UNIVERSITY OF BELGRADE
Faculty of Economics
and Business

ECONOMIC ANNALS

EKONOMSKI ANALI, FOUNDED IN 1955
BY THE FACULTY OF ECONOMICS, UNIVERSITY OF BELGRADE
VOLUME LXIX, NO. 243 / OCTOBER – DECEMBER 2024

243

UDC: 3.33 ISSN: 0013-3264

ECONOMIC ANNALS

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Website: *http://www.ekof.bg.ac.rs/publikacije/casopisi/ekonomski-anali/*

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The journal is published quarterly
Annual subscription: 2400 RSD
Account No. 840-1109666-73
(Faculty of Economics and Business, Belgrade)
Circulation: 100 copies
UDC: 3.33 • ISSN: 0013-3264

Print

JAVNO PREDUZEĆE „SLUŽBENI GLASNIK" – Beograd, www.slglasnik.com

ECONOMIC ANNALS, Volume LXIX, No. 243 / October – December 2024
UDC: 3.33 ISSN: 0013-3264

https://doi.org/10.2298/EKA2443007V

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GREENING OF SMEs IN WESTERN BALKAN COUNTRIES – EVIDENCE FROM FIRM-LEVEL ANALYSIS

ABSTRACT: *The primary objective of this paper is to explore the determining factors and challenges that SMEs face in implementing green measures. A key focus is on identifying which SMEs, as key players in the enterprise sector, could potentially play a dynamic role in the green transition in the Western Balkan countries. To achieve this, a multinomial logit analysis was conducted on a sample of 1,160 firms from Montenegro, Serbia, North Macedonia, Bosnia and Herzegovina, and Albania. The results obtained reveal that internal factors (such as innovation and strategic orientation) and external factors (such as regulatory pressures and competition) significantly influence the adoption of green measures, particularly those that are more capital-intensive. The paper contributes to the literature by highlighting the complex interplay among firm characteristics, external factors, and the adoption of green practices.*

KEY WORDS: *SMEs, EU greening policies, Western Balkans, firm-level analyses*

JEL CLASSIFICATION: D22, F61, L25

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1. INTRODUCTION

The ambitious European Green Deal (EGD) (European Parliament [EP], 2020) aims to introduce climate-neutral policies and actions at all societal levels, including the enterprise sector, which is critical in reducing greenhouse gas emissions by 2050. Greening policies and digitalisation, the so-called big "twin transitions", are two main policy flagship initiatives with which the European Union (EU) is hoping to achieve climate neutrality by the year 2050. These policies also affect the Western Balkan (WB) countries with aspirations of joining the EU, especially those already in accession negotiations, and which have to align their policies with the EU ecosystems. Moreover, the WB countries have signed the Green Agenda for the Western Balkans (EP, 2020), which aligns completely with the EGD, encompassing five pillars: (1) reducing greenhouse gas emissions; (2) promoting a circular economy; (3) reducing air, water, and soil pollution; (4) fostering sustainable food production; and (5) protecting biodiversity and ecosystems (European Commission, 2023b). As a result, the WB region is undergoing significant reforms to align with EU green policies[1].

Climate change and environmental degradation significantly affect small and medium-sized enterprises (SMEs), with firms increasingly adopting sustainable practices globally, recognising the benefits of innovation and environmental responsibility rather than just complying with regulations. Global challenges such as frequent extreme weather conditions, rising heat, resource scarcity, and new laws and regulations promoting a more environmentally sustainable economy significantly affect SMEs' resilience, productivity, and profitability (Saget et al., 2022). As the most vibrant part of the enterprise sector, SMEs are recognised as critical actors in the green transition process, also in the WB region. Some progress towards that direction has been recorded, but it is still very modest, according to the OECD (2022) and the European Bank for Reconstruction and Development (EBRD, 2023).

The literature on transitioning to eco-friendly business practices is interdisciplinary, mainly incorporating environmental science, economics, and political economy. It is rather vast and well-evidenced and provides valuable

[1] Energy Community 2006–2023 provides a detailed overview of the progress of the National Energy and Climate Plans (NECPs) in each WB country.

insights into how and why firms transform their practices, products, and services to go green. In general, greening the business implies adopting environmentally friendly practices that aim to reduce negative environmental impacts while promoting efficient use of resources (Hoogendoorn et al., 2020). The existing research shows that going green not only benefits the environment but also contributes to the sustainable long-term growth and financial success of firms (Ambec & Lanoie, 2008; Bartolacci et al., 2020; Demirel et al., 2019; Hoogendoorn et al., 2020; Martín-de Castro et al., 2016).

The main goal of this paper is to assess progress in greening SMEs in the WB region, which still lacks more significant coverage in the literature. The focus is precisely on the group of ex-Yugoslav states that are in accession negotiations with the EU (i.e. Montenegro, Serbia, North Macedonia, and Bosnia and Herzegovina), plus Albania. Moreover, SMEs are of great importance to this region's economy, accounting for nearly 99% of all firms, producing over 60% of the value-added, and contributing to 75% of employment (OECD, 2022). It is therefore important to gain insights into what drives (or halts) them on their path of green transition.

The research questions (RQ) that are explored are the following:

RQ1: Can SMEs be the primary dynamic agents of the green transition?

RQ2: On which factors does the greening of the WB SMEs depend?

