et al., 2008). The entrepreneurship variable is measured using data on male individuals who have developed their own business activity and are self-employed. In endogenous growth theory (Romer, 1986; Lucas, 1988), self-employment is not only a source of technological progress but also helps to reduce unemployment.
- Tax revenue: Progressive taxation can fund social programmes and reduce income inequality, supporting inclusive growth, unlike excessive taxation, which may discourage investment and economic participation (Besley & Persson, 2013). Tax revenue is captured using income tax. This variable reflects behaviours aimed at avoiding the tax burden, which facilitates the growth of the informal economy. One of the direct consequences of this practice is the misallocation of profits from the exploitation of resources that would otherwise be to the benefit of all individuals. The microeconomic and macroeconomic effects of tax evasion influence a country's economic resilience, shaping opportunities for inclusion, as well as the functioning of social insurance mechanisms (Dell'Anno, 2016). These dynamics are linked to institutional constraints, which act as a buffer against the development risks associated with the formal economy.
- Government debt: Moderate debt can finance public investments that enhance inclusive growth, but excessive debt may crowd out private

investment and lead to austerity measures that harm the poor (Reinhart & Rogoff, 2010). The debt variable is captured by the servicing of governments' external debt. The literature shows the harmful effect of debt on economic growth (Omrane Belguith & Omrane, 2017). While governments often incur debt to cover their deficits, it is important to remember that the repayment of outstanding debt can undermine macroeconomic stability, including efforts to reduce unemployment.

Table 3: Descriptive statistics

Variables	Obs	Mean	Std.	Min	Max	VIF	1/VIF	Units	Source
IGQI	272	0.258	0.03	0.155	0.325	--	--	Index	Authors
ECI	272	-0.37	0.738	-2.373	1.76	1.50	0.668	Index	OEC
Inflation	239	1.504	0.942	-1.797	4.855	1.20	0.831	log	WDI
Government expenditure	248	2.517	0.42	-0.148	3.349	1.16	0.859	log	WDI
FDI	242	0.986	1.03	-3.99	3.56	1.20	0.832	log	WDI
Entrepreneurship	248	3.631	.858	-0.837	4.492	1.33	0.750	log	WDI
Tax revenue	248	13.741	5.711	0.742	43.319	1.05	0.951	on level	WDI
Debt	272	19.946	3.914	0	25.11	1.17	0.851	log	WDI
Breusch–Pagan test for heteroscedasticity					Ramsey RESET test of omitted variable				
$\chi^2(1) = 0.14$ $p = 0.705$					$F(3, 223) = 4.04$ $p = 0.0079$				

Source: Authors.
Note: OEC – Observatory of Economic Complexity (2023); WDI – World Bank (2023)

Table 3 summarises the descriptive statistics for the various quantitative variables. The gap relating to the difference between the number of observations is attributable to data availability. The errors are distributed according to a normal distribution, and there is no heteroscedasticity in the structure of these errors. Furthermore, given the VIF values, which are all less than 10, Table 3 reveals no evidence of multicollinearity. Although the pairwise correlation coefficients between the different variables are low (Table 4), which reduces concerns about multicollinearity, multicollinearity can still arise from complex linear relationships among variables and should therefore be rigorously examined using appropriate econometric techniques.

Table 4: Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)IGQI	1.000							
(2)ECI	0.012	1.000						
(3)Inflation	0.008	-0.381*	1.000					
(4)Government expenditure	-0.190*	0.239*	-0.224*	1.000				
(5)FDI	0.047	0.214*	-0.078	0.127*	1.000			
(6)Entrepreneurship	0.242*	-0.390*	0.307*	-0.326*	-0.008	1.000		
(7)Tax revenue	-0.085	0.102	0.013	-0.017	0.059	0.128*	1.000	
(8)Debt	-0.122*	0.101*	-0.019	0.083	-0.299*	0.061	-0.041	1.000

Source: Authors
Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3.2. Methodology

i. Empirical model

The empirical model adopted in this study takes the form of a simple linear model, generally used to evaluate the impact of a variable *x* on a variable *y*. In this way, we test the influence of economic complexity on inclusive growth. Consequently, the specification is given by the following equation:

$$IGQI_{i,t} = \alpha_{i,t} + \beta_1 \text{ECI}_{i,t} + \beta_2 Infl_{i,t} + \beta_3 FDI_{i,t} + \beta_4 Self\_Empl_{i,t} + \beta_5 Pub\_Exp_{i,t} + \beta_6 Debt_{i,t} + \varepsilon_{i,t}, \quad (5)$$

where $IGQI_{i,t}$ is the inclusive growth quality index in region *i* in period *t*; $ECI_{i,t}$ represents the economic complexity index in region *i* in period *t*; $Infl_{i,t}$ is the inflation rate; $FDI_{i,t}$ represents foreign direct investment; $Self\_Empl_{i,t}$ is entrepreneurship; $Pub\_Exp_{i,t}$ is government spending in region *i* in period *t*; $Debt_{i,t}$ is the level of external debt; and $\varepsilon_{i,t}$ refers to the error term.

ii. Estimation technique

To address the econometric questions posed by this study, several estimation techniques are employed, in accordance with the literature. These techniques include the basic 2SLS estimator developed by Lewbel (2012). Indeed, the use of

this method generally solves the problems related to heteroscedasticity, endogeneity, and those connected with the choice and validation of instruments constructed internally in the model. This method, which identifies effects using internally constructed instruments, exploits the presence of heteroscedasticity in the residuals (Arcand et al., 2015; Lewbel, 2012). This approach makes it possible to construct a large number of instruments (equivalent to the number of parameters associated with the underlying model), which facilitates model identification. The results of the Sargan test, which we present in the tables, validate the instruments used.

The strength of Lewbel's technique also lies in the fact that an instrumental variable method takes into account all the factors that may not have been observed, but which could be correlated with the explanatory variables based on common factors. To this end, to validate our instruments, we use ECI as an instrumental variable. However, in addition to the internal instruments constructed by the Lewbel technique (inflation), we use other exogenous instruments – population, the real interest rate, the net level of migration, and institutions – which are likely to be correlated with economic complexity. The other advantage of Lewbel's 2SLS method lies in its ability to prevent a possible proliferation of instruments (Ongo et al., 2024).

Using a technique similar to Arellano and Bond (1991), Lewbel (2012) proposes a method to identify structural parameters in regression models with endogenous or poorly measured regressors in the absence of traditional identification information, such as external instruments (Lewbel, 1997) or repeated measurements. These parameters are identified through uncorrelated regressors. To construct these instruments as simple functions of the model data, Lewbel (2012) proposes that the appropriate values of the endogenous regressors are lagged. However, this approach is applicable in the case of unavailability of an external instrument, or to complement the external instruments to improve the efficiency of the IV estimator. The application of the instrumental variables approach, where a constraint arises from the unavailability of appropriate instruments or identification restrictions, will be carried over to the auxiliary equation or first-stage regression, to provide the necessary elements for the method (Lewbel, 2012).

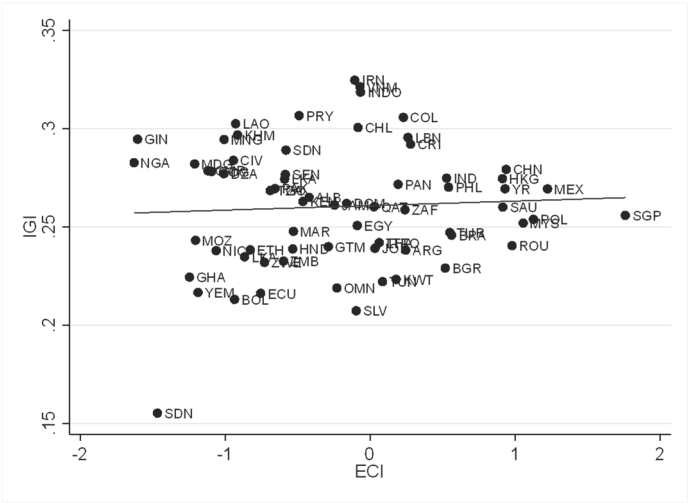
There may be endogeneity in our estimates. In particular, variables omitted from our model (for example, natural resource rents) may bias the value of our estimated coefficients. However, in his analysis, Lewbel (2012) shows that in the absence of instruments, it is possible to identify the coefficient of the endogenous variable. In particular, in the context of a triangular system that corresponds to the presence of endogeneity caused by an omitted variable, he demonstrates that it is possible to identify the impact of the endogenous variable by imposing restrictions on the higher-order moments rather than by estimation with traditional instrumental variables. However, the conditions imposed on the moments are based on the presence of heteroscedasticity in the first stage of an equation linking the endogenous variable and the exogenous variables. With this procedure, the impact of economic complexity on inclusive growth can be identified and estimated without necessarily using information external to the model.

4. EMPIRICAL RESULTS

4.1. Baseline results

The initial evidence, illustrated in Figure 5, shows a visual relationship between the ECI and the IGQI in our sample. Consistent with the correlation matrix, the scatterplot suggests a weak but positive correlation between the ECI and the IGQI. This indicates that countries with a highly complex economic structure, using sophisticated development techniques, tend, on average, to experience slightly higher levels of inclusive growth.

Figure 5: Correlation between total ECI and IGQI



Note: the dots in the scatterplot represent the developing countries in the sample.
Source: Authors.

The main results of this study are presented in Tables 5 and 6. Table 5 reports the results of the first-stage regression of our empirical model and the diagnostic tests, including heteroscedasticity tests and an assessment of the validity and strength of the instruments. The heteroscedasticity tests are highlighted under the assumption of conditional homoscedasticity. According to this, Hansen's J-statistic reduces to Sargan's statistic, which is verified in Step 2. Thus, if there is a heteroscedastic disturbance or autocorrelation of the variables, Hansen's J-statistic is consistent (for an estimate consistent with HAC), while Sargan's statistic is valid in the presence of a homoscedastic disturbance and (for an estimate consistent with AC) autocorrelation (Hayashi, 2000).

The Sanderson–Windmeijer test, which reports the exclusion of Fisher values (Fisher in Table 5) of the instrumental variables used (people enrolled in the armed forces, real interest rate, population level, and life expectancy), shows that the external instruments used are not effective. Indeed, the Fisher values are all significant. Furthermore, under the null hypothesis (H0) of under-identification of the model, according to which important instrumental variables are excluded from the model, implying the existence of a correlation between these instruments and endogenous regressors, the Anderson–Canon LM test allows us

to reject the null hypothesis and accept that the model is well identified. Finally, the Anderson–Rubin Wald (Fisher), Anderson–Rubin Wald (χ^2), and Stock–Wright (2000) LM (χ^2) tests indicate that the external instruments are weak and cannot on their own provide robust and reliable results.

Table 6 shows that the probability of rejecting the null hypothesis is significant at the 1% threshold, which validates the instruments selected. In view of the limitations identified in the first stage, i.e. the weakness of the external instruments and the absence of heteroscedasticity, it is necessary to resort to the second-stage estimates, where Lewbel (2012) generates internal instruments for better efficiency of the exogenous and generated instruments and a more reliable estimation. Indeed, the Sargan-Hansen test of over-identification restrictions enables us to assess the level of identification of our models. The joint null hypothesis (H0) of this test holds that the instruments (inflation, public spending, FDI, entrepreneurship, tax revenues, and public debt) generated by the model are valid, i.e. that these instruments are uncorrelated with the error term, and that the excluded instruments (people enrolled in the armed forces, the real interest rate, population level, and life expectancy) are correctly excluded from the estimated equation. Under H0, the chi-square statistic of this test confirms these conditions, indicating that the model is properly identified.

Table 5: Economic complexity and IGQI: instruments validity test for the first stage

	Estimation technique: 2SLS			Dependent variable: IGQI			
Variables	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6	Spec, 7
Armed forces personnel	3.58e-07***	6.36e-07**	5.65e-07**	1.15e-07		2.93e-07	2.05e-07
	(8.30e-08)	(2.69e-07)	(2.67e-07)	(2.45e-07)		(2.30e-07)	(2.22e-07)
Real interest rate		0.0021	0.0026	0.0038	0.0044*	0.00001	0.0003
		(0.0031)	(0.0030)	(0.0027)	(0.0026)	(0.0027)	(0.0026)
Population		-7.08e-10	-5.46e-10	4.07e-10	7.91e-10***	2.86e-10	3.35e-10
		(6.35e-10)	(6.29e-10)	(5.72e-10)	(1.60e-10)	(5.32e-10)	(5.12e-10)
Life expectancy				0.0398***	0.0349***	0.0336***	0.0337***
				(0.0051)	(0.0049)	(0.0049)	(0.0048)
Inflation		-0.3089***	-0.2806***	-0.2179***	-0.1921***	-0.1804***	-0.1712***
		(0.0459)	(0.0465)	(0.0429)	(0.0417)	(0.0404)	(0.0389)
Government expenditure			0.2828**	-0.0557	-0.1223	-0.1381	-0.1537*
			(0.1039)	(0.1019)	(0.0972)	(0.0959)	(0.0924)
FDI				0.0507	0.0765**	0.0678*	0.0910**
				(0.0400)	(0.0374)	(0.0377)	(0.0366)
Entrepreneurship					-0.2103***	-0.2344***	-0.2263***
					(0.0535)	(0.0524)	(0.0505)
Tax revenue						0.0312***	0.0323***
						(0.0068)	(0.0066)
Debt							0.0475***
							(0.0111)
Constance	-0.4662***	-0.0235	-0.7751**	-2.7601***	-1.5482***	-1.7877***	-2.7834***
	(0.0469)	(0.0858)	(0.2890)	(0.3570)	(0.4671)	(0.4651)	(0.5044)
Observations	268	233	233	228	231	228	228
Sanderson–Windmeijer (Fisher)	18.58***	7.13***	6.99***	22.65***	28.69***	25.58***	23.27***
Anderson–Canon LM	17.50***	19.98***	21.53***	93.90***	89.15***	107.02***	97.78***
Anderson–Rubin W. (F)	7.08**	3.95**	4.16**	3.17**	3.88**	3.66**	4.34***
Anderson–Rubin W. (χ^2)	7.13**	12.11**	12.81**	13.13**	12.05**	15.30***	18.23***
Stock–Wright LM S stat	6.95**	11.51**	12.14**	12.42**	11.46**	14.33**	16.88***

Source: Authors.

Notes: Results based on 2SLS regressions of Model (5)). Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$.

The results of the 2SLS model presented in Table 6 show that economic complexity enhances inclusive growth throughout the different stepwise stages. The last specification (Spec.7) provides more reliable results as it contains all the variables of the model. Based on this, the result is positive and significant at the 1% threshold. This finding aligns with the theoretical framework suggesting that higher economic complexity fosters innovation, technological progress, and sectoral diversification, which in turn promote broad-based economic participation and reduce inequality. Empirically, these results are in line with those of Mbiankeu Naguea and Kaguendo (2023), who recently found that economic complexity enhances inclusive growth in a sample of 22 Sub-Saharan African countries over the period 2000–2017. This result can be explained by the fact that economic complexity generates wealth through increased competitive advantage and the exports of high-technology products. According to Tacchella et al. (2013), countries with a more exceptional ability to produce sophisticated goods are likely to have higher incomes than less productive countries. This makes a difference in the inclusive growth prospects of an economy, especially if it focuses on simple products that are based on natural resources, cheap labour, or economies of scale (such as crude petroleum, textile industries, or cocoa beans) or if it, instead, focuses on a variety of complex products based on high knowledge intensity, networks of skilled labour, or collective learning (such as cars, robots, and medicine) (Ferraz et al., 2021; Hartmann et al., 2017). The current study is closest to that of Mbiankeu Nguea and Kaguendo (2023), with the difference being that we consider more countries (68) and a longer period than they do, thereby offering a more holistic interpretation. Furthermore, while our study is particularly focused on the relationships between these two variables, Mbiankeu Nguea and Kaguendo (2023) analyse the effects of economic complexity on renewable energy. The above findings contradict the view expressed by some authors on the economic complexity–inclusive growth nexus. For example, Hartmann et al. (2019) showed that increases in economic complexity do not automatically translate into inclusive growth. While complexity may raise average income, it can also lead to rising income inequality, particularly in countries with weak institutional frameworks.

Table 6: Economic complexity and IGQI: Baseline results for the second stage

	Estimation technique: 2SLS		Dependent variable: IGQI				
Variables	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec.5	Spec. 6	Spec. 7
ECI	**0.026****	**0.018****	**0.015***	**0.007**	**0.007***	**0.006**	**0.009****
	(0.012)	**(0.009)**	**(0.008)**	**(0.005)**	**(0.004)**	**(0.004)**	**(0.005)**
Inflation		0.006*	0.003	0.001	-0.001	-0.001	-0.001
		(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Government expenditures			-0.018***	-0.014***	-0.010**	-0.009*	-0.008*
			(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
FDI				0.001	0.000	0.000	-0.001
				(0.002)	(0.002)	(0.002)	(0.002)
Entrepreneurship					0.010***	0.011***	0.012***
					(0.003)	(0.003)	(0.003)
Tax revenue						-0.001**	-0.001***
						(0.000)	(0.000)
Debt							-0.002***
							(0.001)
Constant	0.268***	0.256***	0.304***	0.296***	0.250***	0.256***	0.295***
	(0.005)	(0.004)	(0.015)	(0.013)	(0.017)	(0.017)	(0.021)
Observations	268	233	233	228	231	228	228
R-squared	-0.395	-0.193	-0.077	0.006	0.072	0.099	0.133
Sargan statistic	0	5.670	8.558	13.01	11.74	18.49	18.61
Sargan-Hansen statistic	17.50***	5.670*	8.558**	13.01*	11.74**	18.49**	18.61**

Source: Authors.

Notes: Results based on 2SLS regressions of model 5. Robust standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. At the 1% threshold, the probability of rejecting the null hypothesis is significant. The results of the Sargan tests for the different estimates validate the instruments selected.

The results of our control variables indicate that inflation positively and significantly affects inclusive growth. This is contrary to the conventional wisdom that inflation is hostile to economic prosperity as it deteriorates consumers' purchasing power and well-being (Angulo-Bustinza et al., 2023). Studies such as that of Mallik and Chowdhury (2001) have shown that moderate inflation is helpful to growth. In addition, our estimation results reveal that government spending also inclusive growth, in line with the findings of Satrio et al. (2019). Moreover, social spending in developing countries often benefits the rich and middle classes more than the poor. Therefore, a higher share of social spending on items such as health and education will not be reflected in higher incomes for the poor (Traoré, 2018), thereby justifying the negative effect of government expenditure on inclusive growth. The findings further indicate that higher taxes as measured by tax revenue to GDP are negatively correlated with inclusive growth. Lee and Gordon (2005) have also shown that statutory corporate tax rates are significantly negatively correlated with cross-sectional differences in average economic growth rates. Finally, the results of our empirical model show that state debts significantly reduce inclusive growth in the sampled countries. This result is in line with that of Olaoye (2022), according to which public debt above a certain threshold inhibits inclusive growth in Sub-Saharan Africa. If economic growth is debt-induced, more money will be spent on servicing public debt, thus depriving governments of funds for critical intervention programmes.

4.2. Robustness check

We test the robustness of the results by changing the estimation technique and homogenising the panel by continental zone.

i. Change in estimation technique

We test robustness by taking into account a major alternative technique, the quantile regression (QR) method. In efficiency wage theory, as in other classical economic theories, the QR method is used to capture the difference in wages between individuals based on certain specific parameters such as seniority, job, age, time spent at work, gender, among others, which can give rise to endogeneity bias. This bias is called simultaneity bias. With respect to our study, the calculation of the complexity index may take into account diversification variables used in the calculation of the IGQI (Inclusive Growth Quality Index). However, to solve this problem, Haultfoeuille and Givord (2014) show that

quantiles can correct for this bias. In the same vein, Canay (2011) shows that the quantile model solves the endogeneity problem given that, in the context of a panel, this technique allows correlations between independent variables and unobservable individual factors, if and only if these individual factors are stable over time. Unlike the OLS technique, which estimates the mean of the observations, the quantile method attempts to assess how the conditional quantiles of the dependent variable vary as a function of the explanatory variables (Li, 2015). This avoids the risk of providing biased information. In addition to the fact that quantiles allow the empirical evaluation of public policies, Koenker and Bassett (1978; 1982) demonstrate that a quantile of order q results from a loss minimisation situation adopted in decision theory. We therefore specify the theoretical model as follows:

$$Q_{Y_i}\left(\delta / X_1 = x_{1i}, \dots, X_q = x_{qi}\right) = \beta_0(\delta) + \beta_1(\delta)x_{1i} + \cdots + \alpha_q(\delta)x_{qi} + \varepsilon_i(\delta) \tag{6}$$

This equation is valid under the null hypothesis such that the i-th conditional quantile of the error term:

$$Q_{\varepsilon_i}\left(\delta / X_1 = x_{1i}, \dots, X_q = x_{qi}\right) = 0, \tag{7}$$

where θ, (0 < θ <1), is the quantile of order i, Y_i is the dependent variable, x_{ji} is the conditional mean of the independent variable, $\varepsilon_i(\delta)$ are the error terms *iid* and the β_j are the parameters to be estimated. In matrix form, (2) becomes:

$$Y = X'\beta_\delta + \varepsilon_\delta \tag{8}$$

The empirical equation for this study is as follows:

$$IGQI_i = \beta_0(\delta) + \beta_1(\delta)ECI_i + \beta_{p-1}(\delta)\sum_{i=2}^{p-1} X_{q-1,i} + \varepsilon_i(\delta)\,, \tag{9}$$

where IGQI complies with the calculation standards specified above. This calculation by the authors uses data from the World Bank (2023), the UNCTAD (2023), and the World Global Health Expenditure (WHO, 2023).

Table 7: Robustness results with alternative technique

	Regression technique: Quantile			Dependent variable: IGQI		
Variables	Q10	Q20	Q30	Q50	Q80	Q90
ECI	0.019***	0.010**	0.005*	0.001	-0.001	0.006
	(0.006)	(0.004)	(0.003)	(0.003)	(0.003)	(0.005)
Inflation	-0.002	-0.006*	-0.005***	-0.001	0.005*	0.013***
	(0.005)	(0.003)	(0.002)	(0.002)	(0.003)	(0.005)
Government expenditures	-0.012*	-0.009*	-0.009**	-0.007*	-0.002**	-0.008***
	(0.012)	(0.005)	(0.005)	(0.004)	(0.006)	(0.011)
FDI	-0.003	-0.001	-0.001	0.000	0.001	0.002
	(0.004)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)
Entrepreneurship	0.008**	0.012***	0.014***	0.015***	0.006***	0.010**
	(0.007)	(0.004)	(0.002)	(0.003)	(0.004)	(0.005)
Tax revenue	-0.002	-0.000	-0.001**	-0.001*	-0.001***	-0.002***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Debt	-0.001	-0.001**	-0.001***	-0.001***	-0.001***	-0.001**
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Constant	0.294***	0.264***	0.276***	0.263***	0.291***	0.304***
	(0.055)	(0.023)	(0.017)	(0.021)	(0.025)	(0.037)
Observations	234	234	234	234	234	234
R-squared	0.137	0.110	0.135	0.151	0.125	0.119

Source: Authors.

Notes: Authors' estimates. Robust standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$.

Beyond the 2SLS method, the QR results further confirm the positive effect of economic complexity on inclusive growth (Table 7). Across certain quantiles, there is a positive and significant relationship between economic complexity and inclusive growth in developing countries. This suggests that as more goods are produced against a backdrop of advanced technology, the resulting increased growth involves a larger number of individuals, is more diversified, and promotes human capital even more.

Thus, the 10th, 20th, and 30th percentiles make it possible to highlight the intrinsic dynamics of the overall positive effect of the ECI on the IGQI. These results provide strong evidence that economic complexity is an important factor in implementing a policy to achieve inclusive growth in developing countries. Indeed, economic complexity is more likely to lead to growth, but also to involve the largest number of individuals in the process. These results have important implications for policies based on the quality of growth and development in developing countries. Developing countries seeking to achieve more inclusive growth may consider defining alternative production techniques that take into account greater input sophistication.

However, the 50th, 80th, and 90th percentiles do not reveal any significant effect. At the median (50th percentile), economic complexity is associated with a 0.001 increase in the index of inclusive growth, although this is not a decisive factor for such growth. At the 80th percentile, economic complexity tends to reduce inclusive growth, although this is not a determining factor in achieving inclusive growth. At the 90th percentile, the relationship between economic complexity and inclusive growth is positive but not significant.

In addition to the QR method, we use the Tobit method to correct for potential selection bias. Furthermore, the Poisson and negative binomial models are used to overcome the problems related to truncation in the context of the limited dependent variable. The values of the IGQI in our sample lie within the interval [0, 10]. As no observations fall outside this interval, no data points are systematically excluded, ensuring there is no risk of any information contained in the variables being deleted. Moreover, precautions have been taken to avoid any systematic exclusion of relevant observations. Consequently, the results

obtained in Table 8 (with and without censoring) remain consistent with the results of the 2SLS method.

Table 8: Robustness results with alternative technique

	Dependent variable: IGQI		
VARIABLES	Tobit	Poisson	Negbin
ECI	0.006**	0.023**	0.023**
	(0.003)	(0.010)	(0.010)
Inflation	-0.002**	-0.006**	-0.006**
	(0.002)	(0.009)	(0.009)
Government expenditures	-0.007	-0.028*	-0.027*
	(0.005)	(0.014)	(0.014)
FDI	-0.001	-0.003	-0.004
	(0.002)	(0.008)	(0.008)
Entrepreneurship	0.011***	0.045***	0.045***
	(0.003)	(0.010)	(0.011)
Tax revenue	-0.001***	-0.003***	-0.003***
	(0.000)	(0.001)	(0.001)
Debt	-0.001***	-0.005***	-0.005***
	(0.0004)	(0.001)	(0.001)
Constant	0.282***	-1.273***	-1.274***
	(0.018)	(0.059)	(0.064)
Observations	234	234	234
Pseudo R / α	-0.034		-12.18

Source: Authors.
Notes: Authors' estimates. Robust standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$.

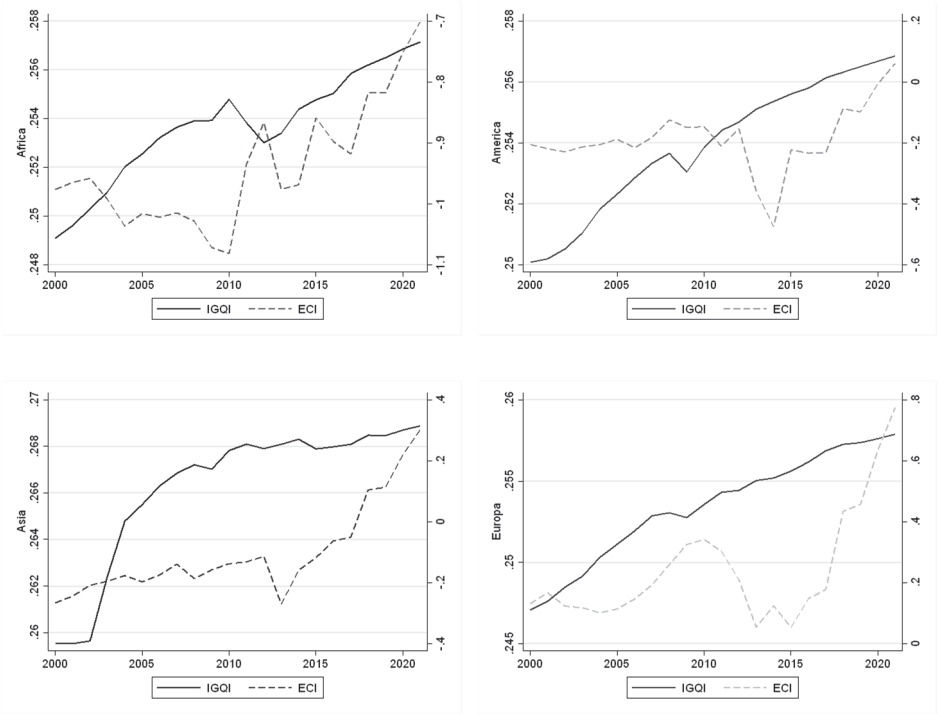
ii. Homogenisation of our panel by continental zone

- **Trends by regional area**

Figure 6 shows the general trends in the inclusiveness of growth. Overall, growth inclusiveness has increased considerably relative to economic complexity over the study period, although the pace of this growth differs from one continent to another. Although we can see that the complexity index is higher than that of inclusive growth, this trend reverses very quickly in 2003 in Africa and Asia but

is maintained for longer in America until 2010. This overshadowing of inclusive growth by economic complexity may be due to the structural transformation of economies. Indeed, if the evolution of employment shares by sector of activity is stagnant relative to the productive structure of the economy, it goes without saying that economic growth will be less inclusive. A country such as China, which has embarked on a process of accelerated convergence, will see the share of agricultural employment shift back towards high-tech production, which is therefore more complex and sophisticated.

Figure 6: Trends in ECI and IGQI by region



Source: Authors.

- **Results by regional area**

Table 9 shows the homogenised results by continent, using Lewbel's 2SLS estimation technique. Economic complexity has a positive effect on inclusive growth in Africa, America, Asia, and Europe. This means that a 1% increase in

the sophistication of trade implies an increase of 2.5%, 3.9%, and 0.8% in inclusive growth in Africa, America, and Asia, respectively, according to each regression. This result, which corroborates our basic findings, confirms the literature on the relationship between economic complexity and economic growth (Chavez et al., 2017; Domini, 2019; Hidalgo, 2021; Hidalgo & Hausmann, 2009; Ourens, 2012; Poncet & de Waldemar, 2013; Stojkoski, 2016; Tacchella et al., 2018). Indeed, economic complexity promotes well-being, economic stability, and diversification, which are key components of inclusive growth (Fig.1). Consequently, the sacrifice ratio of a structural transformation is reduced when it is based on the quantity of productive knowledge that a society mobilises. This contributes to the satisfaction of all individuals, but also generates this satisfaction through collective contribution. This ultimately has a positive influence on overall economic development. However, our results show that economic complexity has a significant negative influence on inclusive growth in Europe. Thus, a 1% increase in inclusive growth leads to a 2.6% decrease. This result can be justified by the fact that Europe is the most developed continent in the world, which is why the effect of geographical proximity between countries forces even developing countries to converge towards a continental standard of development. As a result, there are fewer problems linked to insufficient employment opportunities, for example, and a social security system that is relatively more competitive than that of the rest of our sample. In fact, the poverty line in Europe is between €2,889 and €13,700 (INSEE, 2023). This implies that extreme poverty is in the process of being eliminated throughout Europe. Therefore, the determinants of the quality of inclusive growth in Europe need to be examined from perspectives other than economic complexity. Factors such as violence and crime, or various forms of segregation may instead act as barriers to economic growth in the region.

Table 9: Robustness results with homogeneity by regional area: Estimation by Lewbel method (2SLS)

	Dependent variable: IGQI							
	Africa		America		Asia		Europa	
Variables	1	2	1	2	1	2	1	2
ECI	0.034**	0.025*	0.021***	0.039***	0.013*	0.008*	0.037**	-0.026***
	(0.015)	(0.014)	(0.008)	(0.012)	(0.008)	(0.004)	(0.019)	(0.005)
Inflation		-0.012***		0.008		-0.001**		-0.001***
		(0.004)		(0.005)		(0.002)		(0.004)
Government expenditures		-0.003		-0.021		-0.007		0.040**
		(0.007)		(0.020)		(0.005)		(0.002)
FDI		-0.006***		0.002**		0.007***		-0.014**
		(0.004)		(0.004)		(0.002)		(0.006)
Entrepreneurship		0.027**		0.030*		0.011***		0.034***
		(0.013)		(0.018)		(0.002)		(0.001)
Tax revenue		-0.001**		-0.001***		-0.001*		-0.001***
		(0.001)		(0.001)		(0.000)		(0.001)
Debt		-0.003		-0.003***		0.000		0.003*
		(0.003)		(0.001)		(0.000)		(0.001)
Constant	0.286***	0.278**	0.257***	0.265***	0.266***	0.249***	0.244***	0.192***
	(0.015)	(0.110)	(0.004)	(0.077)	(0.003)	(0.018)	(0.018)	(0.063)
Observations	84	70	64	62	84	74	24	24
R-squared	-0.542	0.168	0.127	0.357	-0.218	0.471	-1.978	0.867
Sargan	0.009	11.86	5.864	27.71	26.00	10.71	0.743	17.89
Sargan-Hansen statistic		5.049*		19.91***		2.238		2.864*
F-statistic	4.914	3.126	6.598	3.780	2.820	8.421	0.489	15.04

Source: Authors.

Notes: Results based on 2SLS regressions of Equation (1). Robust standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. At the 1% threshold, the probability of rejecting the null hypothesis is validated. The results of the Sargan tests for the different estimates validate the instruments selected.

5. CONCLUSION AND POLICY RECOMMENDATIONS

Earlier contributions have tended to regard equity as an obstacle to or a result of growth, while recent contributions have shifted towards looking at growth and inequality jointly under the concept of inclusive growth. In this article, we propose an empirical analysis of the effect of economic complexity on inclusive growth in developing countries. By applying the two-stage least squares approach to a sample of 68 countries from 2000 to 2021, We show that economic sophistication positively and significantly affects inclusive growth in developing countries. In addition, regional specifications suggest that economic complexity has a positive effect on inclusive growth in Africa, America, Asia, and Europe. These findings align with the emerging consensus that economic complexity is essential for inclusive growth (Akobeng, 2016; Alekhina and Ganelli, 2020; Anand et al., 2013). The positive effect of economic complexity on inclusive growth underscores the importance of policies that promote economic diversification and sophistication in developing economies. As highlighted by Aghion et al. (2021), fostering competition, innovation, and inclusive growth through targeted interventions such as progressive taxation and social safety nets is crucial for achieving sustainable and equitable development. Our study adds to the existing literature by providing empirical evidence of the link between economic complexity and inclusive growth, offering valuable insights for policymakers and stakeholders seeking to design effective strategies for promoting economic prosperity that benefits all segments of society.

To this end, we recommend that policymakers should focus on promoting economic diversification and sophistication to enhance inclusive growth in developing countries. This can be achieved through targeted investments in education, technology, and innovation to facilitate the production of complex goods and services. Developing countries should also strive to improve their competitive advantage by investing in high-technology products and fostering a conducive environment for innovation and entrepreneurship that can lead to increased wealth generation and higher incomes, contributing to inclusive growth. To ensure that the benefits of economic complexity are shared equitably, policies should be implemented to address income inequality and ensure that marginalised groups have access to opportunities for economic advancement.

This study has two main weaknesses. First, our study did not include natural resource endowment as a control variable, given the characteristics of our sample of developing countries; second, this study performs analyses at the global level without accounting for country-specific dynamics, thereby failing to provide tailored recommendations. However, future studies can overcome this gap by being more country specific. The main advantage of such an approach is that it can better reflect individual countries' needs.

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APPENDIX A: DEFINITION OF VARIABLES

Variables	Description	Sources
Inclusive growth	Index generated from the CPA following the fundamentals (economic and social dimensions) of inclusive growth by Mlachila et al. (2014).	World Bank (2023) UNCTAD (2023)
Inflation	Level of inflation relative to GDP	World Bank (2023)
Foreign direct investment	Inward FDI flows as a proportion of GDP.	World Bank (2023)
Government expenditures	General government final consumption expenditure (formerly general government consumption)	World Bank (2023)
Entrepreneurship	Contributing family workers and own-account workers are the most vulnerable	World Bank (2023)
Tax revenue	Compulsory transfers to the central government for public purposes.	World Bank (2023)
Debt	Sum of principal repayments and interest actually paid in currency	World Bank (2023)
Economic complexity	Index variable calculated by Economic Complexity Observatory, defined by Hidalgo and Hausmann et al. (2014)	Observatory of Economic Complexity (2023)

Source: Authors

APPENDIX B: LIST OF COUNTRIES

All countries: *Albania, Algeria, Argentina, Bolivia, Brazil, Bulgaria, Cambodia, Cameroon, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Ghana, Guatemala, Guinea, Honduras, Hong Kong, India, Indonesia, Iran, Jamaica, Jordan, Kenya, Kuwait, Lao, Lebanon, Madagascar, Malaysia, Mexico, Mongolia, Morocco, Mozambique, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Paraguay, The Philippines, Poland, Qatar, Republic of the Congo, Romania, Saudi Arabia, Senegal, Singapore, South Africa, Sri Lanka, Sudan, Syria, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Vietnam, Yemen, Zambia, Zimbabwe.*

Africa*: Algeria, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Morocco, Mozambique, Niger, Nigeria, Republic of the Congo, Senegal, South Africa, Tanzania, Togo, Tunisia, Zambia, Zimbabwe.*

America*: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay.*

Asia*: Cambodia, China, Hong Kong, India, Indonesia, Kuwait, Lao, Lebanon, Malaysia, Mongolia, Oman, Pakistan, The Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Syria, Thailand, Trinidad and Tobago, Vietnam, Yemen.*

Europa *: Albania, Bulgaria, Iran, Jordan, Poland, Romania, Turkey.*

Source: Authors, from IMF classification

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AGGREGATE CONSUMPTION FUNCTION BASED ON KEYNES' ABSOLUTE INCOME HYPOTHESIS: EVIDENCE FROM BANGLADESH

ABSTRACT: *This paper examines the short-term and long-term relationship between disposable income and consumption to evaluate the Keynesian absolute income hypothesis (AIH) for Bangladesh. Data from 1974 to 2021 were sourced from the WDI and the Policy Research Institute of Bangladesh. The OLS model, which segments the period into different parts as well as the entire timeframe, provides evidence supporting Keynesian AIH. Additionally, error correction models were used to analyze the relationship between disposable income and consumption. The negative and significant error correction coefficient indicates that the marginal propensity to consume (MPC) adjusts toward its long-run level even though it fluctuates in the short run. The pairwise Granger causality test was performed, and a bidirectional relationship between consumption and income was found. Various diagnostic tests were conducted to verify the robustness of the results, which strongly support the AIH for Bangladesh. Based on these findings, several policy recommendations are proposed for implementation by governments to help strengthen the economies of developing countries such as Bangladesh.*

KEY WORDS: *Keynesian absolute income hypothesis, marginal propensity to consume, error correction model*

JEL CLASSIFICATION: E20, E21, E22

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1. INTRODUCTION

Decisions related to saving and consumption are fundamental to macroeconomic analysis, both in the short term and the long term. Consumption expenditure is the largest component of aggregate demand in an economy, accounting for roughly 50 to 70 per cent of GDP (Froyen, 2013; Muellbauer & Lattimore, 1999). Some economists, such as Keynes, believed that the level of consumption depended on disposable income. Disposable income is calculated by subtracting net taxes from national income. Keynes argued that consumption was the main factor influencing income, though he acknowledged that other variables also played a role. In initial calculations, these additional factors could be ignored. Nevertheless, the consumption-income relationship remains a core element of the Keynesian theory of income determination.

The Keynesian consumption function does not exhibit a directly proportional relationship between consumption and income. It shows that consumption is not a fixed fraction of disposable income. The ratio of consumption to income is called the average propensity to consume (APC). As income rises, the APC decreases. This indicates that consumers tend to save a larger share of their income. Conversely, the ratio of savings to income is known as the average propensity to save (APS). It is assumed that if consumption increases less proportionally than disposable income, then the APC falls while the APS increases. Therefore, wealthier families tend to consume a smaller proportion of their income, and the APS tends to rise with income. This phenomenon may lead to two different outcomes. First, as the APS increases with income, aggregate demand may fall short of total output. Savings act as a leakage from the circular flow of income and expenditure, resulting in insufficient demand to match supply. This can lead to unemployment and eventually hinder economic growth (Hansen, 2018). Alternatively, savings can be channelled into the economy as credit. Access to credit plays a vital role in promoting new investments and increasing overall capacity utilisation of capital stock, thereby boosting the growth rate (Fry, 1980). Furthermore, economic activities are interconnected; higher consumption encourages more production, investment, and employment, ultimately supporting economic expansion (Radulescu et al., 2019). The habits of thrift, expenditure, and consumption at any given income level tend to be stable; thus, changes in current income lead to relatively consistent shifts in total consumption and savings (Ezekiel, 1942). Evidence shows a significant

correlation between savings and investment, both in time series and cross-country data (Gutierrez & Solimano, 2007). Ultimately, this process can promote economic development (Agrawal, 2001).