In order to explore these RQs, an econometric analysis was conducted to determine the factors influencing firms to implement various green measures by using the World Bank Group Enterprise Survey 2019 as the primary data source, supplemented when possible with newer data. The advantage of this database edition is that, along with topics such as standard areas (e.g. access to finance, corruption, infrastructure, labour, and performance measures), it offers a module on the green economy with a wide array of information on significant aspects related to environmental issues from the firm perspective.

The outline of the paper is as follows. After the Introduction, Section 2 offers an overview of recent literature on SMEs' contribution to green development at the EU level. Further, Section 3 provides a comparative analysis of the existing

institutional framework for green transition in selected WB countries, focusing on policies aimed at SMEs. In Section 4, an econometric analysis of the determinants of WB firms that pay significant attention to environmental issues is performed, followed by a discussion of the results' implications. Finally, Section 5 concludes.

2. BRIEF OVERVIEW OF THEORETICAL AND EMPIRICAL BACKGROUND OF EU GREENING POLICIES

Numerous empirical studies on climate change impacts have provided abundant evidence for pushing the policy agenda to tackle the societal threats caused by climate change. The European Commission (EC) considers the EGD a vital part of its new green industrial policy. Thus, in early 2023, it presented a Green Deal Industrial Plan (EC, 2023a), which intends to improve the competitiveness of Europe's industry as it pursues such a transition.

The EGD resolution (EP, 2020) identified specific business opportunities for SMEs' participation in a greener value chain. They are found in re-manufacturing, repair, maintenance, recycling, and eco-design, which, from this perspective, have great potential to become drivers of economic growth and job creation while, at the same time, making a significant contribution to addressing environmental challenges (see also the Green Action Plan for SMEs [EC, 2014]). The EC also adopted a specific European SME strategy (EC, 2020a) that aims to mobilise SMEs across EU industrial sectors to realise the objectives of the EGD and by implementing twin digital and green transitions that closely complement each other in achieving a climate-neutral, resource-efficient, and agile economy.

Not only does climate change incur the costs of mitigating business threats, it can also present many business opportunities (e.g. to advance their green technology and innovation). In such a way, SMEs can make an essential contribution to sustainable and resilient economic growth. Koundouri et al. (2023, p. 4) argue in favour of policies that open up opportunities for promoting technological innovation, economic development that is sustainable and environmentally responsible, and job creation in sustainable sectors. However, achieving such a transition requires substantial investments, which must be funded by both the private sector and the government, along with intervention policies and institutional frameworks to support them. Borowiecki et al. (2023, p. 3). further

argue that the shift to clean energy and green business production requires greater integration of electricity and deeper capital markets to support investment in new technologies. Additionally, they point out that moving towards a greener EU will come at a high cost for affected workers. Therefore, policies should aim to make labour reallocation smoother and, in general, to reduce green transition expenses.

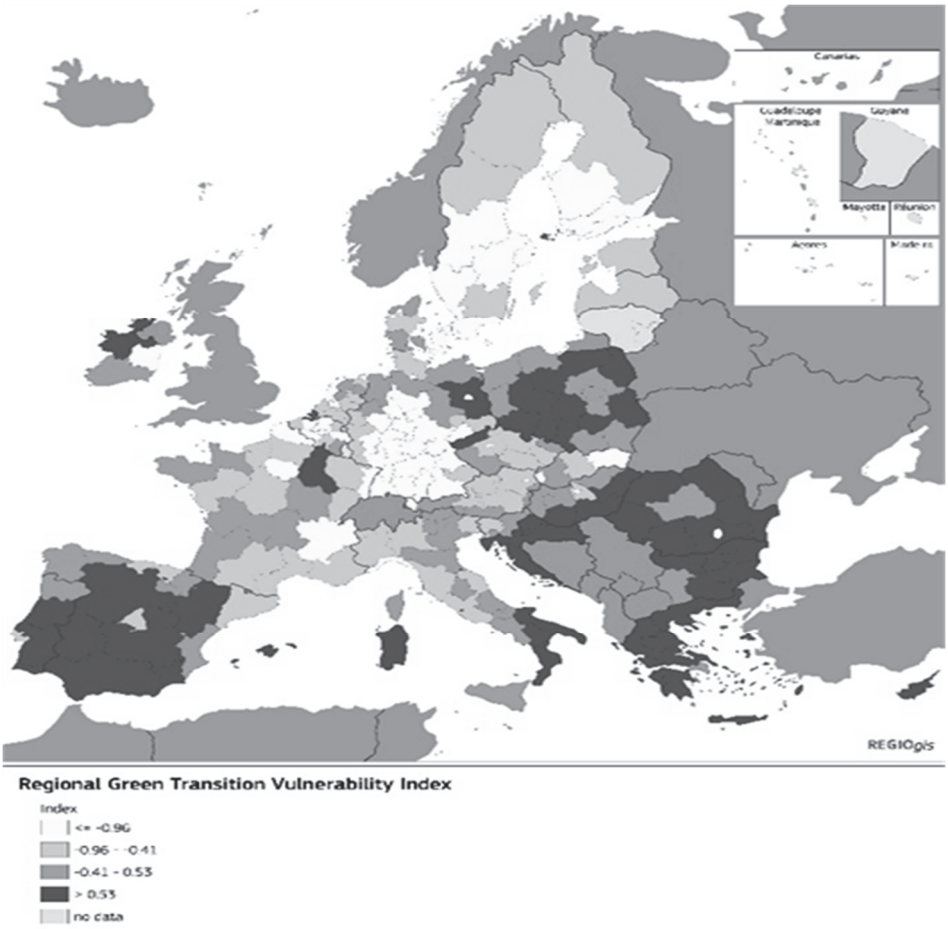
The EU Green Deal Investment Plan (EGDIP) already supports massive investments in green technologies, including those of SMEs. Some of the support funding programmes, such as Horizon Europe, will also be available to assist such a transition in the associated countries of the WB, which are burdened by energy production capacity dating from the 1970s and 1980s, heavy reliance on coal-powered thermal power plants, years of under-investment, and the declining quality of coal, to mention a few (EBRD, 2024).

Altogether, the EGDIP plans to mobilise at least €1 trillion in sustainable investments over the next decade to tackle climate change problems. The costs for such a substantial transformation will likely be enormous for society and the business sector, especially SMEs, which are the most vulnerable part of the enterprise sector. The EGDIP, therefore, includes the Just Transition Mechanism (JTM), which, in essence, ensures that the green transition costs are distributed fairly and justly among all those bearing them. This JTM portion of the EGDIP plans to raise a minimum of €100 billion in investments over the period 2021–2027. According to this EC document, most funding will be targeted to support workers and citizens of the regions most impacted by the transition. Rodriguez-Pose and Bartalucci (2023) argued that it is no wonder that the process confronts several potential discontents, especially at the regional level, where great disparities exist. More precisely, Central and Eastern European countries record the highest vulnerability according to the Green Transition Vulnerability Index (see Figure 1).

SMEs in the EU and globally play a crucial role in driving the transition towards an economy that is sustainable, circular, energy-efficient, and powered by renewable energy sources. The EC (2022a) report states that a typical SME emits an average of 67 tons of CO2 and 75 tons of greenhouse gases. Despite the seemingly low absolute emission figures, SMEs' collective share in the total enterprise emissions is high at 63.3%, mostly due to their large numbers.

Furthermore, the size and relative share of SMEs' CO2 emissions vary by sector, where the highest-emitting sectors are manufacturing, electricity, gas, steam, air conditioning supply, transportation, and storage. Thus, SMEs' crucial role in the economy and capability to generate and employ green technologies make them important for achieving energy and resource-efficient sustainability and transition (Koirala, 2019; OECD, 2018).

Figure 1: Regional Green Transition Vulnerability Index

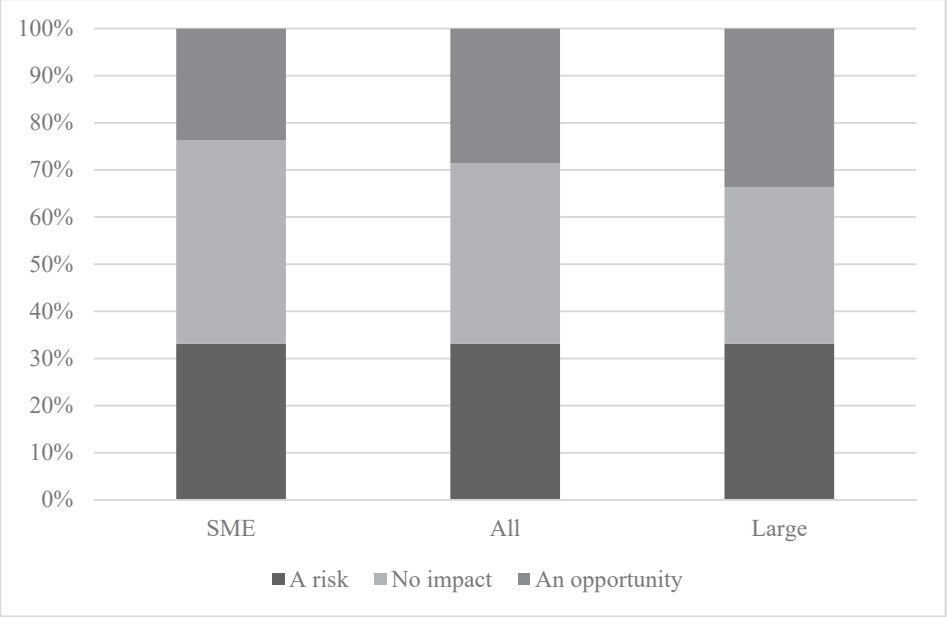


Source: Forging a Sustainable Future Together: Cohesion for a Competitive and Inclusive Europe, European Commission, 2024. https://op.europa.eu/en/publication-detail/-/publication/c6e97287-cee3-11ee-b9d9-01aa75ed71a1/language-en

Due to global trends and regional policies, EU firms are gradually implementing eco-friendly practices, including investing in renewable energy sources, enhancing energy efficiency, improving waste management, etc. The European Investment Bank (EIB) Investment Survey 2023 shows that the percentage of SMEs investing in green measures is slightly lower than that of large companies. However, the trend of investing in green activities is the same – most businesses are investing in waste minimisation and recycling, while the lowest percentage is investing in new, less polluting technologies (EIB, 2023). Therefore, these companies could be seen as eco-adopters, utilising environmental technologies and implementing sustainable business practices; however, it is unlikely that sustainability is part of their core business model, which it is for eco-innovators and eco-entrepreneurs (Koirala, 2019). The greening of such firms encompasses complying with environmental regulations, and the focus should be on providing incentives to go above this minimum (OECD, 2018). Moreover, since the benefits of going green are sector-specific in the case of eco-adopters, it is expected that firm-level obstacles could explain differences in green measures implementation (Koirala, 2019).