Bangladesh's economic growth rate over the past three decades has been among the highest globally, averaging 4.0% per year. Despite political crises and natural disasters, growth rates have consistently increased since 1971. The COVID-19 pandemic had minimal impact, and economic losses were smaller than those in comparable countries. Bangladesh's remarkable long-term development and steady GDP growth can be attributed to its high living standards and improved social and health outcomes (Beyer & Wacker, 2024). Therefore, this study aims to estimate the national consumption function, generally based on Keynesian consumption theory, to determine whether it is a key source of investment, for example, through savings. Then, it aims to estimate the values of APC and APS in both the short and long term. Lastly, the marginal propensity to consume (MPC), which measures the increase in consumption per unit increase in disposable income, is to be analysed in both the short and long run. It is evident that in some countries, the changes in consumption and income move in opposite directions. In others, consumption and income change in the same direction, with consumption changes exceeding income changes (Ackley, 1961). Evidence from short-term annual time series data appears to support the Keynesian hypothesis regarding consumption. This study provides additional evidence on the same issue, which can assist both national and international policymakers in developing effective policies for the country.

There is strong evidence supporting the idea that saving and growth have a dynamic rather than a static relationship: saving rates usually increase in countries experiencing extended periods of economic expansion, while they tend to decrease in countries facing prolonged economic downturns (Carroll, 2006). Therefore, understanding a country's consumption behaviour is crucial for analysing economic activities. Since economic activities are interconnected, higher consumption leads to increased production, investment, and employment, which drive economic progress. This study examined consumption behaviour based on national consumption and income data from 1974 to 2021. This dataset covers the entire period since the country's inception. By dividing the dataset into different periods, the relationships between income and consumption were

estimated using the ordinary least squares (OLS) method. Additionally, time series techniques were employed to assess whether these relationships are reliable. The study's findings are important for economic growth and stability. It uncovers how changes in income influence spending patterns, which in turn affect aggregate demand, the business cycle, and overall economic well-being. Thus, understanding this relationship assists economists and policymakers in predicting economic cycles and implementing measures to manage them effectively.

The study is organised as follows: Section 2 presents a brief review of the existing literature. Section 3 presents data and underlying methodology. Section 4 provides the estimated results and discussion. Section 5 concludes the study and offers some policy options.

2. LITERATURE REVIEW

Consumption theory is essential for economists and policymakers to understand consumer behaviour and make informed policy decisions. This theory became prominent through the work of Keynes. According to Keynes' absolute income hypothesis (AIH), consumption depends on absolute or current income. Keynes states that consumption increases as income rises, but at a rate less than income, indicating that the MPC is between 0 and 1, as individuals divide their income between consumption and savings. Additionally, the APC decreases as income increases. Keynes argued that as income rises, the APC decreases, but empirical studies show this is only true in the short run, while in the long run the APC remains constant. Kuznets (1942) analysed long-term time series data for the USA and found that although AIH holds in the short run, in the long run, MPC equals APC. To address the consumption puzzle, new theories such as the life-cycle hypothesis and the permanent income hypothesis were developed (Froyen, 2013).

Duesenberry (1949) developed the relative income hypothesis (RIH), which states that consumption depends on relative income, not current income. According to the RIH, individuals' consumption levels depend on the environment they belong to; they observe their surroundings and plan their consumption based on their relative income. Individuals live in the same community; if the community's income rises, their consumption remains unchanged since their relative income

stays the same. Although absolute income increases, actual consumption does not increase, as Keynes notes, with the result that the APC remains constant in the long run. However, there is another reason why the APC remains constant over time. According to Duesenberry, when individuals are used to maintaining a certain consumption level, they cannot cut their consumption when their absolute income falls. Therefore, in the long run, APC does not decline as income rises. This is known as the ratchet effect (Duesenberry, 1949).

Modigliani and Brumberg (1954) proposed another consumption theory, the life-cycle hypothesis (LCH), to solve the Kuznets consumption puzzle. Unlike the RIH, the LCH states that consumption relies on expected lifetime income. Households plan their consumption based on their expected lifetime income, and their lifetime income also depends on how much they spend or save today. Under the LCH, individuals dissave or borrow during the early stages of life, they save more when they earn, and then they draw on their savings to sustain their consumption level. Consequently, in the long run, income rises along with wealth, and thus, the APC remains constant in this period. Later, Friedman (1957, pp. 20–37) developed the concept of permanent income, further advancing consumption theory. According to the permanent income hypothesis (PIH), consumption is a function of permanent income, and measured income consists of permanent income and transitory income; therefore, measured consumption is likewise a function of permanent consumption and transitory consumption.

The consumption function has long been one of the most widely analysed relationships in aggregate spending and has played a key role in the development of all macroeconometric models (Muellbauer & Lattimore, 1999). Ofwona (2013) investigated the link between income and household consumption in Kenya from 1992 to 2011. He used Keynes' AIH to analyse how income affects consumption expenditure. The model was tested with OLS, and the results showed that income significantly impacts consumption in Kenya, supporting the AIH's validity in this context. The same theory was examined by testing three hypotheses through a survey of students at the University of the Punjab. A randomly chosen department participated in the survey. The findings support two of Keynes' postulates: first, the MPC among students is 0.778, which falls within the range of 0 to 1 and aligns with Keynes' theory. Second, the APC decreases as income rises, from 0.88 to 0.83, indicating a reduction in consumption relative to income. The

study also found that students have an autonomous consumption of about 456 rupees, representing necessary fixed expenses (Amin, 2015).

Ibbih and Peter (2018) conducted a study using cross-sectional data to examine long-term relationships between current consumption, disposable income, lagged incomes, and other relevant variables. Their findings show that consumption is affected not only by current income but also by past consumption patterns. Both first and second lagged consumption values significantly predict current consumption, with lagged consumption having a stronger influence than lagged income. This indicates that individuals are more affected by their past consumption habits than by previous earnings, emphasising a tendency to maintain established consumption patterns over time (Ibbih & Peter, 2018). Using data from 1970 to 2016, Liaqat et al. (2018) analysed the AIH and the PIH in China. Their results demonstrate that changes in expected income significantly influence the expansion of real private consumption. However, the proportion of forward-looking households was found to be smaller than that of backward-looking households. The study dismisses the validity of the PIH but affirms the robustness of the AIH in China. Tekin (2018) estimated the Keynesian AIH using panel data from developing countries. The findings indicate that current income levels significantly impact consumption expenditures, confirming the validity of the Keynesian consumption function. Both the MPC and the APC declined in low- to upper-middle-income countries.

Khan et al. (2015) used annual data from 1971 to 2013 for countries in the South Asian Association for Regional Cooperation (SAARC) to estimate the consumption function. The empirical result suggests that the AIH is valid for these countries in the short run but not in the long run, as the MPCs were higher under the AIH but comparatively lower under the PIH. However, the smaller values of the MPC in the short run suggest consumers cannot anticipate future income in developing countries.

Alimi (2013) examines how income determines consumption expenditure in Nigeria using Keynes' AIH. He presents a consumption function for the period 1970 to 2011, estimating total household consumption expenditure against total income. The study tested two key predictions: the constant MPC and the decline of the APC as income increases. The results show the MPC conforms to Keynes'

proposition but is not stable in the long run. The income elasticity of consumption does not follow Keynes' prediction.

Khan et al. (2024) analyse the consumption function in four Central Asian economies from 1993 to 2020. Their results indicate that income significantly affects consumption in both the short and long term, supporting the Keynesian AIH and Friedman's PIH. However, Uzbekistan's coefficient exceeds one, which conflicts with the typical consumption function. Policy measures aimed at increasing savings and investment are necessary to promote economic growth. Similarly, a study by Mohammed (2020) examined consumption data from selected African countries between 1985 and 2015 to test the AIH and the RIH. The findings are particularly interesting, as in Nigeria, both hypotheses are partially valid, but relative consumption is inversely related to relative income. Khan (2014) tested the RIH for northern Pakistan, and the results support its validity in that region.

Iheonu and Nwachukwu (2020) examined household consumption in West Africa from 1989 to 2018 using the AMG estimation procedure. Their results show inflation negatively impacts consumption, while GDP per capita, personal remittances, exchange rate, and domestic credit to the private sector positively influence it. The study recommends policy changes to improve household consumption, including implementing long-term education plans and improving domestic credit to the private sector. Monetary authorities should also provide additional funds to financial institutions to increase their credit base. Using time series data, Amin (2011) examines the dynamic relationship between consumption expenditure and output in Bangladesh. His study finds a long-term cointegrating relationship between final consumption expenditure and economic growth by utilising ADF and PP unit root tests, along with Johansen and ARDL cointegration and Granger causality techniques. The Granger causality test reveals a long-run unidirectional causal relationship from economic growth to final consumption expenditure. Wagner's hypothesis is supported by time series data, suggesting that consumption is the result rather than the cause of growth. However, the study faces challenges such as data inconsistency, classification of expenditure categories, and omitted factors affecting the growth process. The productivity of different types of expenditures can be assessed based on their impact on private investments, private incomes, and consumption.

Numerous studies have examined the Keynesian AIH and found empirical support for its validity. The evidence has been provided using time series, panel, and household survey data. However, most of this evidence is from individual countries, multiple countries, or regions. As a developing country, Bangladesh has received little attention in terms of the assessment of the Keynesian AIH. As the country is growing, different measures are being taken to accelerate growth and retain stability. Thus, this study aims to estimate the AIH for Bangladesh. The findings will guide policymakers and academics to formulate and choose a suitable policy. Most of the literature uses GDP and GNI as a proxy for income, whereas this paper uses disposable income as the independent variable to achieve the most efficient results.

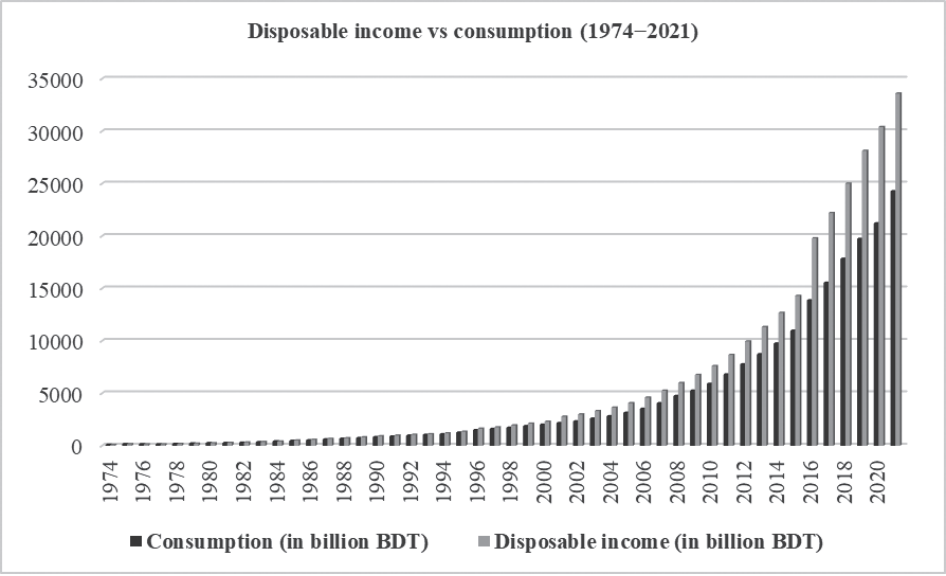
3. DATA AND METHODS

This study aims to estimate the Keynesian consumption function, focusing on the AHI, using time series data for Bangladesh. Disposable income serves as the independent variable, while consumption is the dependent variable. The secondary data were obtained from the World Development Indicator (WB, 2025) for the period from 1974 to 2021. Disposable income (Yd) and household consumption (Con) were then derived from these data. To calculate Yd, we subtracted tax revenue from GDP and added subsidies and other transfers (Mankiw, 2018). Similarly, for consumption, we deducted general government final consumption from total final consumption expenditure since it represents government consumption rather than that of consumers or non-profit households. The data on disposable income and consumption used in this paper are in the local currency units, Bangladeshi taka (BDT), which are nominal in nature. Since tax and transfer data were not available in the local currency units from the WDI from 1974 to 2000, we used tax rates collected from the PRI to estimate income tax from GDP and determine disposable income.

Over the years, consumption expenditure has increased at a slower rate than income, as shown in Figure 1. This trend reflects consumer saving behaviour. As income grows, consumers tend to save more. Higher savings can lead to more funds available for investment through financial markets. However, investment also depends on interest rates, business confidence, and expected returns. If savings increase but there is little desire to invest, it can result in a demand shortfall, a situation that may trigger a recession. Saving does not always

correspond to domestic investment, because capital can flow in or out of the country. Nevertheless, increased savings can fuel investment, which drives growth, but only to a certain extent. Long-term growth also relies on technology, education, and institutions (Mokyr, 2005).

Figure 1: Disposable income vs. consumption expenditure



Based on the AIH postulated by Keynes, the consumption function is $C = a + bYd$, where C is he level of consumption expenditure; a is autonomous consumption expenditure, which is not dependent on income Yd; b is the MPC; and Yd is current disposable income. Therefore, the linear econometric model is expressed as follows:

$$C_t = \beta_0 + \beta_1 Yd_t + u_t \quad (1)$$

where u_t are residuals. After the OLS estimation, Equation 1 is transformed into logarithms, as shown in Equation 2, to simplify the calculation and better model performance (Blinder et al., 1985).

$$lnC_t = \beta_0 + \beta_1 lnYd_t + u_t \quad (2)$$

As the data represent time series, unit root tests are required to check the stationarity of the variables. We used the commonly employed Augmented Dickey–Fuller test (ADF) and the Phillips–Perron (PP) test to check for stationarity (Dickey & Fuller, 1979; Phillips & Perron, 1988). Since the variables were stationary at the first difference, the Engle–Granger residual-based cointegration technique was used to assess the long-run relationship between disposable income and consumption (Gregory & Hansen, 1996). Once cointegration was confirmed, we employed the OLS method to estimate the relationship between disposable income and consumption. Subsequently, the stationarity of the residuals was checked. Based on the unit root result of the residuals, the error correction model (ECM) was utilised to analyse the short-run dynamics between consumption and disposable income. Additionally, this ECM helps to determine the speed of adjustment toward the long-run equilibrium when a structural break occurs (Johansen, 1991). The pairwise Granger causality test was performed to examine the bidirectional causality as suggested by Granger (1969). Lastly, to ensure the model's robustness, we applied various diagnostic tests, such as the Breusch–Pagan test for heteroscedasticity (Breusch & Pagan, 1979), and the Breusch–Godfrey LM test for autocorrelation (Breusch, 1978; Godfrey, 1978). The Engle–Granger technique and the ECM analysed both short-run and long-run relationships between disposable income and consumption (Engle & Granger, 1987). However, this study had some limitations. Due to unavailability of data, disposable income was derived using two different methods for two different periods: from 1974 to 2000 and from 2001 to 2021. Additionally, the model consists of only one independent variable, which may lead to unstable or inconsistent results. Furthermore, the residuals were not significantly normally distributed, which may affect the validity of the model used in this paper.

4. RESULTS AND DISCUSSION

This section presents and discusses the estimated results. Table 1 shows the statistical summary of consumption and disposable income. There are 48 observations in total, with average consumption close to 4,450 billion, and disposable income around 5,946 billion. This aligns with the expectations of consumption theory. The standard deviations for both variables are substantial, indicating notable variability around the mean. Based on the maximum and minimum values, consumption ranges from approximately 94.32 to 24,279

billion, and disposable income from 90.01 to 33,606.62 billion. Positive skewness values suggest that both variables are right skewed. Additionally, the kurtosis values are slightly below the normal distribution benchmark of 3, indicating a flatter distribution with lighter tails. In conclusion, despite the positive skewness and broad variability, the data are suitable for further statistical analysis.

Table 1: Descriptive statistics of targeted variables

Statistic	*Con*	*Yd*
Observations (*N*)	48	48
Mean	4,449.38	5,946.44
Median	1,668.01	1,859.45
Standard deviation	6,195.65	8,757.67
Minimum	94.32	90.01
Maximum	24,278.99	33,606.62
Skewness	1.84	1.91
Kurtosis	2.58	2.77

Note: Values for *Con* and *Yd* are expressed in billions of BDT.

The estimated results of the OLS for different time periods, such as 12 years, 24 years, and 48 years, are reported in Table 2. For the first twelve years, the estimated MPC is 0.90, indicating that each unit of incremental disposable income increases consumption by 0.90 units and savings by 0.10 units. Additionally, the APC is 0.98 during this period, suggesting that households averaged a consumption of 98 per cent of their income while saving the remainder. From 1986 to 1997, however, the MPC increased to 0.91 and the MPS declined to 0.09. This indicates that household consumption increased for each additional income compared to the previous decade, while savings decreased. However, the average consumption significantly decreased to 92 per cent compared to the previous decade. In the next period from 1998 to 2009 and from 2010 to 2021, the estimated MPC declined to 0.74 and to 0.67 respectively. During the longer period from 1998 to 2021 (23 years), the MPC showed a slight upward tendency compared to the previous periods, although it remained lower than the average MPC of the whole study period.

Table 2: OLS results at different periods and other estimates of Equation 1

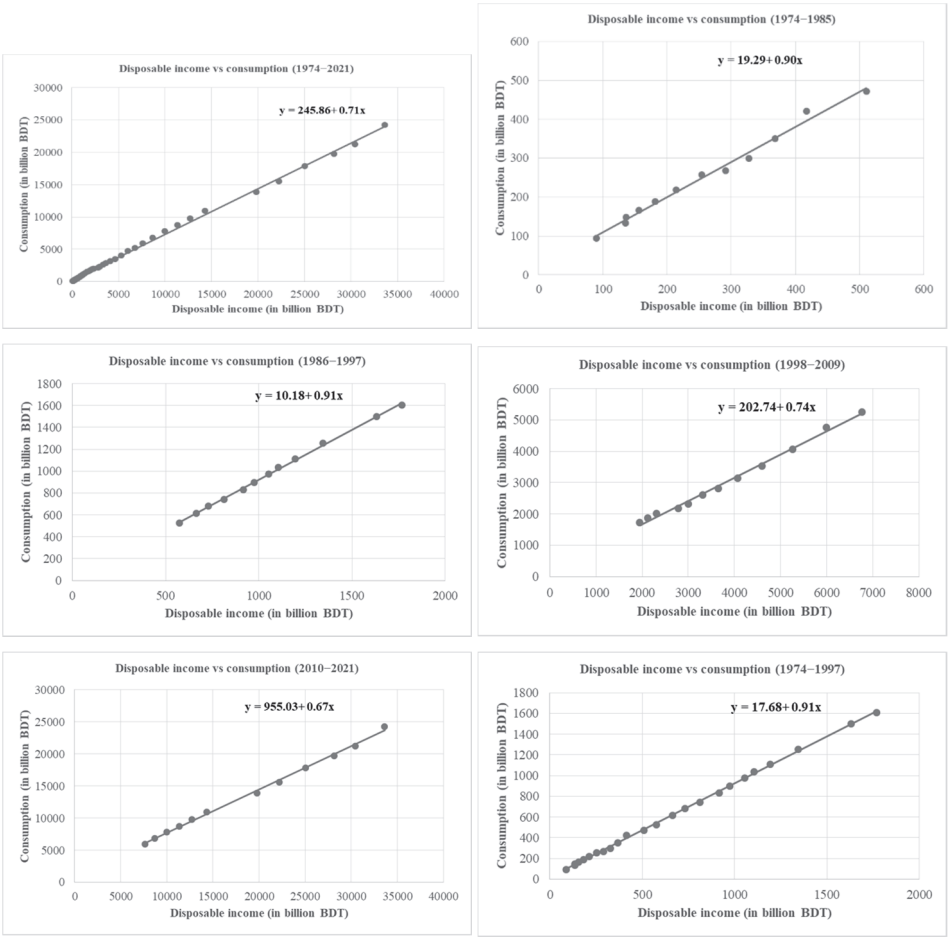
Period	Estimated results of OLS	R^2 value	MPC	MPS	Value of multiplier (1/MPS)	APC	APS
1974–1985	C_t= 19.29 + 0.90 Y_{dt}	0.990	0.90***	0.10	10	0.98	0.02
1986–1997	C_t= 10.18 + 0.91 Y_{dt}	0.999	0.91***	0.09	11.11	0.92	0.08
1998–2009	C_t= 202.74 + 0.74Y_{dt}	0.994	0.74***	0.26	3.85	0.79	0.21
2010–2021	C_t= 955.02 + 0.67Y_{dt}	0.997	0.67***	0.33	3.03	0.73	0.27
1974–1997	C_t= 17.68 + 0.91Y_{dt}	0.999	0.91***	0.09	11.11	0.93	0.07
1998–2021	C_t= 469.54 + 0.69Y_{dt}	0.998	0.69***	0.31	3.22	0.74	0.26
1974–2021	C_t= 245.86 + 0.71Y_{dt}	0.998	0.71***	0.29	3.45	0.75	0.25

Note: ***indicates significant at 1%, ** at 5%, and * at 10%. Autonomous consumption is measured in billions.

The multiplier's value is estimated based on the MPC or MPS, which indicate how much output changes when autonomous spending, such as investment, varies. This shows that changes in output can be greater than the changes in autonomous spending and helps explain why output fluctuates (Dornbusch et al., 2014). Larger multipliers are observed during the periods 1974–85 and 1986–97 in the short run, and for 1974–97 in the long run. The effect of the multiplier was largest in the first decade after independence, which is understandable since the country started utilising resources with the support of foreign countries and development agencies. In addition, rural and government transformation occurred during this period (Mudahar & Ahmed, 2010).

For the whole period, the estimated MPC is 0.71, which suggests that a one-unit increase in disposable income leads to a 0.71 increase in consumption. This value is within the range Keynes postulated ($0 < 0.71 < 1$). This result is significant at a one per cent level. Hence, we can reject the null hypothesis that there is no relationship between consumption and disposable income. Therefore, the model provides evidence of a long-run relationship between consumption and disposable income. Hence, Keynes' AIH holds for Bangladesh. Using the estimated MPC, the projected multiplier is about 3.45. This indicates that a unit increase in autonomous spending could lead to an increase in aggregate demand in the long run, assuming there is excess capacity in the economy. Estimated regression models based on the different time periods are shown in Figure 2.

Figure 2: Estimated regression lines for the different periods



The estimated results of Equation 2 are presented in Table 3. It shows that the consumption response to a change in disposable income is about 0.93.

Table 3: OLS estimated results of Equation 2

	$lnC_t = \beta_0 + \beta_1 lnYd_t + u_t$			
	Coefficient	Std. error	*t*-statistic	*p*
Constant	1.914	0.095	20.08	0.000
Y_{dt}	0.93	0.003	275.54	0.000
R^2	0.999	Observations	48	
F-statistic	75924	*p* (*F*-statistic)	0.000	

Using conventional least squares or similar techniques could lead to erroneous findings for non-stationary time series. In other words, regression test results can suggest that two uncorrelated variables have a significant relationship. The non-stationarity of the time series used in the regression model is the primary cause of this type of regression, known as a spurious regression. However, even if they may deviate from equilibrium in the short term, two or more variables can establish a long-term equilibrium connection. Engle and Granger (1987) developed the cointegration test method to examine the relationships between non-stationary variables due to these issues. Therefore, the first step in time series analysis is to check the stationarity of the variables. The results of the ADF and PP tests are presented in Table 4.

Table 4: Augmented Dickey–Fuller and Phillips–Perron unit root test results

Variable	Level or first difference	ADF unit root test statistic	PP unit root test statistic
lnCon	Level	-0.698	-0.832
ΔlnCon	First difference	-11.371***	-11.523***
lnYd	Level	-0.764	-0.943
ΔlnYd	First difference	-11.681***	-11.121***

Note: ***indicates significance at 1%, ** at 5%, and * at 10%.

With respect to the ADF tests, the *p*-values for two variables, *lnCon* and *lnYd*, are not statistically significant ($p > 0.05$), indicating that the null hypothesis of stationarity cannot be rejected. However, after taking the first difference, the *p*-values become statistically significant at the 1% significance level ($p < 0.01$), which allows us to reject the null hypothesis of stationarity. Therefore, both variables are stationary in first differences. Similarly, according to the Phillips–Perron unit

root test, both variables exhibit stationarity at the first difference ($p < 0.01$) at a 1% significance level. Table 5 shows the results of the ADF and PP tests for residuals, indicating that these series are stationary at the level, thus the error is I(0) ($p < 0.01$). This confirms the long-run cointegration between disposable income and consumption. We reject the null hypothesis that the least squares residuals are nonstationary and conclude that they are stationary. This implies that consumption and disposable income are cointegrated. In other words, there is a fundamental relationship between these two variables. The estimated regression is valid and not spurious (Hill et al., 2018).

Table 5: Stationarity test of the residual

Variable	Order of integration	ADF	PP
Residual	I(0)	-3.752***	-3.789***

Note: ***indicates significance at 1%.

The equation of the error correction model (ECM) is given as follows:

$$\Delta lnCon = \alpha_0 + \alpha_1 \Delta lnYd + \gamma \hat{e}_{t-1} + \mu_t,$$

where $\Delta lnCon$ is the percentage change in the consumption, α_0 is autonomous consumption, α_1 is elasticity, γ is the speed of adjustment, $\hat{e}_{(t-1)}$ is the error correction term, and μ is the white noise error term.

Table 6: Long-run regression results of Engle-Granger model

Dependent Variable: ($lnCon$)	Coefficient	Std. error	t-value	p-value
$lnYd$	0.93	0.003	275.54	0.000
Constant	1.91	0.095	20.08	0.000
$N = 48$, $R^2 = 0.999$, Adjusted $R^2 = 0.999$, $F(2,44) = 75924$, $p < 0.01$				

The results reported in Table 6 demonstrate that the response of consumption is 92 per cent due to an increase in income of 100 per cent. This result is significant at the one per cent level.

Table 7 shows the short-run results of the ECM Model. The coefficient of $\Delta lnYd$ is 0.938 ($0 < 0.938 < 1$), which is significant at the one per cent level. This suggests a positive short-run relationship between the change in consumption and

disposable income. The error correction term (ECT) is negative and significant, which shows the model adjusts toward the long-run equilibrium at a speed of 46.9 per cent per period after the short-term deviations shown in Table 7. The adjusted R^2 is 0.880, indicating a good fit to the data.

Table 7: Short-run results of error correction model

Variable	Coefficient	Std. error	*t*-value	*p*-value
$\Delta lnYd$	0.938	0.054	17.42	0.000
ECT	-0.469	0.130	-3.61	0.000
Constant	-0.0005	0.008	-0.06	0.953

Note: $\Delta lnCon = -0.0005 + 0.938\Delta lnYd + -0.469\, ECM_{t-1}$

In the short-run regression table (Table 7), the elasticity coefficient is 0.93, which suggests that a one-per-cent increase in disposable income leads to a 0.93 per-cent increase in consumption ($0 < 0.93 < 1$). The *p*-value is significant at one per cent level. Thus, we can reject the null hypothesis that there is no relationship between consumption and disposable income. Therefore, the model provides evidence of a long-run relationship between consumption and disposable income. Hence, Keynes' AIH holds for Bangladesh.

An ECT that is negative and less than one ensures the system is not explosive (Hill et al., 2018). This implies that an increase in disposable income will likely boost consumption, but it may take time to alter consumption patterns in response to a change in income. This finding has significant policy implications. Policymakers can utilise this finding for policy formulation: If they can restrict consumption and boost investment through increased savings, it will be possible to enhance economic growth.

There may be a bidirectional relationship between disposable income and consumption, as consumption can influence income through aggregate demand. Consequently, to test the bidirectional causality, the pairwise Granger causality test was performed (Granger, 1969). The estimated result reported in Table 8 confirms a bidirectional Granger causality between disposable income and consumption. This can be theoretically justified, as consumption largely depends on disposable income, and on the other hand, consumption may influence income through aggregate demand. In an economy, when consumption

increases, aggregate demand also increases. Therefore, firms start to increase their production to meet the higher demand, and consequently new investments take place (Froyen, 2013; Mankiw, 2018). This further generates income for new workers in the economy. Additionally, higher consumption generates higher taxes revenues for the government (Milesi-Ferretti & Roubini, 1998). The government can then spend more on various development projects, which in turn boosts income in the economy.

Table 8: Results of pairwise Granger causality tests

Pairwise Granger causality test	F-statistic	p-value
Yd → C	5.279	0.0264
C → Yd	14.873	0.0004

Source: Authors' estimation

Diagnostic tests

In time series modelling, diagnostic testing entails evaluating the fitted model to make sure it accurately depicts the observed data and to identify possible areas for development. To find trends or biases that can point to model misspecification, this procedure usually involves examining the residuals, or the discrepancies between the observed data and the model's predictions. Two post-diagnostic tests were conducted: the LM test for autocorrelation among residuals and the Breusch-Pagan test for examining heteroscedasticity. The diagnostic results are reported in Table 9. The LM test yielded a p-value of 0.84 (> 0.05), which indicates that we cannot reject the null hypothesis. Therefore, no autocorrelation is seen in the model. Similarly, the Breusch-Pagan test results indicate no heteroscedasticity in the model ($p > 0.05$).

Table 9: Diagnostic tests for model assumptions

Test	F -statistic	p-value	Conclusion
LM	0.174	0.84	Fail to reject H_0 (No autocorrelation)
Breusch–Pagan	1.434	0.25	Fail to reject H_0 (No heteroscedasticity)

5. CONCLUSION AND POLICY RECOMMENDATIONS

The purpose of this paper was to estimate and analyse the national consumption function based on Keynesian consumption theory to determine whether it is a key source of investment, for example, through savings, in both the short term and long term in Bangladesh, using annual time series data from 1974 to 2021. The estimated OLS models indicate the existence of the Keynesian AIH. This finding is consistent with previous studies such as Khan et al. (2024) covering Central Asian countries, Alimi (2013) focusing on Nigeria, and Khan et al. (2015) examining SAARC countries. The Engle-Granger model confirms the long-run relationship, while the error correction model illustrates the short-run dynamics between disposable income and consumption. Thus, as income increases, consumption also rises, but less than proportionally. Therefore, it can be concluded that the model is stable and that the absolute income hypothesis holds well for Bangladesh. This result implies that a part of any increase in disposable income will be saved instead of being completely spent on consumption. This relationship influences development prospects (Triantis, 1999). As consumption spending increases with disposable income at a slower rate, the share of income spent on consumption will decrease as disposable income rises, which could lead to slower economic growth. On the other hand, as economies develop and incomes rise, people might shift their spending patterns toward durable goods, services, or investments rather than just necessities (Black & Cusbert, 2010). This shift can further impact the relationship between income and consumption.

The existence of bidirectional Granger causality between disposable income and consumption is also theoretically justified. This finding implies that consumption may influence income through aggregate demand. Once consumption increases, the aggregate demand also increases. Therefore, firms start to increase their production to meet the higher demand, and then new investments take place (Froyen, 2013; Mankiw, 2018). Furthermore, higher consumption generates higher taxes revenues for the government (Milesi-Ferretti & Roubini, 1998). The government can then spend more on various development projects, which in turn boosts income in the economy.

The government can implement several policies to boost household spending and strengthen the economy. Adopting an expansionary fiscal policy could be especially beneficial. For a developing country such as Bangladesh, applying

progressive income taxes and offering subsidies to the agricultural sector can encourage consumption. Additionally, increasing government spending on infrastructure and development projects would generate jobs and lower unemployment. However, such measures might lead to higher interest rates, which can be offset by implementing expansionary monetary policies alongside fiscal expansion.

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FACTORS SHAPING WOMEN'S SAVING BEHAVIOUR FOR ECONOMIC ADVANCEMENT IN EMERGING NATIONS: A STUDY IN BANGLADESH

ABSTRACT: *This study investigates the factors influencing women's saving behaviour for economic advancement in developing countries. A total of 418 individuals aged 18 to over 50 years old from various demographic backgrounds in Bangladesh were included in the study. The data was processed and analysed with structural equation modelling using Smart PLS (version 4.1.0.3). This study concluded that financial inclusion, technology, and digital inclusion have a notable positive influence on the economic empowerment of women and, consequently, women's economic empowerment leads to the economic advancement of the nation. The study highlighted how the factors influencing women's saving habits are connected to the economic freedom of women and the reciprocal effect that is generated on the nation's economic development by dint of better decision-making, diverse investment options, resource allocation, and agency formation by women in general. Consequently, it is crucial to have strategies that focus on improving these factors and enforcing actions that promote gender equality and economic independence for women to unleash their potential as catalysts of sustainable economic development in developing countries.*

KEY WORDS: *women's saving behaviour, economic advancement, emerging nations, economic independence, sustainable economic development*

JEL CLASSIFICATION: D1, E2, I3, N2

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1. INTRODUCTION

The term emerging nations encompasses diverse countries experiencing rapid economic growth, industrialsation, and social transformations (Wu & Pan, 2021). In the rapidly evolving landscape of emerging nations, women's economic empowerment is gaining increasing recognition as a pivotal force for sustainable development (Kabeer, 2005). Within this transformative journey, a crucial dimension lies in understanding the influential factors that shape women's saving behaviour, directly influencing their pursuit of economic advancement (Razak & Ishwara, 2022). This study initiates a journey into unravelling the interconnections of diverse factors affecting the saving behaviour of women with their economic freedom in emerging nations.

To appreciate the significance of examining women's saving nature for economic advancement, it is imperative to contextualise the broader challenges and opportunities within emerging nations. Bangladesh is a testament to emerging countries' vitality in the present global scenario, showcasing a thriving economy and a burgeoning manufacturing sector (Hossain, 2021). These regions' economic landscapes are often characterised by volatility, diverse cultural contexts, and multifaceted social structures (Hossain, 2021). Against this backdrop, women are vital contributors to and beneficiaries of economic progress (Dhar, 2023). The significant role of Bangladeshi women in both family and economic aspects mirrors a broader trend observed in emerging nations (Anwary, 2017). Women, serving as primary caregivers, contribute to family well-being and manage household responsibilities, a pattern prevalent in many emerging economies, including Bangladesh (Zinia et al., 2022). Their substantial contribution to the ready-made garment industry aligns with the common theme of women actively participating in key economic sectors, enhancing export earnings, and fostering economic growth in emerging nations (Billah & Manik, 2017).

In emerging nations such as Bangladesh, several factors significantly impact women's saving behaviours, contributing to their economic progress (Yeasmin et al., 2023). The intricate interplay between cultural norms, financial literacy, and resource access significantly influences how women engage with saving initiatives (Kahn & Rahman, 2016). Understanding these influential factors is imperative for crafting targeted interventions that foster women's economic empowerment

and contribute to societal progress (Yeasmin et al., 2023). In Bangladesh, women's contributions to economic development are closely tied to their saving behaviour since savings act as a financial reservoir that empowers women to invest in education, entrepreneurship, and other avenues that catalyse economic growth (Goswami & Islam, 2019). Hence, it is crucial to acknowledge and thoroughly examine the significant factors that shape women's saving behaviour to advance the discussion on women's economic empowerment in such emerging countries as Bangladesh.

This study aims to empirically investigate and illuminate the multifaceted positive impact of financial inclusion on women's economic empowerment by analysing their access to and involvement in formal financial institutions, banking services, and investment opportunities. Furthermore, it examines the beneficial impact of technology and digital inclusion on women's economic empowerment, specifically focusing on the utilisation of digital platforms, skills in technology, and the availability of information and communication technologies (ICTs) among empowered women. Furthermore, the study investigates the overall impact of economic advancement on women's economic empowerment, considering its role in income generation, entrepreneurship, and broader economic development. By addressing these specific dimensions, this study provides a valuable understanding of how women's economic empowerment positively contributes to various aspects of the economic advancement of an emerging nation such as Bangladesh.

The study seeks to contribute valuable insights into the determinants of women's saving behaviour in the context of emerging economies. By analysing these factors, it attempts to deepen the understanding of the dynamics surrounding women's economic empowerment in emerging nations. The findings have implications for policymakers, practitioners, and scholars, assisting in creating specific interventions and policies that promote economic progress and financial inclusion for women. Ultimately, the study advances knowledge that might contribute to more effective strategies for promoting women's economic agency and societal progress in emerging nations.

2. LITERATURE REVIEW

2.1. Factors shaping women's saving behaviour

Every country's economic solvency and sustainability rely extensively on women's saving behaviour. Previously accumulated savings help to meet current or future unexpected financial adversities. While determinants such as income, access to credit, and family size positively impact the savings behaviour of women, a few determinants, namely age and education, yield an insignificant effect (Ayenew, 2014).

2.1.1. Inclusion in financial services

Since women are more prone to saving on a precautionary basis to avert uncertainties, financial inclusion, such as access to bank accounts, savings schemes, credit facilities, and loan taking, contributes positively to this behaviour. (Vishwakarma, 2024). Similarly, a study conducted in India found that women's saving behaviour is positively related to their income, education, and nature of their profession, while age, loans, and number of dependents affect this habit adversely (Suresh et al., 2019).

Employment opportunities

Working women are entitled to independent income sources and earning opportunities, and their inclusion in the mainstream workforce increases the tendency to save. Furthermore, it has been found that women are more inclined to save a significant portion of their earnings than men. Hence, employment and earning opportunities positively impact women's saving tendency (Woolley et al., 2013). In addition, employed women are more likely to save because of their individual income, risk-averse mentality, and preference for financial security (Bhabha et al., 2014).

2.1.2. Educational opportunities

Globally, the literacy rate of women in emerging nations is increasing rapidly. In studying saving behaviour, many researchers have attempted to establish the link between women's financial literacy and their saving habits, often overlooking the level of educational attainment of women due to the lack of generalisability. However, it does not preclude the possibility that an individual's educational achievement might also be related to their propensity to save. For women in

particular, achieving higher educational qualifications increases their willingness to save, and the more knowledgeable they become, the greater their tendency to invest their accumulated funds within the formal financial sector. (Aydemir, 2021).

2.1.3. Cultural and societal influence

Cultural and societal phenomena often impact women's saving behaviour through ingrained gender norms and role expectations. In different areas, whenever women attempt to engage with formal financial institutions or fundraising communities, they are obstructed by normative behaviours owing to their restricted financial autonomy arising from outdated gender roles (Jumena, 2022). Constructed on Hofstede's framework, dimensions such as uncertainty avoidance and long-term orientation further strengthen the risk-averse tendency of women, encouraging them to opt for more conventional savings strategies (Cruz et al., 2024). Additionally, women are found to be more inclined to utilise money for family needs such as healthcare and children's education rather than keeping it for personal benefit or wealth accretion, a tendency well validated by societal expectations from women in the aspect of caregiving and household accountability (OECD, 2021; Binsuwadan et al., 2024). This phenomenon is especially evident among young women, whose financial behaviour is affected by cultural value systems and low levels of financial literacy rate (Wilska & Nyrhinen, 2023).

Apart from this, factors such as socioeconomic status and life cycle stage also contribute significantly to the saving behaviour of women. Working women in developing countries face restricted ability to engage with long-term financial goals or consistent saving habits owing to their limited employment and social security (Tahir et al., 2022). For women entrepreneurs in patriarchal societies such as Nigeria, cultural restrictions and gender role expectations further raise the barriers to financial inclusion (Adebayo & Musa, 2025). To counter this scenario, digital literacy campaigns and targeted financial education programmes effectively overcome the barriers imposed by cultural constraints and empower women to develop robust saving habits (Mishra et al., 2024). Consequently, determining the interplay between cultural norms and socio-economic contexts is imperative before finding ways to promote women's saving habits.

2.1.4. Technology and digital inclusion of women

In the post-era, the saving behaviour of women has been shaped by multiple novel factors such as attitudes towards adversity, the interaction of working women with their colleagues (Sistiani, et al. 2021), and the emergence of digital financial inclusion technologies (Varlamova et al., 2020). As digital technology permeates national and global economies, it also significantly impacts the interplay of various factors, producing outcomes that are at odds with previous research findings. This complex situation is challenging as it shapes human behaviour in conflicting ways. On the one hand, it encourages saving by reducing barriers to accessing financial services and offers lucrative saving instruments; on the other hand, it has also made borrowing and spending money more accessible than ever before, which acts as a disincentive to saving (Akinrinola et al., 2023). Nevertheless, researchers have also found that technology and the digital inclusion of a larger portion of the population positively influence saving behaviour. Moreover, more significant levels of economic development are observed in developed countries than in developing countries due to increased savings behaviour (Paulsen & Yıldırım, 2018).

2.2. Women's economic empowerment

The contemporary focus on women's empowerment and gender equality is quite noticeable and rigorous in the international endeavour for development. The United Nations identified it as a cornerstone of the Sustainable Development Goals (SDG) (Labadi et al., 2021). Although the concept and measurement of women's empowerment have been challenged, most researchers have discussed and evaluated it from an economic perspective. Women's empowerment refers to women being equipped with the agency and work that leads to economic independence (Pereznieto & Taylor, 2014). However, this empowerment of women must occur at multiple levels: within the individual (power to), within the household or community (power to), over financial and other resources (power over), and at the organisational level to organize dynamically and communally (power with) for long term sustainability and advancement in the broader legal and political spectrum (Reshi & Sudha, 2023). Previous researchers have addressed economic empowerment as a prime indicator of women's empowerment because it enhances women's decision-making capability and financial adequacy. Women's economic empowerment is imperative to establish women's rights and to achieve such positive changes as poverty alleviation,

economic progress, and social well-being in the broader arena (Kumari et al., 2020).