Regarding the expected effect of stricter climate regulations on firm performance, most large companies perceive them as a chance to enhance their performance. At the same time, this view is not as widespread among SMEs (Figure 2). As a result, larger corporations, due to their size, can be seen as eco-entrepreneurs who proactively search for new opportunities created by shifts in values, rules, and issues and then develop and market solutions to address them. Moreover, their strategic objectives and incentives differ from those of SMEs, and they typically prioritise achieving greater sustainability as one of their primary business objectives (Koirala, 2019).

Figure 2: Expected impact of stricter climate regulations on firm performance



Source: Authors' compilation based on the European Investment Bank (2023) on the basis of question Q71: *Thinking about your company, what impact do you expect this transition to stricter climate standards and regulations will have on your company over the next five years?*

Another point that deserves special mention concerning the success of the twin transitions approach in Europe is their impact on the competitiveness of the business sector and national/regional economies in general. The competitiveness issue was particularly emphasised in the 2023 Green, Digital and Competitive SME Index produced by the Lisbon Council. The authors of the background policy brief, Hofheinz et al. (2023), argue that EGD goals cannot be achieved without assessing their impact on the overall competitiveness of the enterprise sector and how they impact and contribute to the increase in sustainability and efficiency of the business sector. Some of the goals and adopted policies contradict each other. The authors stress that it is of prime importance, therefore, to mobilise and activate the energy and talent of the private sector, especially the SMEs that should drive such a transition, as they represent more than 90% of all enterprises and employ more than half of total EU labour. The background research concludes that according to the assessed indicators, one could not yet observe a substantial positive link between firms' competitiveness and the green

transition. On the contrary, technology and the energy transition still mainly come in the form of high costs to most SMEs in the EU, which calls for the special attention of policy-makers since such costs could be reduced in the future through increased investment, market opening, smart regulation, and more innovation, which cannot happen overnight.

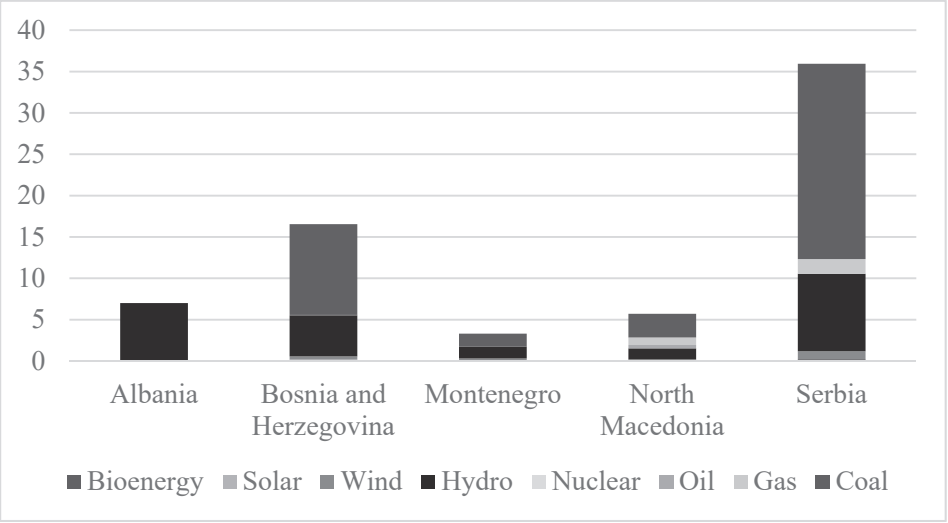
The increased internationalisation process of SMEs in the EU could contribute to the general increase of competitiveness of the EU enterprise sector, as green and ecologically conscious enterprises are better skilled and equipped to deal with strong market competition. They could also contribute to their participation in more sustainable and flexible green global supply chains that are more resilient to disruption and provide a viable alternative to the large multinational enterprises (MNE) that have so far been dominant in global trade and investment relations (EBRD, 2023). Although most of the global economic trade and global value chains (GVCs) have been dominated by MNEs, SMEs' flexibility and adaptability might be a key advantage in the times of economic uncertainty in which the world has lived in the last four years. The global disruptions caused by the COVID-19 pandemic in 2020/2021 showed how quickly EU SMEs adapted to exogenous market shocks. They quickly provided new and innovative products and found valuable market niches that responded to the increased demand caused by global supply and value chain disruptions during the pandemic.

Tagliapietra and Veugelers (2023, p. 1) stress that the European Green Deal will have to foster broad paradigmatic shifts in the EU's industrial structure. Thus, it is often referred to as "an industrial revolution against a deadline". In this context, green industrial policy emerges as a cornerstone of the EGD. As the authors rightly point out, the EU economies face the challenge of reconciling a green industrial policy's various and often conflicting objectives. Designing a successful green industrial policy that effectively combines policy goals such as decarbonisation with economic growth, maintaining employment levels, and striving for global competitiveness and resilience and security of supply might often be an immense challenge, especially in the short term. Needless to say, these challenges are even more demanding for WB countries as there are many more parallel tasks on their reform policy agenda.

3. SME GREENING IN THE WB: SNAPSHOT OF COMPARATIVE INSTITUTIONAL AND POLICY FRAMEWORK

In November 2020, the EC and WB countries endorsed a blueprint for the green transition of the WB called the Green Agenda for the Western Balkans and identified key pillars for achieving environmental sustainability in line with the EGD. Implementing that ambitious agenda relies on necessary regulatory and institutional reforms backed up by substantial investment within the Economic and Investment Plan for the WB. The plan is consistent with EU climate regulations, striving for carbon neutrality by 2050 and meeting energy and climate goals by 2030. The green transition is anticipated to have significant social and economic effects on the WB countries, which have traditionally relied on coal mining. Generally, the WB countries have made limited progress in advancing the Green Agenda due to their dependence on fossil fuels (except Albania). Figure 3 shows electricity production by source, and it is seen that the main source in all countries, except Albania, is coal.