2.3. Economic advancement in emerging nations

The previous literature supports the notion that women's economic empowerment is essential for inclusive growth in developing countries. In many contexts, due to women's limited access to financial services such as savings and credit facilities, a large proportion of women are economically vulnerable. Their reliance on male household earners means they are more prone to becoming financially deprived due to job loss of the male member of their family, divorce or the death of their husbands or the earning male member (Candiya et al., 2018). Additionally, due to male-centered control of assets and developmental activities, women are more vulnerable financially by way of gender discrimination in access to financial services and literacy, employment, income, and educational opportunities (Siddik, 2017). Hence, meaningful economic progress in developing nations remains unlikely unless women are integrated into the mainstream workforce and achieve financial independence. (Quayyum, 2019).

2.4. A behavioural and feminist economics perspective

The present study aligns closely with both behavioural and feminist economics theories (Braunstein & Folbre, 2001; Thaler, 2016). Behavioural economics is pertinent as it investigates how psychological factors, social norms, and emotional aspects influence economic decision-making (Kahneman & Tversky, 2013). Understanding cognitive biases and emotional drivers can provide insights into financial choices in relation to women's saving behaviour. (Mullainathan & Shafir, 2013). Additionally, feminist economics offers a relevant framework by examining economic phenomena through a gender-focused lens, enabling an exploration of how societal gender norms and expectations shape women's saving patterns and economic progress. (Braunstein & Folbre, 2001). By integrating these theoretical perspectives, the current study can offer an in-depth understanding of the complex dynamics influencing women's saving behaviour in relation to economic advancement in emerging nations.

2.5. Research gap

A significant research gap persists in understanding the synergistic effect of financial inclusion and educational and employment opportunities on women's

economic empowerment, which, in turn, impacts economic advancement in Bangladesh. Apart from research on the effects of digital financial services on women's financial inclusion (Aziz & Naima, 2021), there is little data on how these services interact with educational attainment and employment opportunities to empower women economically, so that they can save and invest more, and contribute to the nation's economic growth. Furthermore, while there is growing recognition of the importance of women's economic empowerment in mitigating gender discrepancy in Bangladesh's development agenda, there is limited comprehensive analysis of how women's education and employment opportunities promote their economic resilience and advancement. Addressing this research gap is crucial for designing holistic and effective policies that leverage women's economic empowerment by utilising the factors that promote women's saving behaviour and foster sustainable economic development in Bangladesh.

3. HYPOTHESIS FORMULATION

3.1. Women's economic empowerment and financial inclusion

In Bangladesh, where women play a crucial role in economic development, the interconnection between women's economic empowerment and financial inclusion is paramount. The importance of Bangladeshi women in the ready-made garment industry and other sectors in influencing the country's economy has been highlighted (Quayyum, 2019). Financial inclusion remains difficult due to gender differences in access to formal financial services. (Roy & Patro, 2022). This echoes the global scenario, where other emerging nations face similar hurdles. Financial inclusion empowers marginalised communities in emerging countries (Demirgüç-Kunt & Klapper, 2013), aligning with the global discourse on gender equality and sustainable development (Onditi & Odera, 2017). In this multifaceted narrative, the role of mobile banking and digital financial services (Mehra et al., 2012), along with financial literacy and education, emerges as a pivotal component for women's economic empowerment and financial inclusion (Mammen & Paxson, 2000; Swamy, 2014). These modern tools bridge gaps and amplify opportunities, allowing women to navigate and participate actively in the economic landscape. Bridging these perspectives shows that achieving meaningful economic empowerment for women necessitates addressing power imbalances and enhancing women's agency, underlining the reciprocal

relationship between economic empowerment and financial inclusion (Chen & Barcus, 2024; Emon & Nipa 2024). This underscores the need for comprehensive policy frameworks, as the World Bank advocates, to overcome barriers and foster inclusive growth in Bangladesh and emerging nations globally (World Bank, 2023). Based on these analyses, this study proposes the following hypothesis.

H_1: Financial inclusion has a positive impact on women's economic empowerment.

3.2. Women's economic empowerment and technology and digital inclusion

In the dynamic landscape of women's economic empowerment, technology and digital inclusion emerge as pivotal catalysts, shaping the trajectory of progress, especially in Bangladesh and other emerging nations (Genilo et al., 2015). Acknowledging the substantial contribution of Bangladeshi women to economic growth, Roy (2016) emphasised the incorporation of technology in this story.

However, the digital gender gap in Bangladesh poses challenges to fully realising women's economic potential, highlighting the urgency for inclusive digital strategies (Hernandez, 2019; Rashid, 2016). Proper internet access and connectivity is a critical aspect influencing women's economic empowerment (Prasad & Sreedevi, 2013), coupled with active participation in e-commerce (Maier & Nair-Reichert, 2007; Noor & Suprayoga, 2019; Sultana & Akter, 2021). On a global scale, the significant impact of technology on improving women's economic agency in emerging nations underscores the need to address digital disparities and reinforces the case for women's empowerment, advocating for comprehensive policies that bridge the digital gender gap while equipping women with digital skills (David & Phillips, 2023; Mariscal et al., 2019). As technology and digital inclusion have become integral to women's economic empowerment agendas, there is a collective call for innovative strategies that resonate locally in Bangladesh and globally across emerging nations. Based on the above discussion, a hypothesis may be proposed as follows:

H_2: Technology and digital inclusion positively impact women's economic empowerment.

3.3. Women's economic empowerment and educational and employment opportunities

In the realm of women's economic empowerment, this literature review delves into the nuanced landscape, focusing mainly on the perspectives of emerging nations, with a spotlight on Bangladesh. It is important to stress that educational programmes in Bangladesh should align with women's economic empowerment, which shows how important education is in empowering women economically (Bradshaw et al., 2017). The digital gender gap in Bangladesh accentuates the necessity for educational interventions to boost women's digital literacy, a critical element for active workforce participation (Shah & Krishnan, 2023). Expanding the lens globally, the World Bank identifies education as a cornerstone for women's economic empowerment, advocating policies that offer women opportunities to acquire skills and knowledge (World Bank, 2023). Resonating with this perspective, there is a strong emphasis on advocating comprehensive policies aimed at bridging gender gaps in education and enhancing employment opportunities for women in emerging nations (Bradshaw et al., 2017; Shah & Krishnan, 2023). Recognising that educational attainment (Jayaweera, 1997; Shetty & Hans, 2015), vocational and skills training (Ahamad et al., 2016; Jabbar & Zaza, 2016), and equal employment opportunities are pivotal factors. This literature review delves into influential elements shaping women's saving nature for economic advancement (Habib et al., 2019; Mishra, 2014; Sohail, 2014). This literature review highlights the interconnected dynamics of educational and employment opportunities, showcasing their integral role in shaping the multifaceted landscape of women's economic empowerment in both the Bangladeshi and broader global emerging nations contexts. In light of the literature above, a hypothesis may be formulated as follows:

H_3: Educational and employment opportunities positively impact women's economic empowerment.

3.4. Women's economic empowerment and economic advancement

Women's economic empowerment and advancement in developing countries have garnered significant attention from researchers and policymakers due to their potential to catalyse broader societal development. Several studies have emphasised the importance of increasing women's access to resources and opportunities for education and work to promote economic growth and reduce

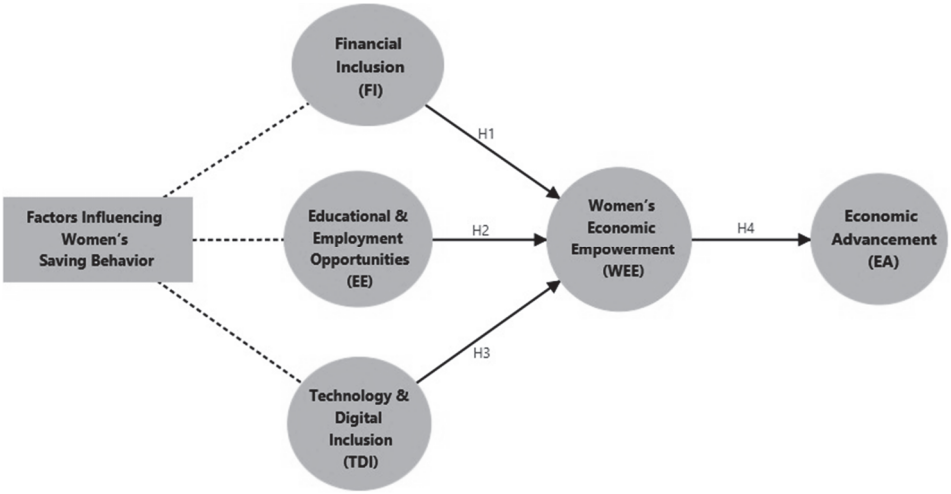
poverty (Duflo, 2012; Kabeer, 2005). Empirical evidence suggests that investing in women's economic empowerment yields substantial returns in terms of increased productivity, improved household welfare, and enhanced social cohesion (World Bank, 2019). Key factors contributing to women's economic advancement include targeted skills training, access to credit and financial services, legal reforms promoting gender equality, and supportive social norms (Agarwal, 2015; Malhotra et al., 2017). However, persistent barriers such as gender discrimination, unequal inheritance rights, and limited access to markets continue to impede women's full participation in the economy (Quisumbing et al., 2014). To effectively tackle these challenges, comprehensive strategies are necessary, including policy interventions, institutional reforms, and community engagement, to cultivate a conducive atmosphere that promotes the economic empowerment of women (Buvinic et al., 2014; Kabeer, 2012). By encouraging women's economic autonomy and agency, developing countries can unlock their full potential as sustainable development and poverty reduction engines, thereby contributing to inclusive and equitable growth (World Economic Forum, 2020). Based on the above discussion, the study proposes the following hypothesis:

H_4: Women's economic empowerment has a positive impact on financial advancement.

4. METHODOLOGY

4.1. Conceptual framework

Figure 1. Conceptual framework



Source: developed by the authors

4.2. Data collection, sampling technique, size and variables description

Data for this study were collected from women living in Bangladesh's Dhaka, Chittagong, and Khulna regions. The reason for choosing these areas is that, according to statistics published by the Bangladesh Bureau of Statistics (BBS) in 2023, these regions are the three most densely populated areas in Bangladesh. Approximately 38% to 40% of the total population of Bangladesh is in the three divisions covered in this study with Dhaka covering about 21%, Chittagong covering about 16%, and Khulna covering about 3% based on figures from the BBS (2023). Women belonging to different age groups and economic categories – employed, unemployed, and students – were included in the survey conducted for this study. A pre-test was conducted with four academic experts and five social service workers to establish the content validity of the questionnaire. The social service workers recommended considering women voters living in the city corporation areas, i.e. the major metropolitan areas, with verifiable formal/informal savings within the six months preceding the survey. The academic experts involved agreed that choosing such respondents would strengthen the reliability and validity of the findings of the study. After

integrating the experts' suggestions, the questionnaire was finalised for data collection. Assistance was provided in conducting the survey, including distributing and collecting responses, from November 2023 to January 2024.

A sampling frame was generated from the voter list maintained by the Union Parishad and the city corporation of the respective areas to determine the sample for this study. The voter list included information usually found in a residence register, such as age, gender, address, contact address and information, name of father/spouse, amongst others. Following the recommendations of the experts, women aged 18 and above were identified across the three selected regions. Using simple random sampling ensured the representativeness across the regions by giving every eligible woman an equal chance to be selected, avoiding the overrepresentation of women from more populous or easily accessible areas. Woman meeting the predetermined criteria were randomly drawn from the sampling frame and invited to participate in the survey. To ensure independent responses and avoid intra-household bias, only one woman per household was considered eligible. In this way, a demographically diverse sample to determine the factors shaping women's saving behaviour was obtained. However, this study did not perform a formal test for non-response bias; instead, when selecting the final 551 respondents from the sampling frame, a substantially larger pool of respondents was considered to ensure the inclusion of individuals who met the required saving criteria. If a respondent was not available at the time of the survey, the next eligible woman on the sampling frame list was contacted immediately. This sampling technique helped minimise non-response issues and enable an unbiased survey process while allowing for a critical examination of the interaction between such factors as income level, educational qualification, employment status, marital status, and the saving tendency of women. The survey included questions to collect data on the socio-economic characteristics of the participants and was further analysed to determine the association between such demographic aspects and the saving behaviour of women.

Although 551 questionnaires were initially received, yielding a response rate of 61%, 133 questionnaires subsequently had to be discarded due to incompleteness or inconsistency in responses. Therefore, finally, 418 completed questionnaires were considered for structural equation modelling (SEM) analysis using Smart

PLS (4.1.0.3 version). The demographic profiles of the respondents were also analysed using SPSS (version 25).

The study examined multiple variables, each measured using various items presented in the following table:

Table 1: Variables

Variables	Number of items	Source	Items adopted
Financial Inclusion (FI)	Three	(Rink et al., 2021)	Financially literate **(FI1),** limited financial ability **(FI2),** low level of financial literacy, and literacy level **(FI3)**
Educational and Employment Opportunities (EE)	Nine	Three items (Davis et al., 2012)	**Educational Opportunities** – easy enrollment **(EE1),** performs well in competitive assessment **(EE2),** and completion of studies **(EE3)**.
		Six items (Salway et al., 2005)	**Employment Opportunities** – mobility and visibility **(EE4)**, management and access to material resources **(EE5),** protecting personal interests **(EE6),** ties with natal kin **(EE7)**, individual savings **(EE8),** control of male over female entry in the workforce **(EE9)**
Technology and Digital Inclusion (TDI)	Three	(Thathsarani & Jianguo, 2022)	Access to technology-based services **(TDI1)**, use of digital technology **(TDI2)**, and quality of technology **(TDI3)**

Women's Economic Empowerment (WEE)	Seven	(Nguse et al., 2022)	Financial ability to meet emergencies **(WEE1),** increased saving and investment **(WEE2),** increased source of income **(WEE3),** improved living standard **(WEE4),** better medical facility **(WEE5),** increased productivity **(WEE6),** and increased position in the family **(WEE7).**
Economic Advancement (EA)	Four	(Porta & Shleifer, 2008)	Per capita GDP **(EA1),** fluctuation in GDP rate or currency **(EA2),** number of SMEs **(EA3),** and male-female ratio in the labour force **(EA4)**
A total of five variables and 26 items			

5. RESULTS

5.1. Profile of the respondents

A total of 418 samples were gathered for this investigation. The demographic profile of the participants is displayed in Table 2. The ages of the respondents ranged from 18 to over 50 years. Specifically, 66.7% were aged 18 to 30 years, 19.4% fell within the 31 to 40 years group, 10.3% were 41 to 50 years old, and 3.6% were aged 50 years or above. Regarding employment status, 41.1% of the respondents were employed and 59.9% were unemployed at the time of data collection.

The educational qualifications of the respondents were also taken into account. Among the respondents, 39.5% were at the undergraduate level, 31.1% at the graduate level, 21.8% at the postgraduate level, and 7.7% reported possessing other types of educational qualifications. The respondents' monthly income was split into four groups: 58.4% reported incomes between Tk. 0 and Tk. 9,999;

12.4% earned between Tk. 10,000 and Tk. 19,999; 15.6% percent reported incomes between Tk. 20,000 and Tk. 29,999; and 13.6% reported earning Tk. 30,000 or more per month.

Table 2: Demographic characteristics of respondents

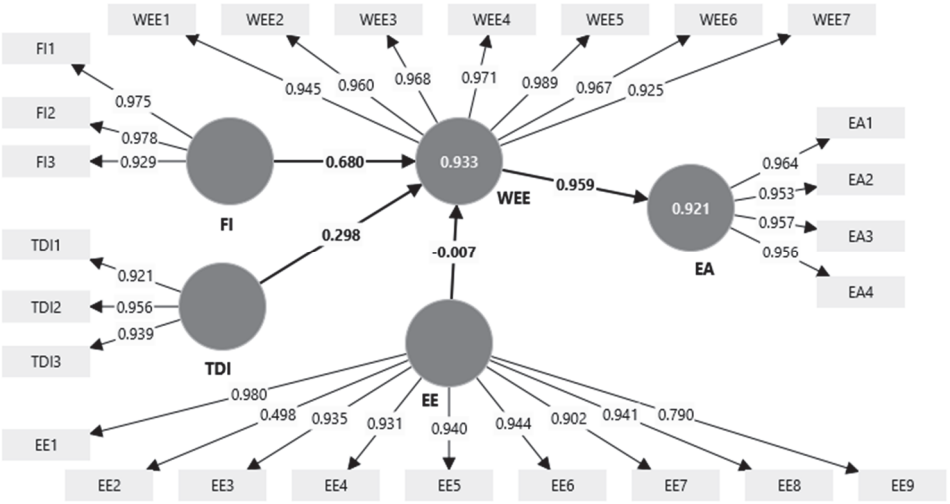
Characteristics		Frequency	Percentage (%)
Age	18–30	279	66.7
	31–40	81	19.4
	41–50	43	10.3
	50 or above	15	3.6
Employment status	Employed	172	41.1
	Unemployed	246	59.9
Occupation	Student	186	44.5
	Employed (salary-based)	125	29.9
	Business	16	3.8
	Housewife	71	17.0
	Others	20	4.8
Educational qualification	Undergraduate	165	39.5
	Graduate	130	31.1
	Post Graduate	91	21.8
	Others	32	7.7
Monthly income (Taka)	0 – 9,999	244	58.4
	10,000 – 19,999	52	12.4
	20,000 – 29,999	65	15.6
	30,000 or more	57	13.6

5.2. Factor analysis

Exploratory factor analysis (initial test)

In this study, initial exploratory factor analysis was conducted using SmartPLS software (version 4.1.0.3). Specifically, factor loading was used to assess how the factors relate to the variables (Kline, 2011). Loadings typically range from -1 to 1, with values above 0.5 considered optimal (Fornell & Larker, 1981; Kline, 2011). The questionnaire included 26 reflective indicators. Figure 2 below shows that initial testing found one indicator (EE2) out of 26 indicators had a low loading on its intended construct. This indicator was excluded from the final structural model to improve model validity and reliability.

Figure 2: The structural equation modelling (initial)



5.3. Assessing reflective measurement models

Reliability indicator

Table 3: Indicator reliability

	EA	EE	FI	TDI	WEE
EA1	0.964				
EA2	0.953				
EA3	0.957				
EA4	0.956				
EE1		0.980			
EE3		0.935			
EE4		0.931			
EE5		0.940			
EE6		0.944			
EE7		0.902			
EE8		0.941			
EE9		0.790			
FI1			0.975		
FI2			0.978		
FI3			0.929		
TDI1				0.921	
TDI2				0.956	
TDI3				0.939	
WEE1					0.945
WEE2					0.960
WEE3					0.968
WEE4					0.971
WEE5					0.989
WEE6					0.967
WEE7					0.925

Note: EA = Economic Advancement, EE = Educational and Employment Opportunities, FI = Financial Inclusion, TDI = Technology and Digital Inclusion, and WEE = Women's Economic Empowerment.

A high communality value, nearing one, suggests that variables align well with the factor solution, whereas lower values indicate poorer alignment. Loadings of 0.50 or higher are considered acceptable, indicating a good fit. As shown in Table

3 above, all values surpass the 0.5 threshold, indicating no issues with the data according to the commonality test. Therefore, none of these items will likely load significantly onto other variables (Hulland, 1999).

5.4. Internal consistency reliability

In partial least squares structural equation modelling (PLS-SEM), composite reliability evaluates the internal consistency of reflective constructs, contrasting with Cronbach's alpha by accommodating potential differences in indicator loadings. The Table 4 shows composite reliability values above 0.7, indicating good internal consistency (Hair et al., 2011).

Table 4: Construct reliability and validity overview

	Cronbach's α	Composite reliability (ρ_a)	Composite reliability (ρ_c)	Average variance extracted (AVE)
EA	0.970	0.970	0.978	0.917
EE	0.963	1.008	0.969	0.783
FI	0.959	0.965	0.973	0.924
TDI	0.933	0.937	0.957	0.882
WEE	0.986	0.987	0.988	0.924

Note: EA = Economic Advancement, EE = Educational and Employment Opportunities, FI = Financial Inclusion, TDI = Technology and Digital Inclusion, and WEE = Women's Economic Empowerment.

A cutoff of 0.5 for average variance extracted (AVE) is suggested by Sarstedt, et al. (2014). Values equal to or greater than 0.5 are statistically accepted, indicating that the construct can explain over 50% of the variance in related items. Table 4 above shows all AVE values meeting this criterion for convergent validity.