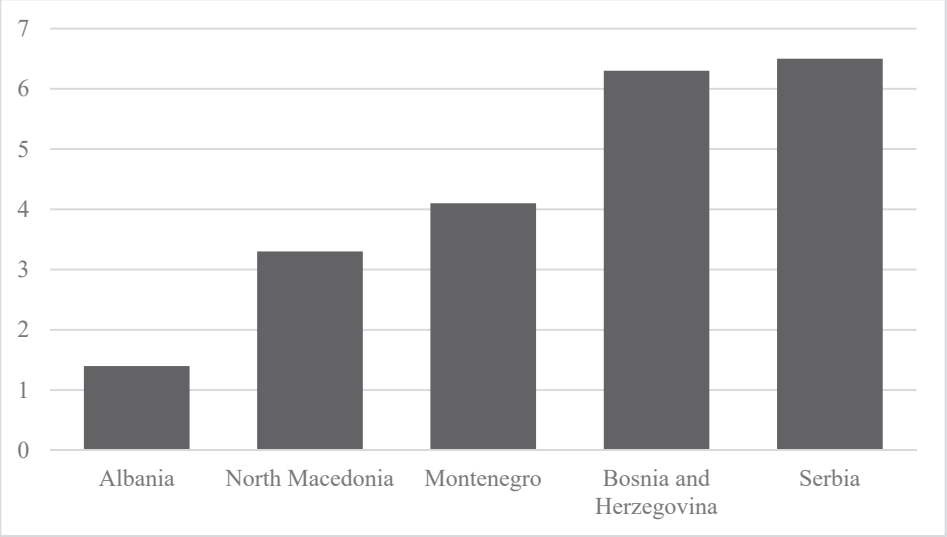
Figure 3: Electricity production by source (TWh)



Source: Our World in Data--Total Electricity Generation (2024).
https://ourworldindata.org/grapher/electricity-production-by-source

As a result of such trends, CO2 emissions are the highest in Serbia and Bosnia and Herzegovina (Figure 4).

Figure 4: CO2 emissions (tCO2/per capita)



Source: IEA. https://www.iea.org/data-and-statistics/data-tools/greenhouse-gas-emissions-from-energy-data-explorer

Since the start of the Green Agenda for the WB in 2021, the EC has assigned €1.25 billion to support its implementation. The Economic and Investment Plan for the WB directs a significant amount of investments towards innovation and green growth of SMEs, especially through the WB Investment Fund, through their programmes SMEs Go Green, Climate Programme, Green Finance for Inclusion, and Green for Growth lending programmes.

The OECD (2022) assessed the changes that had taken place in the region since 2019 when the greening policies were first announced. It assessed the progress in the institutional framework for environmental policies targeting SMEs, including sectoral and innovation policies, and several key findings arose. Firstly, the greening policies had been integrated into strategic national documents with clear goals and dedicated budgets, with energy efficiency and eco-innovations being leading priorities among the set goals. However, SME greening policies had advanced unevenly across countries, mostly due to a lack of government finance for greening policy measures. When looking into the observed cluster of the WB countries, the OECD (2022) considered that the implementation of such policies had progressed the most in Bosnia and Herzegovina, Montenegro, and North

Macedonia, whose governments introduced several measures and financial incentives to support the transformation of environmental ecosystems and the transition towards the green performance of their SMEs. In all these countries, environmental policies are now an integral part of the SME strategies, and energy efficiency and eco-innovation hold a pivotal place. Secondly, there had been a reduction in the funding gap for SME greening through the support of state investment banks. Finally, another interesting finding is that systematic monitoring of behavioural change and concrete results of SME greening policies was still lacking in all the countries, especially when it comes to collecting data (OECD, 2022).

Moreover, according to the survey of Flash Eurobarometer 498 (EC, 2022b), the most common resource efficiency actions undertaken by EU SMEs pursuing the greening goals are minimising waste (64%), saving energy (61%), saving materials (57%), recycling by reusing material or waste within the company (47%), and saving water (46%). The report also provides information on specific SME greening policy actions for the WB countries (with the exception of Bosnia and Herzegovina, see Table 1), where the largest share of firms takes the following actions to be more resource efficient: saving energy, minimising waste, and selling their residues and waste to another company. The data show that the adoption of green measures is markedly lower in the WB than in the EU27. Also, the shares of measures are quite heterogeneous among the WB countries, where, for example, in Albania, almost 50% of SMEs state that they are not undertaking any actions to be more resource efficient. The relatively high share of SMEs in the WB countries reporting such answers could suggest that there may be a lack of financial sources and/or motivation to invest in green measures.