5.5. Discriminant validity

Discriminant validity assesses the relationships between research variables by calculating all possible correlation values (Henseler et al., 2015). Indicators should predominantly load heavily on their intended construct to confirm discriminant validity and minimally on others (Voorhees et al., 2016). Table 5 presents the Cross-loading matrix, illustrating discriminant evidence across constructs.

Table 5: Cross-loading matrix

	EA	EE	FI	TDI	WEE
EA1	0.964	0.073	0.941	0.924	0.941
EA2	0.953	0.138	0.916	0.900	0.916
EA3	0.957	0.140	0.923	0.907	0.911
EA4	0.956	0.107	0.913	0.900	0.906
EE1	0.097	0.980	0.085	0.087	0.076
EE2	0.003	0.498	0.005	0.012	0.025
EE3	0.108	0.935	0.111	0.115	0.097
EE4	0.118	0.931	0.115	0.122	0.106
EE5	0.149	0.940	0.141	0.135	0.129
EE6	0.119	0.944	0.100	0.101	0.095
EE7	0.083	0.902	0.069	0.072	0.060
EE8	0.107	0.941	0.094	0.094	0.085
EE9	0.036	0.790	0.022	0.020	0.016
FI1	0.959	0.109	0.975	0.947	0.960
FI2	0.969	0.116	0.978	0.947	0.963
FI3	0.845	0.090	0.929	0.837	0.842
TDI1	0.838	0.080	0.842	0.921	0.836
TDI2	0.946	0.108	0.945	0.956	0.943
TDI3	0.882	0.125	0.881	0.939	0.869
WEE1	0.898	0.139	0.902	0.888	0.945
WEE2	0.928	0.113	0.933	0.916	0.960
WEE3	0.926	0.078	0.929	0.912	0.968
WEE4	0.928	0.076	0.933	0.915	0.971
WEE5	0.964	0.105	0.966	0.951	0.989
WEE6	0.924	0.079	0.925	0.912	0.967
WEE7	0.884	0.089	0.876	0.839	0.925

Note: EA = Economic Advancement, EE = Educational and Employment Opportunities, FI = Financial Inclusion, TDI = Technology and Digital Inclusion, and WEE = Women's Economic Empowerment.

5.6. Fornell–Larcker criterion

The Fornell–Larcker criterion is a widely-used approach to assessing discriminant validity (Fornell & Larcker, 1981). It contrasts the square root each construct's AVE with its correlations to other constructs in the model.

Discriminant validity is affirmed when a construct's AVE surpasses its correlations with other constructs (Hair et al., 2011).

Table 6 below confirms discriminant validity by showing that all AVE values exceed their respective correlations with other constructs according to the Fornell–Larcker criterion.

Table 6: Discriminant validity – Fornell–Larcker criterion

	EA	EE	FI	TDI	WEE
EA	0.957				
EE	0.119	0.885			
FI	0.964	0.110	0.961		
TDI	0.948	0.111	0.949	0.939	
WEE	0.959	0.101	0.961	0.942	0.961

Note: EA = Economic Advancement, EE = Educational and Employment Opportunities, FI = Financial Inclusion, TDI = Technology and Digital Inclusion, and WEE = Women's Economic Empowerment.

Table 7: Coefficient of determination (R^2)

	R-square	*R*-square adjusted
EA	0.921	0.920
WEE	0.933	0.932

Note: EA = Economic Advancement, WEE = Women's Economic Empowerment.

For EA, the R^2 value of 0.921 suggests that the exogenous variables included explain 92.1% of the variance in economic advancement. This high R^2 indicates a robust relationship, highlighting the model's accuracy in predicting changes in economic advancement based on the variables studied. Similarly, WEE has an R^2 value of 0.933, indicating that the model's exogenous variables explain 93.3% of the variance in women's economic empowerment. This underscores the model's predictive ability to understand the factors influencing women's economic empowerment within the framework of the study.

5.7. Structural equation modelling results

After rigorously evaluating the reliability and validity of all reflective measurements in our research model and ensuring data integrity, we applied the

SMART-PLS algorithm with a path weighting scheme to maximise the R^2 value for our endogenous latent variable, EA.

Figure 3: The structural equation modelling (final)

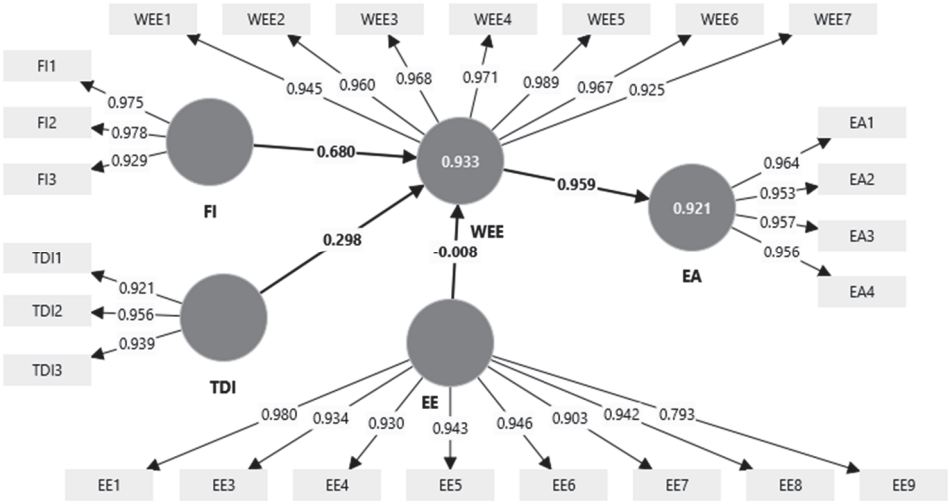


Table 8: Path coefficients interpretation

	EA	EE	FI	TDI	WEE
EA					
EE					-0.008
FI					0.680
TDI					0.298
WEE	0.959				

Note: EA = Economic Advancement, EE = Educational and Employment Opportunities, FI = Financial Inclusion, TDI = Technology and Digital Inclusion, and WEE = Women's Economic Empowerment.

The relationship between EA and WEE is characterised by a path coefficient of 0.959, indicating a highly positive and robust impact. An increase of one unit in EA is expected to correspond to a 0.959 unit increase in WEE, highlighting the strong association between these variables. When examining the relationship between EE and WEE, the path coefficient is -0.008. This suggests a weak and slightly negative effect, indicating that a one-unit increase in EE may lead to a 0.008-unit decrease in WEE. Although these variables have a small association,

the impact is minimal. FI significantly impacts WEE with a path coefficient of 0.680. A one-unit increase in FI is expected to result in a 0.680-unit rise in WEE. This signifies a strong and positive relationship, indicating that improved financial inclusion is closely tied to higher levels of women's economic empowerment. The relationship between TDI and WEE is characterised by a path coefficient of 0.298. This suggests a moderate and positive effect, indicating that a one-unit increase in TDI corresponds to a 0.298-unit increase in WEE. While the impact is less intense than EA or FI, it still highlights the association between improved technology, digital inclusion, and greater women's economic empowerment.

Table 9: Path coefficients significance using bootstrapping test

	Original sample (O)	**Sample mean (M)**	**Standard deviation (STDEV)**	***t*-statistics (|O/STDEV|)**	***p*-values**
FI -> WEE	0.680	0.678	0.068	9.996	0.000
EE -> WEE	-0.008	-0.008	0.016	0.507	0.612
TDI -> WEE	0.298	0.300	0.068	4.361	0.000
WEE -> EA	0.959	0.960	0.014	66.910	0.000

Based on the findings, it is evident that the path coefficient from FI to WEE demonstrates a highly significant relationship (p = 0.000), indicating a strong positive association between these variables. Therefore, H_1 is supported. Conversely, the path coefficient from EE to WEE does not exhibit statistical significance (p = 0.612), suggesting an absence of a significant relationship between these variables. Consequently, H_2 is not supported. Furthermore, the path coefficient from TDI to WEE also displays a highly significant relationship (p = 0.000), signifying a significant positive association between these variables. Hence, H_3 is supported. Moreover, the path coefficient from WEE to EA is extremely strong and highly significant (p = 0.000), indicating a strong positive relationship between these variables. Consequently, this provides robust support for H_4.

6. DISCUSSION

This study establishes a clear connection between economic advancement and women's economic empowerment. Furthermore, it reveals a link between women's economic empowerment, financial inclusion, technology and digital inclusion, and educational and employment opportunities. These results align with previous research findings (Varlamova et al., 2020; Vishwakarma, 2024), which suggests that financial inclusion impacts women's economic empowerment. Consistent with our finding, financial literacy has recently been shown to predict women's economic empowerment (Kumari et al., 2020).

In contrast, our findings indicate that educational and employment opportunities do not significantly influence women's economic empowerment, in line with earlier evidence (Ayenew, 2014). However, an explanation might be offered for this finding based on several previous studies (Norlita & Noor, 2022; Salway et al., 2005). The latter study asserts that educational attainment does not necessarily imply financial literacy and that women's saving behaviour and economic empowerment are antecedents of financial literacy. Hence, women's educational level might still significantly influence their economic empowerment. Furthermore, according to Salway et al., 2005, employed women tend to spend their earnings on monthly household expenses, children's education, support for natal kin, and occasionally hand over their income to their spouse to avoid domestic violence. As a result, employment status alone is not a reliable predictor of women's economic empowerment, highlighting the critical reality that women in Bangladesh cannot spend or save their earnings at their own discretion due to a lack of decision-making power and authority over the resources available to them.

In addition, although the proportion of female enrolment in education is rising, this is only marginally reflected in women's saving behaviour. Aydemir (2021) found that while education increases women's propensity to save via formal financial channels, it does not necessarily impact how much they save. The study further suggested that the disparity between savings and income of women may be further explained by relevant factors such as restricted control over financial affairs, or family traditions, even though women might have access to formal financial institutions.

Similarly, a recent study on workers of the ready-made garment industry and the microenterprise sector of Bangladesh found that women's employment in these sectors does not directly translate into a rise in their savings (Al Mamun & Hoque, 2022). The reasons for this could lie in the industry-specific low compensation structure, job insecurity, and minimal employment-related benefits. Moreover, in terms of societal context, women's employment is not parallel to women's autonomy, financial independence, or decision-making power regarding how to use their hard-earned money. Although they might be the ones earning the money, they are frequently not the ones who call for how to spend or save that money in the patriarchal social structure of this country (Al Mamun & Hoque, 2022). Consequently, the findings of this study may further demonstrate that women's employment and education do not equate to financial autonomy or independent decision-making power to impact their saving habits significantly.

Additionally, technology and digital inclusion have significantly impacted women's economic empowerment (Varlamova, et al., 2020). As technology has become deeply integrated into all aspects of the economy, finance, and human behaviour, it is imperative that technology and digital inclusion contribute to the economic empowerment of women by promoting informal saving behaviour and bringing formal saving schemes just one click away through mobile devices.

Finally, the findings of this study reveal that women's economic empowerment significantly impacts Bangladesh's economic advancement. This aligns with previous studies conducted by Kamberidou (2020), Sedai et al. (2022), and Anderson et al. (2021), which also show that empowering women improves economic growth across different national contexts. Economic enablement of women leads to economic diversification, which enhances a nation's economic development and resilience. Through this increased agency, women have greater influence over decision-making, resource allocation, associating with others as a community, and mobility. Consequently, they can play a significant role in saving and managing household income efficiently. Economic freedom further enables women to use available human and natural resources to explore diverse investment and entrepreneurial options, in turn contributing to national economic advancement. Hence, given that women constitute approximately 40% of the global workforce and contribute substantially to national economies at the micro level and the world economy at a macro level, it would be short-sighted to

deprive them of economic freedom. Expecting the economy to flourish without acknowledging their direct or indirect contribution in the socio-economic development of the nation is fundamentally unrealistic (Sajjad et al., 2020).

7. LIMITATIONS AND SCOPE OF FUTURE STUDY

This study has utilised cross-sectional data, thus capturing only a single point in time. Therefore, future research should conduct longitudinal studies that monitor the lasting impacts of financial inclusion, educational, and career possibilities on women's saving habits. The lack of longitudinal data limits our understanding of how these factors interact and their long-term impact on women's economic empowerment. This study examines three different regions within Bangladesh, where cultural, social, and economic elements may vary significantly. These differences might impact the success of efforts to promote financial inclusion and economic empowerment, affecting the applicability of the research findings (regional differences). Additionally, insufficient attention is given to the impact of intersectional factors, such as age, marital status, and rural-urban disparities, that may shape women's saving behaviour and economic empowerment (demographic disparities). Furthermore, the analysis lacks a thorough examination of the impact of informal financial practices and savings systems in Bangladesh, which could substantially affect women's saving habits and economic resilience. It also does not provide a comprehensive analysis of the obstacles to technological access and digital literacy, both of which are essential for women to effectively utilise digital financial services, particularly in rural and underserved regions. Given the constraints of time and resources, this study was carried out on a sample of 418 respondents. The sample, which included both urban and semi-urban respondents, provided the diversity of access to financial institutions, technology adoption and working conditions that all reflect the national trend according to the Bangladesh Bureau of Statistics (2023). Thus, although there might be slight regional variations, the sample provides a balanced and credible basis to represent the financial behaviour and patterns of empowerment among Bangladeshi women,.

8. CONCLUSIONS

This study contributes to the literature in three ways. Firstly, it aligns with previous research findings that depriving almost half of the population of their

economic rights creates hurdles to their social security, ultimately restricting the nation's economic improvement. As a result, the other half of the nation's population, men, have to provide both for themselves and women, which adds to their economic burden. Secondly, it highlights that women's economic empowerment is positively associated with more inclusive approaches such as conjugal decision-making in the family, female education, more diverse investment opportunities, reduced male domination in employment sectors, and improved living standards. Finally, this study underscores the need to ensure women's easy access to digital technology so that they might explore better saving and investment opportunities, which will, in turn, contribute to Bangladesh's economic development. The comprehensive analysis has revealed that the variables shaping saving behaviour in this study play a significant role in determining women's economic independence and subsequent economic advancement.

9. POLICY RECOMMENDATIONS

The results of this study are expected to assist policymakers in Bangladesh and provide guidance to other developing countries in formulating their future economic policies in order to fulfill their commitment to achieving Sustainable Development Goals (SDG). Additionally, the results of this study can serve as a guide for promoting the economic empowerment of marginalised women in Bangladesh and supporting their ability to maintain their rights. Utilising technology and implementing digital inclusion programmes can effectively remove barriers and provide widespread financial access. Furthermore, the implementation of laws and programmes aimed at promoting gender equality and financial autonomy could be employed to enhance women's economic empowerment. Ultimately, it is crucial to collectively tackle these concerns in order to foster sustainable economic growth and development in emerging nations by fully harnessing the potential of women as essential catalysts for economic progress. This study has policy significance for the national economy of Bangladesh as it showcases women's saving behaviour, which can assist financial institutions in introducing diverse financial plans. For instance, initiatives might be undertaken to engage microfinance borrowers with workshops on financial literacy, small business support mechanisms, and relevant peer networks. In addition, gender-specific loan cycles with longer grace

periods and greater flexibility might be introduced to take account of household decision-making subtleties. Furthermore, real-time monitoring of women's financial inclusion by Bangladesh Bank's data dashboards could track service usage, client retention rates and saving patterns in the long term. This would, in turn, encourage financial service providers to set gender-based key performance indicators and design customised financial product designs for women.

These measures might significantly contribute to the economic inclusion of Bangladesh, facilitating its transition from a least developed country (LDC) to a developing country by the end of 2026, as recognised by the UN General Assembly. Given that women comprise 50% of the overall population, it is imperative for the government to give substantial consideration to them when devising policies related to financial inclusion.

This study's results confirm the necessity of implementing targeted policies and measures to encourage women's entrepreneurship. This should include the use of gender-responsive budgeting while addressing obstacles that prevent women from using digital financial services. Mobile financial service providers such as Bkash, Rocket, Nagad might make a pivotal contribution by actively recruiting female agents and simplifying the onboarding process for women as both employees and customers. Furthermore, effective incorporation of proper financial resource management into secondary school curricula and adult literacy programmes would be crucial to raise the financial capability of women at the grassroots level. In this respect, non-governmental organisations such as BRAC might be able help in redesigning these curricula to a greater extent to raise financial awareness among people. In conclusion, these measures have the potential to promote economic expansion by fostering women-led enterprises and improving employment prospects.

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ANALYSIS OF FACTORS INFLUENCING THE TYPE OF AUDIT OPINION

ABSTRACT: *The audit of financial statements represents a highly important and indispensable area of accounting, focused on assessing the reliability and fairness of a company's financial reporting. The purpose of conducting an audit of financial statements is to issue an audit opinion. Therefore, this study aimed to identify factors that may indicate the issuance of either a modified or unmodified audit opinion. The study included 52 companies operating across various industries within the Republic of Serbia over a period of three years. Limitations include the focus on a single country and a relatively small sample. Future studies could include companies from neighbouring countries and increase the number of observed entities. The theoretical implications of this study lie in expanding understanding of the factors influencing the issuance of modified and unmodified audit opinions. Practical implications, on the other hand, reflect the relevance of the results for auditors and company management. The findings indicate a statistically significant relationship between factors such as profitability, liquidity, size, and growth of a company, on the one hand, and the issued audit opinion, on the other.*

KEY WORDS: *audit, financial statements, auditor's opinion, modified opinion, unmodified opinion*

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1. INTRODUCTION

Since the primary purpose of auditing is to express an opinion on a client's financial statements and protect the interests of their users, it can be concluded that auditing adds value to the information disclosed by companies. Thus, auditing financial statements has a positive impact on users by providing a high-quality and adequate informational basis for making various decisions related to companies. Managers and accountants might influence companies to publish financial statements containing numerous falsified or manipulated data if they knew they would not be detected or face consequences. However, the presence of external auditing as a tool to prevent manipulative financial reporting can significantly reduce the likelihood of such manipulations. After completing the audit process, an external auditor prepares an audit report in which they express their opinion on the accuracy and objectivity of the data presented in the company's financial statements. The auditor's opinion, as a powerful control mechanism, can influence the decisions of investors and other stakeholders (Bo & Wu, 2011). An auditor's opinion may be unmodified or modified (a qualified opinion, an adverse opinion, or a disclaimer of opinion).

The subject of this study is to examine the factors that indicate whether a client company will receive a modified or unmodified audit opinion. These factors are primarily financial and are based on the calculation of specific financial indicators. These indicators can assist the audit team by highlighting particular aspects of a company's operations that should be given attention during the audit process and aiding in the determination of the audit opinion. Considering the defined research subject, the aim of this paper is to identify the factors that may point to the issuance of a modified or unmodified audit opinion and to determine the interdependence of these factors with the type of audit opinion (modified or unmodified) issued to the company.

This study encompasses 52 companies operating in the Republic of Serbia which are subject to external financial statement audits. Among the companies in the sample, 14 fall into the category of micro-enterprises, 9 are small enterprises, 12 are medium-sized, and 17 are large enterprises. The data in the research were processed using the Statistical Package for the Social Sciences (SPSS) software (version 27), employing the chi-square ($\chi 2$) test and logistic regression. In

addition to these quantitative methods, the study also utilised qualitative methods such as induction, deduction, analysis, synthesis, and abstraction.

In addition to the introduction, the paper consists of four sections. The second section presents a review of the relevant literature. The third section provides an overview of the methodology used in the study. The fourth section contains the results and discussion, while the fifth section is dedicated to the conclusion.

2. LITERATURE REVIEW

Given the complexity of the audit engagement and the numerous risks faced by the auditor in the field, it is essential to consider all relevant factors and conditions that lie before the audit team before expressing an opinion on the truthfulness and objectivity of the client company's financial statements. Specifically, the audit team faces the risk of issuing an incorrect opinion, such as issuing an unmodified opinion when a modified opinion should have been issued, and vice versa. In other words, when the audit team cannot adequately conduct the audit procedure and expresses an incorrect audit opinion (for example, if the audit staff fails to give professional attention and does not gather sufficient evidence), it means that the audit was unsuccessful (Chang et al., 2008).