Table 1: SMEs' actions towards being more resource-efficient

Q1 What action is your company undertaking to be more resource efficient?	*EU27*	*HR*	*SI*	*MK*	*ME*	*RS*	*AL*
Saving water	46%	40%	34%	8%	31%	28%	8%
Saving energy	61%	51%	52%	22%	41%	44%	23%
Using predominantly renewable energy (e.g. including own production through solar panels, etc.)	19%	6%	12%	8%	6%	7%	4%
Saving materials	57%	47%	42%	11%	33%	38%	8%
Switching to greener suppliers of materials	33%	24%	34%	8%	25%	19%	6%
Minimising waste	64%	59%	57%	16%	43%	44%	10%
Selling your residues and waste to another company	24%	21%	22%	25%	20%	28%	12%
Recycling, by reusing material or waste within the company	47%	33%	36%	11%	21%	26%	18%
Designing products that are easier to maintain, repair or reuse	26%	25%	17%	8%	17%	17%	9%
None	9%	11%	12%	31%	15%	16%	49%

Source: Flash Eurobarometer 498: SMEs, green markets and resource efficiency (EC, 2022b)
Notes: HR (Croatia); SI (Slovenia); MK (North Macedonia); ME (Montenegro); RS (Serbia); AL (Albania)

According to the OECD (2021), encouraging small businesses to adopt eco-friendly practices is a complex issue since many SMEs prioritise short-term profits over long-term environmental concerns. When it comes to the perceived obstacles to setting up resource efficiency actions, at the EU level, the largest share of SMEs state that the complexity of administrative and legal procedures is the greatest obstacle (Table 2). Among the WB countries, a large share of SMEs also find the lack of specific environmental expertise and supply of required materials, parts, products, or services to be an obstacle.

Table 2: SMEs' perception of difficulties with setting up resource efficiency actions

Q7 Did your company encounter any of the following difficulties when trying to set up resource efficiency actions?	*EU27*	*HR*	*SI*	*MK*	*ME*	*RS*	*AL*
Complexity of administrative or legal procedures	34%	41%	19%	24%	31%	38%	13%
Difficulty to adapt environmental legislation to your company	21%	21%	12%	8%	10%	20%	7%
Technical requirements of the legislation not being up to date	18%	27%	13%	14%	22%	25%	2%
Difficulty in choosing the right resource efficiency actions for your company	21%	14%	12%	10%	11%	17%	12%
Cost of environmental actions	27%	17%	24%	12%	13%	14%	16%
Lack of specific environmental expertise	23%	18%	13%	10%	23%	22%	21%
Lack of supply of required materials, parts, products or services	24%	21%	20%	19%	23%	27%	27%
Lack of demand for resource efficient products or services	20%	23%	16%	12%	24%	20%	9%
Complexity associated with environmental labelling and certification	19%	11%	14%	7%	17%	13%	0%
None	32%	25%	41%	31%	38%	24%	35%

Source: Flash Eurobarometer 498: SMEs, green markets and resource efficiency (EC, 2022b)
Notes: HR (Croatia); SI (Slovenia); MK (North Macedonia); ME (Montenegro); RS (Serbia); AL (Albania)

Next, in both EU and the WB countries, SMEs perceive that grants or subsidies would have the greatest effect as the push factor towards more resource-efficient businesses (Table 3). This highlights the financial constraints' effect on greening businesses, especially among SMEs.

Table 3: SMEs' preferences regarding instruments/policies needed to be more resource efficient

Q8 Which of the following would help your company the most to be more resource efficient?	*EU27*	*HR*	*SI*	*MK*	*ME*	*RS*	*AL*
A tool to self-assess how resource efficient your company is with respect to other companies	15%	7%	4%	4%	10%	7%	6%
Consultancy on how to improve resource efficiency in your company	25%	24%	23%	17%	24%	25%	21%
Grants or subsidies	36%	45%	55%	53%	55%	56%	18%
Advice on funding possibilities and financial planning for resource efficiency investments	20%	28%	26%	22%	30%	16%	19%
Demonstration of new technologies or processes to improve resource efficiency	22%	21%	15%	14%	11%	22%	12%
Database with case studies that show the benefits of resource efficiency for companies	16%	10%	9%	6%	3%	13%	4%
Better cooperation between companies across sectors so that new processes to re-use waste and by-products can be developed	26%	27%	16%	14%	17%	25%	22%
Clearer rules on the use of secondary raw materials	19%	12%	9%	12%	19%	18%	7%
None	17%	13%	18%	10%	16%	11%	31%

Notes: HR (Croatia); SI (Slovenia); MK (North Macedonia); ME (Montenegro); RS (Serbia); AL (Albania)

Source: Flash Eurobarometer 498: SMEs, green markets and resource efficiency (EC, 2022b)

4. ECONOMETRIC ANALYSIS OF CHARACTERISTICS OF GREEN SMES

4.1. Contextual framework for variables selection

Green measures are shown to be adopted differently in SMEs compared to large corporations. Since SMEs have unique characteristics affecting their approach to environmental issues, policymakers can promote green initiatives among SMEs by developing measures that consider such characteristics (OECD, 2018; OECD, 2021). Several internal and external factors influence companies when it comes to taking environmental action. Factors such as green financing, producing environmentally friendly outputs, green production processes, strategic orientation, and norms are only some of the factors that shape their decisions internally. Externally, the government's regulatory and policy frameworks directly and indirectly impact enterprises (Saget et al., 2022).

There is a growing body of literature that focuses on investigating the degree of importance entrepreneurs assign to environmental protection and sustainability (e.g. Aykol & Leonidou, 2015; Chien & Peng, 2012; Hoogendoorn et al., 2020; Nguyen et al., 2023). Despite resource constraints, it is unclear why and which SMEs engage in environmentally friendly practices. It is also unclear whether entrepreneurs who run such businesses are intrinsically motivated or more under pressure from various stakeholders or regulations. Nguyen et al. (2023) explored the differences between firms that adopt environmentally friendly practices for reasons of intrinsic motivation and those that do so due to extrinsic pressures. Their research revealed that women-led companies are more likely to adopt such practices for more intrinsic and extrinsic reasons than those run by men. However, they noted that the relationship weakens with increased market competition.