The issuance of a modified opinion by the audit team can represent a very serious problem for the client company, as it can lead to a decrease in the company's stock price on the capital market. The company's management greatly fears such a situation, as the drop in stock price can increase the cost of capital for the company and lead to a reduction in management compensation (Cullinan et al., 2012). Since modified audit opinions are perceived as bad news on the stock exchange, management may delay the publication of the information that their company has received a modified opinion. Research has shown that companies receiving unmodified audit opinions disclose information about their revenues earlier than those with modified audit opinions (Elliott, 1982; Soltani, 2002; Whittred, 1980). Some authors, studying the situation in China regarding this issue, conclude that modified audit opinions can result in costly actions against the company, such as suspension of trading in securities and/or higher capital acquisition costs, so managers facing a modified opinion may prefer to prolong negotiations with auditors, leading to the postponement of the issuance of the "bad" audit opinion (Haw et al., 2003). In the same study, the authors found that

companies that received a modified audit opinion reported their financial results later than companies that received an unmodified opinion. In this regard, Whittred (1980) suggests that audit opinion modifications are not homogeneous, and that some types of opinions have more serious effects than others. Li and Wu (2004) also point out that the severity of audit opinions gradually changes from stringent to milder, ranging from a disclaimer of opinion to an unmodified opinion, with the most unfavourable being the disclaimer of opinion, according to the gradation logic provided by the authors.

Below is an overview of individual factors. Their specific values may indicate the issuance of a modified audit opinion for a given company. These factors form the basis for the research hypotheses formulated in this study, which take into account the results of previous research. Furthermore, as reflected in the formulated hypotheses, each factor exhibits an interdependence with the type of audit opinion issued (modified or unmodified).

2.1. Profitability

Profitability can be defined as the final measure of economic success achieved by a company relative to the invested capital (Andriani et al., 2021). Profitability is the ability of a company to generate profit, and economic success is determined by the size of net income. Profitability is the primary goal of all companies, and without achieving satisfactory profitability rates, a company cannot survive over the long term (Khan & Raj, 2020). The most commonly used indicator for measuring profitability is the return on assets (ROA) ratio (Gombola et al., 1987; Lo, 1986; Ohlson, 1980), which represents the ratio of net income to total assets of a company. Based on how this indicator is calculated, it shows the number of monetary units of net income a company generates per monetary unit of total assets. However, it is important to clarify how this indicator may be associated with the audit opinion issued in the audit report.

Laitinen and Laitinen (1998) developed a model using accounting indicators to identify factors affecting the auditor's opinion in Finland. The results imply that low profitability reduces the likelihood of receiving an unmodified audit opinion. Kirkos et al. (2007) used three different data mining methods – decision trees, neural networks, and Bayesian networks – to distinguish between unmodified and modified audit opinions. The model was built based on 26 financial

indicators. Empirical results reveal that financial distress, as measured by the Altman Z-score, is closely related to the audit opinion, with companies showing low profitability receiving modified opinions. They also note that these models can be a useful analytical tool for auditors when assessing a company's financial position and performance. Dopuch et al. (1987) developed a probit model based on financial and market variables to predict the audit opinion and argued that a loss in the current year signals that the company will receive a modified opinion from the auditor. Caramanis and Spathis (2006) examined whether financial and non-financial factors influence audit opinion modifications. They created a logistic regression model based on a sample of 185 companies, finding that financial factors such as operating margin relative to total assets (profitability indicator) were significantly related to the audit opinion. The logistic model they developed classified companies from the sample with 90% accuracy. Additionally, Özcan (2016), in his study, notes that the results of univariate analysis show that unmodified audit opinions are issued for companies with higher profitability. Dopuch et al. (1987) also concluded that the most important variable in predicting the issuance of a modified audit opinion is the assumption of corporate profit for the current year, as well as changes in corporate profit adjusted for the average profit in the sector. Furthermore, in their study, Ha et al. (2016) state that profitability has a positive relationship with the likelihood of issuing an unmodified audit opinion. Handayani et al. (2023) state that decreased profitability leads to the expression of a modified opinion by the auditor. Some authors also suggest that the likelihood of receiving an unmodified opinion from the auditor decreases if profit growth is low (Aryantika & Rasmini, 2015). Based on the findings of previous research, the following hypothesis can be formulated:

H1: There is a statistically significant interdependence between the type of audit opinion and the profitability of the company.

2.2. Liquidity

Liquidity assets are generally considered a safeguard against crises, as they enable companies to save resources by avoiding the need to sell assets in unfavourable situations to pay off debts (Shleifer & Vishny, 1992). Liquidity can be measured in various ways, and for the purposes of this study, liquidity will be measured using three ratio indicators. These are the current ratio, which represents the ratio of current assets to current liabilities; the quick ratio, which is derived from the

ratio of current assets minus inventory (also known as relatively liquid assets) to current liabilities; and the liquid ratio, which is the ratio of cash to current liabilities (Saleem & Rehman, 2011). All three ratio indicators show the number of monetary units of current assets, relatively liquid assets, or cash covering one monetary unit of current liabilities.

Based on a sample of one hundred companies operating in Greece, Spathis (2003) used a logistic regression model that can identify factors influencing audit opinion. The empirical findings reveal that the type of audit opinion is strongly related to the liquidity of the company, with higher liquidity indicators suggesting a greater likelihood of issuing an unmodified audit opinion. The model, created with financial and non-financial information, classifies all companies in the sample with an accuracy of 78%. Dopuch et al. (1987) state that the change in the ratio of total liabilities to total assets plays an important role in predicting the type of audit opinion; if a company is less able to meet its obligations (lower liquidity), a modified opinion may be issued by the auditor. Özcan (2016) highlights that, among other things, favourable liquidity indicators suggest a higher likelihood of issuing a positive, or unmodified, audit opinion. Additionally, Reynolds and Francis (2001) note that the probability of receiving an unmodified audit opinion increases if the company's liquidity improves. Cahyono (2014) reports that there is a high probability that companies without liquidity issues will not be subjected to a modified audit opinion. Januarti and Fitrianasari (2008) find that liquidity has a positive correlation with the probability of issuing an unmodified audit opinion, and a negative correlation with the likelihood of issuing a modified audit opinion. Mawaddah et al. (2023) also observe that there is an inverse relationship between liquidity and the likelihood of a company receiving a modified audit opinion. Furthermore, Ireland (2003) argues that poor liquidity increases the probability of issuing a modified audit opinion to a company. Based on all the above, the following research hypothesis is:

H2: There is a statistically significant interdependence between the type of audit opinion and the liquidity of the company.

2.3. Leverage

Leverage shows the impact of debt on investment rates and opportunities in companies, where the level of corporate debt indirectly influences investor

interest and confidence (Rohmadini et al., 2018). The debt-to-equity ratio (DER) is a measure used to assess a company's leverage by comparing all debts, including current liabilities, with total equity, or total liabilities, the value of which is equal to total assets (Dirman, 2020). Thus, this indicator focuses on the indebtedness of a company, which primarily arises from borrowing funds (most commonly bank loans).

Özcan (2016) states that companies are less likely to receive a modified audit opinion if their debt-to-total-assets ratio is low. Ha et al. (2016) concluded from their research that companies with higher debt levels, or high financial leverage, are less likely to receive an unmodified audit opinion or, in other words, are more likely to receive a modified opinion. Lennox (2000) also found that companies often receive modified audit opinions when their level of indebtedness is high. Similarly, Simamora and Hendarjatno (2019) concluded that leverage affects the issuance of a modified audit opinion, indicating a degree of interdependence between leverage and the likelihood of receiving a modified opinion from auditors. Banias and Kuntadi (2022) present data that also suggest leverage has an impact on the issuance of modified opinions. Chen and Church (1992) point to a positive relationship between the level of leverage and the likelihood of receiving a modified audit opinion. Simamora and Hendarjatno (2019) similarly reports findings that leverage has a positive effect on the likelihood of auditors issuing a modified opinion. Consequently, the following research hypothesis is formulated:

H3: There is a statistically significant interdependence between the type of audit opinion and the leverage of the company.

2.4. Company size

Company size represents a descriptive characteristic of a company, i.e., a non-financial, qualitative piece of information. Company size can be defined in several ways, such as by the volume of assets a company holds (Bahri & Amnia, 2020) or by the number of employees. In our study, company size will be assessed according to the criteria outlined in the *Law on Accounting of the Republic of Serbia* (2021), specifically based on the number of employees, the size of revenue, and the size of business assets (total assets). A company must meet at least two of the three criteria to be classified in a specific category.

It should be noted that the relationship between the type of audit opinion and the size of the client company has rarely been examined in previous research (Diab et al., 2021), and this study will attempt to address this research gap. Laitenen and Laitenen (1998) concluded that unmodified audit opinions are positively associated with the number of employees. Company size was used as a non-financial variable by Mutchler (1986) to develop a predictive model for the type of audit opinion issued to a company. Mutchler (1986) emphasised that companies receiving modified audit opinions were smaller in size compared to those receiving unmodified opinions. Tsipouridou and Spathis (2014) found that company size in Greece is among the significant factors determining the type of audit opinion received, with smaller companies being more likely to receive modified opinions. Carcello and Nagy (2004) discovered that large American client companies may have greater bargaining power, allowing them to persuade auditors to issue unmodified opinions. In line with the above, the following research hypothesis is:

H4: There is a statistically significant interdependence between the type of audit opinion and the size of the company.

2.5. Company growth

Company growth can take various forms, such as market growth, asset growth, financial growth, and growth in terms of size or profitability. In this study, company growth will be considered solely from the perspective of total asset growth, following the approach applied in Özcan's (2016) study. Accordingly, growth will be quantified by taking into account the change in total assets in each year compared to the preceding year.

Laitenen and Laitenen (1998) suggest that a lower growth rate of a company decreases the likelihood of receiving an unmodified audit opinion, and increases the likelihood of receiving a modified opinion. Özcan (2016) states that higher growth rates increase the likelihood of receiving an unmodified audit opinion, whereas lower growth rates increase the likelihood of receiving a modified opinion. Additionally, Gaganis et al. (2007) report results indicating that companies with lower growth rates are more likely to receive a modified audit opinion. Mawaddah et al. (2023) found a degree of interdependence between

company growth and the type of audit opinion issued. Based on the above, the following, and final, research hypothesis can be formulated:

H5: There is a statistically significant interdependence between the type of audit opinion and the company's growth rate coefficient.

2.6. Auditing environment in developing countries and Serbia

While factors influencing the type of audit opinion, such as profitability, liquidity, leverage, and company size, have been extensively covered in the international literature (DeFond et al., 2002; Knechel et al., 2015), research in the context of developing countries reveals additional, institutionally determined factors that shape auditing practices (Al-Ajmi, 2009). In these economies, significant roles are played by regulatory specifics, financial reporting transparency, the capacity of supervisory bodies, and the presence of foreign investors.

Serbia, as a transitional country, faces challenges in implementing International Financial Reporting Standards (IFRS) and International Standards on Auditing (ISA). Although the legal framework is formally aligned with these standards, auditing practices are often limited by institutional weaknesses, such as an inefficient capital market and underdeveloped corporate governance mechanisms. An additional challenge in the Serbian context is the issue of applying fair value accounting, which is particularly pronounced in an environment where market prices are not always available, and capital markets are shallow and illiquid. Bonić et al. (2022) show that such conditions cause volatility in financial statements and complicate the assessment of the accuracy of the data used by auditors in the process of forming an opinion.

Developing countries, including Serbia, are often faced with weak regulatory body efficiency, a limited number of trained auditors, and occasional conflicts of interest. These factors raise questions about the auditors' ability to fully apply professional standards and, therefore, the informative value of quantitative indicators such as return on assets, liquidity, or leverage (Banimahd et al., 2013; Francis & Wang, 2008). In other words, although these indicators are significant in developed economies, their applicability in the context of countries with limited supervisory mechanisms may be questionable.

One of the key questions that arises is: do traditional financial indicators have the same predictive power for audit opinions in institutional environments with weaker frameworks? Additionally, the significance of the presence of the Big Four audit firms gains an additional dimension in developing countries, where their reputation may serve as compensation for the shortcomings of the local regulatory system. Francis & Wang (2008) show that the protective role of the Big Four firms is more pronounced in countries with weaker legal systems, which could also be the case with Serbia.

Technological changes also bring new challenges. According to research by Vuković et al. (2023), the application of digital tools in auditing (such as big data analysis, artificial intelligence, and blockchain) requires significant changes in procedures and additional training for auditors in Serbia. This digital transition is still in its early stages, and its full implementation requires time and institutional support.

All of the above opens up space for additional research questions and a deeper analysis in both academic and practical terms. Although the variable of audit opinion type itself and the associated financial indicators are not new, their analysis under the institutional specificities of Serbia and developing countries can make a significant contribution to the scientific literature.

3. RESEARCH SAMPLE AND METHODOLOGY

For the purposes of the study, a sample consisting of 52 companies was formed. This was obtained through targeted sampling from the population of business entities registered in the Republic of Serbia whose audit reports are publicly available via the Serbian Business Registers Agency ([SBRA], 2024). The criteria applied included: (1) the obligation to audit financial statements in accordance with accounting law, (2) the availability of complete financial statements and audit opinions for all three observed years, and (3) affiliation with the real sector, with the exception of insurance companies, which were included due to their specific balance sheet structure and stricter regulatory framework. Of these, 14 are micro enterprises, 9 are small, 12 are medium-sized, and 17 are large enterprises. Such a sample structure allows for the examination of the potential impact of company size on the likelihood of receiving a modified or unmodified audit opinion. Company size is frequently cited in the literature as a significant

factor, as it affects internal monitoring, the quality of financial reporting, and transparency. Larger companies typically have more developed accounting and monitoring mechanisms, which may influence the audit outcome, whereas smaller companies may have limited resources and a higher risk of irregularities. The criteria for classifying companies by size were based on those set out in the *Law on Accounting of the Republic of Serbia (2021)*, as presented in Table 1. It should be noted that at least two of the three specified criteria must be met for a company to be classified into a particular group.

Table 1: Criteria for classifying companies by size

Size	Average number of employees	Business revenues	Total assets
Micro	≤ 10 employees	≤ 700,000 euros	≤ 350,000 euros
Small	> 10 and ≤ 50 employees	> 700,000 and ≤ 8,000,000 euros	> 350,000 and ≤ 4,000,000 euros
Medium	> 50 and ≤ 250 employees	> 8,000,000 and ≤ 40,000,000 euros	> 4,000,000 and ≤ 20,000,000 euros
Big	> 250 employees	> 40,000,000 euros	> 20,000,000 euros

Source: Authors, based on the Law on Accounting of the Republic of Serbia (2021)

In terms of industry composition, the sample includes 18 companies operating in the food and beverage sector, 10 companies from the transportation and infrastructure sector, 13 from the construction sector, 6 trading companies, and 5 insurance companies. The aim of such a selection is to include sectors with diverse financial, regulatory, and operational characteristics that may influence the type of audit opinion issued. For instance, industries with complex business models and long operating cycles, such as construction or infrastructure, often face challenges related to asset valuation and revenue recognition, which may be relevant for auditors when forming their opinion. By including multiple sectors, the study ensures comparative analysis and greater external validity of the findings. This structure enables the analysis of potential differences in audit procedures and outcomes depending on sectoral and organisational characteristics. All the companies included in the sample are subject to audit, as all the micro and small companies in the sample are listed on the Belgrade Stock Exchange and, as such, regardless of their size, are required to undergo external audits of their financial statements. Regarding the sample structure in terms of

the legal form of the companies, there are 8 limited liability companies, while the remaining 44 are joint-stock companies. Additionally, of the 52 companies included in the sample, 18 are unlisted companies, while the securities of the remaining 34 are traded on the financial market.

The time period covered by the study spans from 2020 to 2022, a total of three years, with company performance observed at the end of each year. This is due to the fact that the subject of analysis comprises financial statements and audit reports, which are published at the end of the financial year. Given that the performance of 52 companies is observed over a three-year period, the study includes a total of 156 observations. All financial statements were retrieved from the website of the SBRA (2024), and the data presented in them were processed using the SPSS statistical software (version 27) for social sciences. Consolidated financial statements were used for those companies that prepare such statements.

The chi-square (χ^2) test was used to examine the interdependence between various factors and the type of audit opinion. This involved determining the interdependence between individual factors (expressed as categorical or numerical variables) and the audit opinion (expressed as a categorical variable). Additionally, logistic regression was employed to test the accuracy of predicting the type of audit opinion to be issued to a company based on the factors included in the study.

Regarding the individual factors used in the study, the profitability indicator utilised was the return on assets (ROA) ratio. To assess liquidity, the current ratio (CR), the quick ratio (QR), and the liquid ratio (LR) were calculated. In addition, leverage (LEV) was calculated as the ratio of total liabilities to total equity (assets), while company growth (GROW) was measured as a chain index of the change in total assets in each year compared to the preceding year. The size of the company (SIZE) is a categorical variable determined in accordance with the criteria outlined in the *Law on Accounting of the Republic of Serbia* (2021), as previously mentioned.

In order to more accurately assess the factors that influence the likelihood of receiving a modified or unmodified audit opinion, a binary logistic regression model was applied. The dependent variable in the model is the audit opinion type, coded as a binary variable (0 = unmodified opinion, 1 = modified opinion).

The selection of the model and variables in this study is based on previous empirical works that have examined the factors influencing the type of audit opinion. Studies such as Ruiz-Barbadillo et al. (2004), Knechel et al. (2015), and Al-Thuneibat et al. (2011) employ various quantitative models – from logit and probit models to contingency analysis – to investigate the relationship between financial indicators and the likelihood of receiving a modified opinion.

Many studies use the following independent variables: profitability (typically ROA or net income), current liquidity, leverage, company size, and growth in total assets, as these indicators are often linked to the auditor's perception of risk (Geiger et al., 2021; Mutchler, 1985). For example, Chen et al. (2005) demonstrated that less profitable and highly leveraged companies are more likely to receive a qualified opinion or an opinion with an emphasis of matter.

The chi-square test was applied to examine the statistically significant relationship between the categorical dependent variable (audit opinion type) and the individual characteristics of the company. A similar approach is used in the work of Casterella et al. (2002), which highlights a significant relationship between company size and the likelihood of receiving a modified opinion. Although more recent studies often prefer logistic regression models due to their ability to include multiple variables simultaneously, the chi-square test remains relevant for examining partial relationships when dealing with discrete variables and smaller samples (Hair et al., 2010).

Logistic regression is the most commonly used method in the literature when the dependent variable is qualitative in nature, as is the case with the type of audit opinion (e.g., modified vs. unmodified opinion). This model allows for the estimation of the probability of receiving a particular type of opinion based on a company's financial and non-financial characteristics. Studies such as DeFond et al. (2002), Al-Thuneibat et al. (2011), and Knechel et al. (2015) employ logistic regression to identify factors that increase the risk of receiving a qualified opinion, an emphasis of matter, or an adverse opinion. For instance, Chen et al. (2005) demonstrated that negative financial indicators, such as losses and high leverage, significantly increase the likelihood of receiving a modified opinion. Moreover, logistic models enable the inclusion of multiple independent variables

and the control of interaction effects, thereby offering a more accurate insight into the factors influencing auditors' decisions.

The logistic regression model used in this study can be expressed as follows:

$$OPINION = \beta_0 + \beta_1 ROA + \beta_2 CR + \beta_3 QR + \beta_4 LR + \beta_5 LEV + \beta_6 GROW + \beta_7 SIZE + \beta_8 LEGAL\_FORM + \beta_9 LISTED + \beta_{10} INDUSTRY + \beta_{10} BIG\_4 ,$$

where the dependent variable is:

OPINION – modified or unmodified.

The independent variables include:

ROA (return on assets) – a profitability indicator, which is calculated as the ratio of net profit and total assets;

CR (current ratio), QR (quick ratio), LR (liquid ratio) – liquidity indicators. CR is calculated as the ratio of current assets and current liabilities, QR is calculated as the ratio of current assets minus inventory and current liabilities, and LR is calculated as the ratio of cash and cash equivalents and current liabilities;

LEV (leverage) – ratio of total liabilities to equity;

GROW (growth) – measured as the chain index of total asset change;

SIZE – categorical variable based on national classification (micro, small, medium, large).

In addition to the main predictors, several control variables were introduced to adjust for institutional and structural characteristics that might affect the auditor's decision-making independently of financial indicators. These control variables included:

LEGAL_FORM – whether the company is a limited liability company (LLC) or a joint-stock company (JSC), as audit stringency might differ based on legal structure;

LISTED – whether the company is listed on the Belgrade Stock Exchange (1 = listed, 0 = not listed), to account for increased scrutiny and regulatory oversight of public firms;

INDUSTRY – sector classification (e.g., food and beverage, transport, construction, trade, insurance), incorporated to capture industry-specific risks and reporting practices;

BIG_4 – whether the company's financial reports are examined by an audit firm which belongs to the Big Four or not (0 = yes, 1 = no).

The logistic regression model was run separately for each of the three observed years (2020–2022), and model fit was evaluated using Nagelkerke R^2, along with classification accuracy (confusion matrix). All variables were included simultaneously in the regression model (enter method) to assess their joint explanatory power.