The factor most often analysed in the literature is the firm’s size, closely related to access to resources. SMEs face challenges in investing in sustainable businesses due to their limited financial resources, while larger companies have more access to resources (see e.g. De Rademaeker et al., 2011; Tritto et al., 2023). The firm's age has also been shown to influence green practices, with older companies going green more than younger ones (Hoogendoorn et al., 2015; Trencansky & Tsaparlidis, 2014). However, the firm's age could also have the opposite effect (Ozturk & Ozen, 2021; Rizos et al., 2016).

Numerous studies have highlighted the significance of considering the sector or industry while analysing the propensity towards going green. For example, Perrini et al. (2007), Uhlaner et al. (2012), Demirel et al. (2019), and Tritto et al. (2023) have emphasised this aspect. Demirel et al. (2019) pointed out that industries, particularly those under stricter regulations, are more likely to be motivated to innovate towards sustainability and green businesses. This is because firms need to adhere to industry-specific environmental regulations and minimise the environmental impact of their industrial processes.

The implementation of green measures is also highly influenced by international trade, which includes direct and indirect exports of firms. Costantini and Mazzanti (2012) and Nguyen and Vu (2024), for example, suggest that firms exposed to global environmental standards are more likely to adopt green measures in order to stay competitive. Export-oriented firms, in particular, do this to gain a competitive advantage. However, participation in GVCs can have a mixed impact on firm-level green practices. While it facilitates the transfer and adoption of greener technologies, it can also result in the shift of polluting activities to less regulated environments (De Marchi et al., 2013).

Next, the different aspects of ownership structure should be included in the analyses, as well as the gender aspect. Type of ownership could impact the implementation of different green measures, where, for instance, foreign-owned companies might face pressure from international environmental standards, leading them to implement green measures (Christmann & Taylor, 2001; Hanousek et al., 2019). Additionally, research has shown that female presence in a company can influence its knowledge management practices and innovation levels (Nguyen & Vu, 2024), implying that companies led by men and those led by women might have different priorities regarding innovation and green measures.

Also, firms with advanced technological capabilities and more financial resources are shown to be better positioned to engage in green innovations (see, e.g., Agostino & Ruberto, 2023; Fernàndez et al., 2018; Wagner, 2017). In particular, access to finance is critical, as investments in green technologies can be substantially capital-intensive (Hoogendoorn et al., 2020). Finally, regulatory framework and pressures from stakeholders, such as customers, suppliers, and

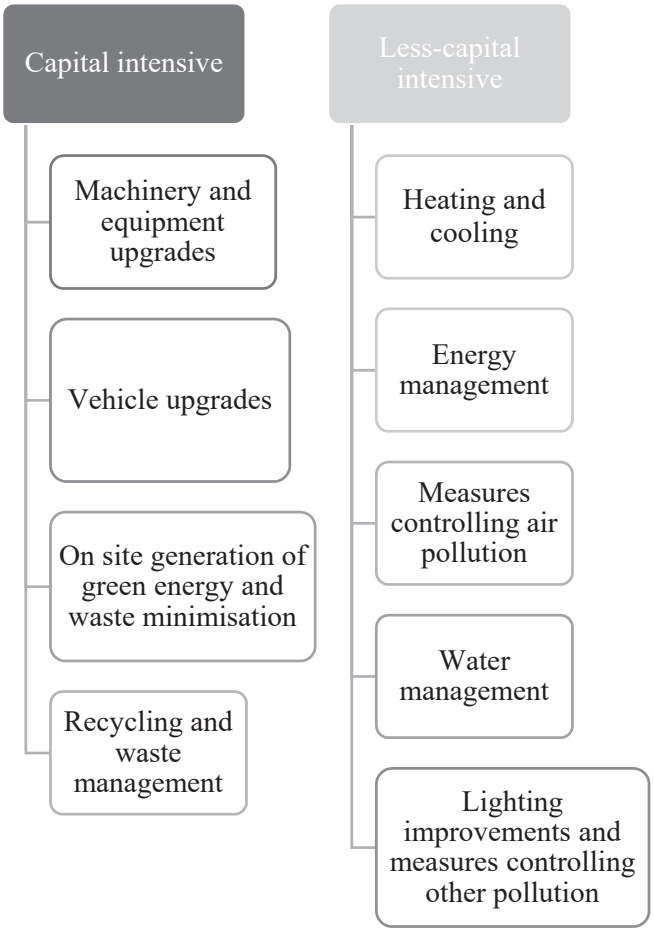
the community, can significantly (de)motivate firms to adopt green measures (Agostino et al., 2023; Hoogendorn et al., 2015).

Research on these issues for the WB countries is scarce and generally focuses on the experiences of individual countries. There is, for example, a paper by Silajdžić et al. (2015), who found that the main determinants of green-oriented firms encompass the owners' or managers' motivation, the firm's location, and a longer-term orientation towards sustainability.