4. RESULTS AND DISCUSSION

4.1. Research results

The hypotheses were initially tested using the chi-square (χ^2) test, followed by logistic regression as an additional multivariate method that integrates all factors included in the analysis. The following section presents the key results, including tests of statistical significance at confidence levels of $\alpha = 0.10$, $\alpha = 0.05$, and $\alpha = 0.01$.

Table 2 presents the results of the chi-square test for the interdependence of the selected factors and type of audit opinion in 2020. The number of observations (52 companies) remained unchanged across all observed years. Additionally, for interpreting the results of the chi-square test, it is considered that there is a weak association if the phi coefficient or Cramer's V is less than 0.25 (25%), a moderate association if the value is between 0.25 (25%) and 0.75 (75%), and a strong association if it exceeds 0.75 (75%). It should also be noted that the phi coefficient is used if both categorical variables in the test have two possible outcomes, forming a 2 × 2 matrix. Otherwise, the value of Cramer's V is used for interpretation.

Table 2: Results of the chi-square test for 2020

Factor	*p*	*φ*	Cramer's *V*	Strength of interdependence
ROA	0.004***	-0.396	—	moderate
CR	0.646	—	0.130	not statistically significant
QR	0.471	—	0.170	not statistically significant
LR	0.030**	—	0.368	moderate
LEV	0.796	—	0.094	not statistically significant
GROW	0.002***	-0.461	—	moderate
SIZE	0.077*	—	0.363	moderate
BIG_4	0.000***	0.527	—	moderate

Note: Significance (p) at the level of 10% (*), 5% (**), and 1% (***); φ = phi coefficient.
Source: Authors

Based on the data presented in Table 2, the results indicate that there is a statistically significant ($p = 0.004 < \alpha = 0.01$) moderate inverse dependence ($\varphi = -0.396$) between profitability (measured by the ROA ratio) and receiving a modified audit opinion. The phi coefficient was used given that a 2 × 2 contingency table was employed. Audit opinions are classified as either modified or unmodified, and companies categorised as profitable or unprofitable. A company is considered unprofitable if its ROA value is negative and profitable if it is positive. The same logic applies to company growth: growth is treated as either an increase or a decrease, where a positive growth index indicates company growth, whereas a negative value indicates a decline. The remaining variables are categorical with multiple levels: liquidity is classified as illiquid, liquid, and very liquid depending on liquidity ratio values; leverage, is categorised as non-indebted, indebted, and over-indebted; and size is divided into three groups: micro and small, medium, and large). As for liquidity, there is a statistically significant ($p = 0.030 < 0.05$) moderate association (Cramer's $V = 0.368$) between the liquid ratio and the type of audit opinion. Additionally, there is a statistically significant ($p = 0.002 < 0.01$) moderate inverse relationship ($\varphi = -0.461$) between company growth and receiving a modified audit opinion. Between company size and the type of audit opinion, there is a statistically significant ($p = 0.077 < 0.10$) moderate relationship (Cramer's $V = 0.363$). When it comes to the interdependence between the auditing firm that conducted the audit (based on whether the firm is a member of the Big Four or not) and the type of audit opinion

issued, a statistically significant (p = 0.000 < 0.01) moderate positive association between these two variables can be observed. Therefore, it can be concluded that the affiliation of the auditing firm with the Big Four plays a significant role in determining the type of audit opinion that will be issued to the audited company.

In Table 3, the results of the chi-square test for the interdependence of all variables used to formulate the research hypotheses and the issued audit opinion are presented. The number of observations remains unchanged (n = 52).

Table 3: Results of the chi-square test for 2021

Factor	p	φ	Cramer's V	Strength of interdependence
ROA	0.004***	-0.395	—	moderate
CR	0.086*	—	0.307	moderate
QR	0.092*	—	0.303	moderate
LR	0.333	—	0.206	not statistically significant
LEV	0.514	—	0.160	not statistically significant
GROW	0.578	-0.077	—	not statistically significant
SIZE	0.242	—	0.284	not statistically significant
BIG_4	0.000***	0.507	—	moderate

Note: Significance (p) at the level of 10% (*) and 1% (***); φ = phi coefficient.
Source: Authors

On the basis of the data presented in Table 3, it can be concluded that the ROA indicator, as well as the current ratio and quick ratio, have some interdependence with the issued audit opinion. Specifically, there is a statistically significant (p = 0.004 < 0.01) moderate inverse interdependence (φ = -0.395) between the ROA indicator and receiving a modified audit opinion. In other words, the more profitable the company, the less likely it is to receive a modified audit opinion. In addition, there is a statistically significant moderate interdependence (p = 0.086 < 0.10 and Cramer's V = 0.307) between the current ratio and the audit opinion, and a similar situation occurs with the relationship between the quick ratio and the audit opinion (p = 0.092 < 0.10 and Cramer's V = 0.303). For the remaining factors examined, no statistically significant relationship with the type of audit opinion was found. This is particularly interesting when considering the relationship between growth and size and the type of audit opinion issued. In

2020, a clear and statistically significant relationship was observed, while in 2021, the results were not statistically significant. Regarding the interdependence between the auditing firm (based on whether the firm is a member of the Big Four or not) and the type of audit opinion, a statistically significant ($p = 0.000 < 0.01$) moderate positive association between these two variables was observed, as was the case in 2020. It is concluded that whether an auditing firm belongs to the Big Four remains a highly relevant factor in determining the type of audit opinion issued to a company in the year under review.

Table 4 presents the results of the chi-square test for the final year of the period covered, 2022. The number of observations remained the same as in the previous two years.

Table 4: Results of the chi-square test for 2022

Factor	*p*	*φ*	Cramer's *V*	Strength of interdependence
ROA	0.000***	-0.486	—	moderate
CR	0.057*	—	0.332	moderate
QR	0.039**	—	0.353	moderate
LR	0.285	—	0.220	not statistically significant
LEV	0.469	—	0.171	not statistically significant
GROW	0.262	-0.189	—	not statistically significant
SIZE	0.569	—	0.197	not statistically significant
BIG_4	0.000***	0.469	—	moderate

Note: Significance (p) at the level of 10% (*), 5% (**) and 1% (***); φ = phi coefficient.
Source: Authors

From the data presented in Table 4, it can be seen that the results of the chi-square test for 2022 are similar to those of 2021. There is a statistically significant ($p = 0.000 < 0.01$) moderate inverse relationship between profitability and receiving a modified audit opinion ($\varphi = -0.486$), indicating that as profitability increases, the likelihood of receiving a modified audit opinion decreases. The current ratio also shows a statistically significant ($p = 0.057 < 0.10$) moderate association with audit opinion (Cramer's $V = 0.332$), while there is also a statistically significant ($p = 0.039 < 0.05$) moderate interdependence between the quick ratio and the audit opinion (Cramer's $V = 0.353$). No statistically significant relationships with the

audit opinion were found in relation to the other factors (liquid ratio, leverage, company growth, and size). In 2022, the variable indicating whether the audit firm belongs to the Big Four continues to retain the significance it held in the previous two observed years. Specifically, whether or not an audit firm is part of the Big Four shows a statistically significant moderate association ($p = 0.000 < 0.01$) with the type of audit opinion issued in 2022 as well.

If the aggregate data for all three observed years are considered, it is clear that there is a statistically significant moderate inverse relationship between profitability measured by the ROA indicator and receiving a modified audit opinion. However, the only factor that did not show a statistically significant relationship with the audit opinion in any of the observed years is leverage, which suggests that, based on the results of the chi-square test, this indicator does not have an interdependence with audit opinion. Furthermore, the current ratio and quick ratio show marginally statistically significant and statistically significant relationships, respectively, with the type of audit opinion in 2021 and 2022, i.e., in the years following the COVID-19 pandemic, which may indicate that this is a consequence of the stabilisation of company operations. This assertion is supported by the fact that only in 2020 was there a statistically significant relationship between the liquid ratio, growth, and company size, on the one hand, and the type of audit opinion issued, on the other. Such a situation may also be a result of the COVID-19 pandemic, considering that cash operations were hindered under such a crisis, and company growth was uncertain in the year the pandemic began.

Considering the type of data used in this study, the literature review, and the number of variables involved, it is possible to perform a logistic regression analysis to predict the issuance of a modified or unmodified audit opinion based on the individual factors analysed in the study. In this case, logistic regression was applied to the entire sample, across all three observed years. As mentioned earlier, the independent variables included in the logistic regression were the following factors: return on assets, current ratio, quick ratio, liquid ratio, leverage, company growth coefficient, size, legal form, industry, and whether the companies were listed or not. The dependent variable was the type of audit opinion (modified or unmodified). The results of the logistic regression are presented below.

Firstly, in Table 5, the values of the coefficient of determination are presented for the observed years. Subsequently, classification tables of the regression model used are presented, broken down by year.

Table 5: Coefficients of determination by year

Nagelkerke R^2		
2020	**2021**	**2022**
0.856	0.390	0.645

Source: Authors

As shown in Table 5, the Nagelkerke R^2 results indicate that, in all three observed years, the created regression model adequately describes the observed phenomenon, accurately predicting the type of audit opinion issued based on the factors included in the regression model, with Nagelkerke R^2 exceeding 50% in two out of the three observed years, while approaching 50% in the third (0.390 in 2021).

Table 6 presents the classification table of the logistic regression model for 2020, showcasing the validity of the regression model itself, i.e., the model's accuracy in predicting whether a company will receive a modified or unmodified audit opinion based on the observed independent variables.

Table 6: Classification table for 2020

		The type of audit opinion (prediction)		**% of accuracy**
		Unmodified	**Modified**	
The type of audit opinion (real)	**Unmodified**	27	0	100.00%
	Modified	25	0	0.00%
Total %				51.90%

Source: Authors

Table 6 demonstrates that the logistic regression model achieves a satisfactory level of predictive accuracy, with a value of 51.90% for the observed year. In other words, based on all the factors included in the analysis, it is possible to predict whether a company will receive a modified audit opinion with an accuracy of

51.90%. It can also be observed that the regression model correctly classified 27 companies that received an unmodified opinion, while no companies were correctly classified as receiving a modified opinion. However, a limitation of the regression model is the fact that 25 companies, i.e. nearly 50% of the analysed companies, received a modified opinion, but the model classified them in the group of companies with an unmodified opinion. This discrepancy could be problematic, as it is generally considered more undesirable for the model to predict an unmodified opinion for a company that actually received a modified one, rather than the reverse. In practice, it is highly unfavourable when an unmodified opinion is issued to a company despite grounds for a modified opinion. Furthermore, no companies that received an unmodified opinion were misclassified as companies that received a modified audit opinion. It is observed that a relatively large number of audited companies were misclassified by our logistic regression model, indicating that the model generated incorrect predictions. This result can be explained by the exceptional circumstances during that year, particularly due to the outbreak of the COVID-19 pandemic. The pandemic had multifaceted effects on business operations, including supply chain disruptions, declining demand, rising costs, and reduced labour availability. These circumstances likely affected the financial stability of companies and created more challenging conditions for audit procedures, which may have resulted in more frequent issuance of qualified or adverse opinions. Furthermore, in such times of crisis, auditors may exhibit heightened professional scepticism, potentially leading to stricter evaluations of financial statements and a lower prevalence of unmodified opinions.

In Table 7, data is presented on the accuracy of the regression model for 2021, with the number of observations and the number of observed factors remaining unchanged. It is important to note that the value of the determination coefficient for this year is the lowest, at 57.4%, meaning that 57.4% of the changes in the observed phenomenon are explained by the regression model, while the remaining changes are the result of the influence of factors not included in the model.

Table 7: Classification table for 2021

		The type of audit opinion (prediction)		% of accuracy
		Unmodified	**Modified**	
The type of audit opinion (real)	**Unmodified**	12	16	42.90%
	Modified	0	24	100.00%
Total %				69.20%

Source: Authors

For 2021, a notable improvement is observed in the accuracy of the regression model. Specifically, the overall accuracy of the model is 69.20%, indicating that the model successfully predicts whether a company will receive a modified or unmodified audit opinion based on the factors representing the independent variables. The classification table shows that 36 companies were correctly classified, while 16 were misclassified. The 12 companies that the model correctly predicted belong to the group of companies that received an unmodified opinion, and 24 companies that the model accurately predicted belong to the group that received a modified opinion. However, 16 companies that received an unmodified opinion were misclassified by the model as receiving a modified opinion, and no companies that received a modified opinion were incorrectly classified in the group of companies that received an unmodified opinion. This represents a significant improvement compared to the model's prediction for 2020.

Finally, Table 8 presents the data on the accuracy of the logistic regression model for 2022, taking into account that the coefficient of determination in this year was 0.640, which is lower than in 2020 but higher than in 2021.

Table 8: Classification table for 2022

		The type of audit opinion (prediction)		% of accuracy
		Unmodified	Modified	
The type of audit opinion (real)	Unmodified	23	7	76.70%
	Modified	3	19	86.40%
Total %				80.80%

Source: Authors

The data presented in Table 8 indicate that the overall accuracy of the created regression model is at a satisfactory level, as the model correctly predicted the audit opinion for 80.80% of the observed companies: 23 companies received an unmodified audit opinion, which the regression model classified correctly, while 19 companies that received a modified audit opinion were also correctly classified by the regression model. However, 10 companies were misclassified, meaning the regression model incorrectly predicted the type of audit opinion they would receive. Specifically, 7 companies that actually received an unmodified audit opinion were classified as modified opinion, while 3 companies that received a modified audit opinion were incorrectly predicted to receive an unmodified audit opinion.

4.2. Discussion

Based on the findings of this study, conclusions can be drawn regarding the confirmation or refutation of the proposed hypotheses. The first hypothesis (H1: There is a statistically significant interdependence between the type of audit opinion and the profitability of the company) has been confirmed, given the results of the chi-square test. The chi-square test results showed that, in all three observed years, there was a statistically significant inverse interdependence between the profitability of the company, measured by the ROA indicator, and receiving a modified audit opinion. The results indicated that the higher the profitability of the company, the lower the likelihood of receiving a modified audit opinion, and vice versa. Therefore, the findings of this study are consistent with the results of earlier studies (Aryantika & Rasmini, 2015; Caramanis & Spathis, 2006; Dopuch et al., 1987; Ha et al., 2016; Handayani et al., 2023; Kirkos et al., 2007; Laitinen & Laitinen, 1998; Özcan, 2016). Additionally, the results of

the logistic regression show that the regression model, which included the ROA ratio indicator as an independent variable for the observed companies, adequately predicted in all three years whether the companies would receive a modified or unmodified opinion.

Regarding the second hypothesis (H2: There is a statistically significant interdependence between the type of audit opinion and the liquidity of the company), it can be concluded that, based on the results of the chi-square test, this hypothesis is also confirmed. Specifically, the research results showed that, in 2020, there was a statistically significant moderate interdependence between the type of audit opinion and the liquid ratio of the company, while in 2021 and 2022, there was also a moderate interdependence between the type of audit opinion issued and liquidity, as measured by the current ratio and quick ratio. Considering the results of the chi-square test analysis as well as the additional multivariate analysis using logistic regression, it can be concluded that these findings are consistent with the results of previous studies (Dopuch et al., 1987; Ireland, 2003; Januarti & Fitrianasari, 2008; Mawaddah et al., 2023; Özcan, 2016; Reynolds & Francis, 2000; Spathis, 2003).

The third hypothesis (H3: There is a statistically significant interdependence between the type of audit opinion and the company's leverage) cannot be confirmed based on the results of this study; in other words, this research hypothesis is refuted. The results of the chi-square test were not statistically significant in any of the observed years with respect to the interdependence between leverage and the type of audit opinion issued. Therefore, based on the results of this study, it can be concluded that the type of audit opinion issued, modified or unmodified, is not influenced by whether the company is indebted or not. These results support the auditor's objectivity and independence, indicating that even companies identified as over-indebted may receive an unmodified audit opinion provided their financial statements have been prepared objectively and in good faith. These findings contrast with the results of previous research (Banias & Kuntadi, 2022; Chen & Church, 1992; Ha et al., 2016; Lennox, 2000; Özcan, 2016; Simamora & Hendarjatno, 2019).

Based on the presented results, it is concluded that the fourth hypothesis (H4: There is a statistically significant interdependence between the type of audit

opinion and the size of the company) is partially confirmed. Although the chi-square test showed a moderate statistically significant interdependence between the type of audit opinion issued and the size of the company in 2020, no statistically significant interdependence was found between these two variables in 2021 and 2022. However, since the 2021 result did not substantially deviate from statistical significance (p = 0.134), it can be concluded that there is some degree of association between the size of the company and the category of audit opinion issued to the company. These results confirm the findings of previous studies (Carcello & Nagy, 2004; Diab et al., 2021; Laitinen & Laitinen, 1998; Mutchler, 1986; Tsipouridou & Spathis, 2014).

The fifth hypothesis (H5: There is a statistically significant interdependence between the type of audit opinion and the company's growth rate) is also partially confirmed based on the results of this study. Taking into account the results of the chi-square test, similar to the findings for the fourth hypothesis, in 2020 there was a moderate statistically significant interdependence between the type of audit opinion issued and the growth of the company, measured as the chain index of the company's asset change. This supports the hypothesis. In contrast, no statistically significant relationship was found between these two observed variables in 2021 and 2022. Moreover, unlike the previous hypothesis, the chi-square test results for 2021 and 2022 were not close to the level of statistical significance, while the results for 2020 were highly significant at the 99% confidence level (p = 0.002). These results are therefore consistent with the findings of previous studies (Gaganis et al., 2007; Laitinen & Laitinen, 1998; Mawaddah et al., 2023; Özcan, 2016).

5. CONCLUSION

This study analysed 52 companies, of of varying sizes and sectors. The results indicate no statistically significant relationship between leverage and the type of audit opinion issued, which contrasts with previous studies. However, the study confirmed the findings of previous studies regarding profitability, liquidity, size, and growth of the company, all of which showed a statistically significant interdependence with the audit opinion issued.

The results presented in this study have both theoretical and practical implications. Theoretically, the contribution of the study lies in expanding

understanding of the importance of the analysed factors in the context of the type of audit opinion issued to the company, potentially indicating whether a company will receive a modified or unmodified opinion. This is important because this understanding can help quantify audit opinions and the likelihood of their issuance, even though audit opinions are qualitative categories. By linking audit opinions with these factors, it becomes possible to make meaningful interpretations of data that are otherwise qualitative. The practical implications of the study lie in its contribution to the management of companies, auditors, users of financial and audit reports, as well as business partners such as customers and suppliers. For company managers, by considering the factors analysed in the study, they can predict whether the company will receive a modified or unmodified audit opinion. This can be particularly facilitated through the logistic regression analysis conducted in the study. In this way, managers can monitor operational accuracy and take steps to prevent a modified audit opinion. The results of the study may be valuable for external auditors, as they can take into account the factors that show some interdependence with the type of audit opinion issued. This can assist in further verifying or confirming their decision to issue a modified or unmodified audit opinion. Users of financial statements, especially current and potential investors, can use the results of this study to make decisions about investing in or withdrawing funds from a particular company. By reviewing the factors analysed in the study, investors can easily assess the company's operations and obtain relevant information for their decision-making process, identifying any potential irregularities in the company's operations that could lead to the issuance of a modified audit opinion, which would affect the investors' interests. A similar situation applies to the implications of the results of the study for the company's customers and suppliers. By analysing the factors that may indicate the type of audit opinion that will be issued to the company, as well as potential operational irregularities, they can decide whether to initiate, continue, or terminate their business relationship with the company.

However, this study has certain limitations. Specifically, the analysis was conducted on a sample of 52 companies over a three-year period, resulting in a total of 156 observations. The reason for conducting the study over a period of only three years is the availability of data on the website of the Serbian Business Registers Agency (2024), as the earliest available audit reports at the time of writing this paper were for the year 2020. Additionally, company growth was

measured as the change in business assets (total assets) in each year compared to the preceding year. It is possible that the results of the study would have been different if, instead of measuring growth in this way, it had been measured using alternative indicators, such as the change in the number of employees, changes in profit (net result), operating performance, or market share in each year compared to the preceding year.

Future research in this area could involve a larger sample, including all public joint-stock companies in the Republic of Serbia, a greater number of limited liability companies, as well as companies from neighbouring countries that are subject to financial statement audits. Additionally, the study period could be extended, if relevant data are available, as the current study covered only a three-year period. Regarding the factors whose interdependence with the type of audit opinion issued was examined, the results might be more reliable if additional factors were included in the study, or if some of the existing factors were calculated differently, such as the aforementioned company growth factor. Furthermore, future steps in exploring this area of financial statement auditing could involve the application of additional, more complex statistical methods.

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