4.2. Data and methodology

The World Bank Enterprise Survey 2019, within its Green Economy Module, provides data regarding businesses adopting environmentally friendly measures (such as upgrading machinery, equipment, vehicles, and on-site energy generation to reduce greenhouse gas emissions; enhancements to heating and cooling systems; waste reduction, recycling, and waste management; energy and water management; air pollution control; lighting systems; and other pollution control measures). These measures can be categorised into two groups, as illustrated in Figure 5. Although the more capital-intensive measures offer long-term benefits, they will probably require significant upfront investment, so it is reasonable to expect that there will be differences in factors that influence SMEs implementing these two types of measures.

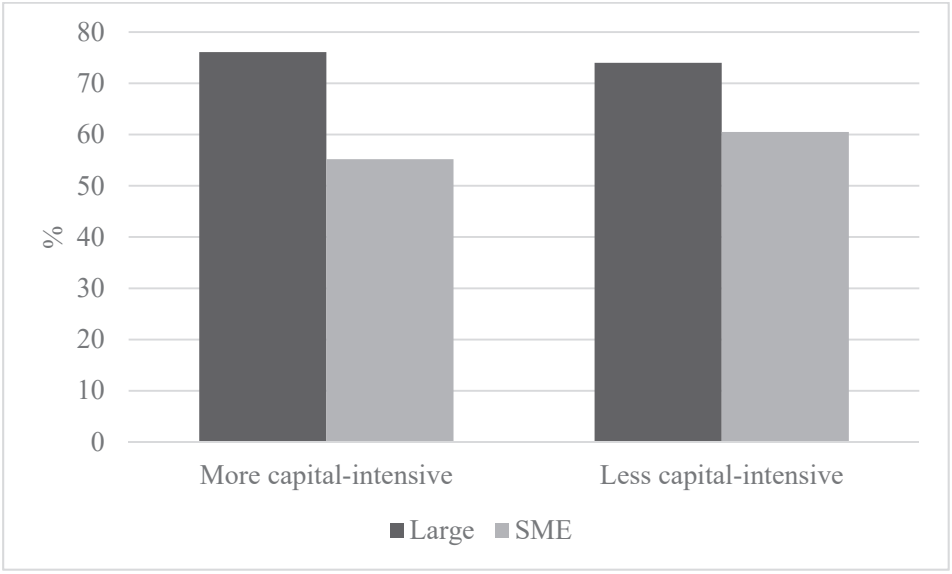
Figure 5: Greening measures from the World Bank Enterprise Survey



Source: Authors' compilation based on the World Bank Enterprise Survey 2019 and Kalantzis et al. (2022)

Figure 6 shows the share of firms with more and less capital-intensive measures at the level of the WB countries selected for the analysis. For the above-mentioned reasons, large firms implement more of each category. However, the share of firms implementing more capital-intensive measures is slightly higher in large firms, while the opposite holds for SMEs.

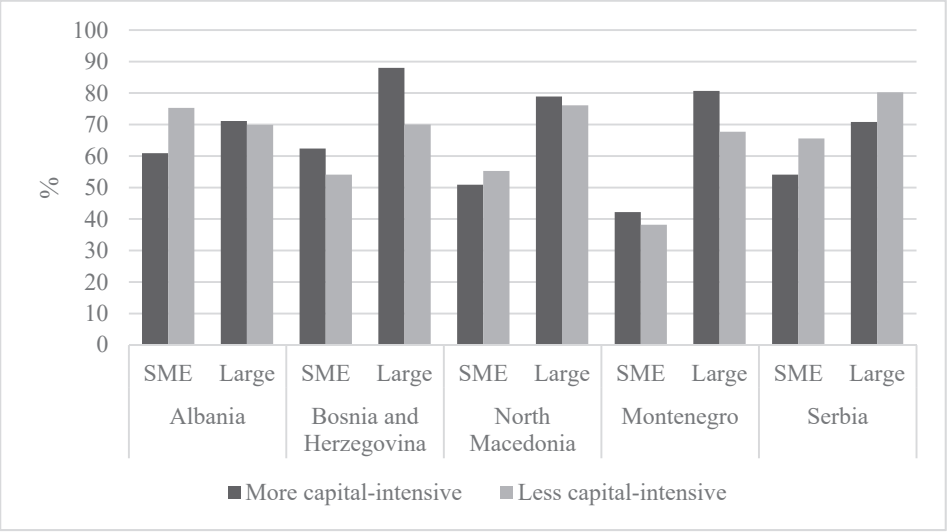
Figure 6. Share of firms implementing more and less capital-intensive measures (large firms vs. SMEs), all 5 WB countries



Source: Authors' calculation based on the World Bank Enterprise Survey 2019

Next, the observed heterogeneity among individual countries shown in Figure 7 justifies this paper's research approach, which examines the determinants of firms implementing different green measures.

Figure 7. Share of firms implementing more and less capital-intensive measures (large firms vs. SMEs), by individual country



Source: Authors' calculation based on the World Bank Enterprise Survey 2019

To examine the determinants of WB SMEs going green, a multinomial logistic regression was performed on a sample of 1,160 firms from Montenegro, Serbia, North Macedonia, Bosnia and Herzegovina, and Albania. A multinomial logistic regression is used when a categorical outcome variable has more than two values, The outcome is the log odds of one category's probability over the base category's probability. The dependent variable here is a categorical variable with a value of 1 if firms undertake no green measures, 2 if they undertake only less capital-intensive measures, and 3 if they undertake only more capital-intensive measures. The category 1 (i.e. firms undertake no green measures) is the base category, which means that the probability of being in other categories is compared to the probability of membership in the base category. Thus, with three categories in the outcome, there are two equations:

$$ln\left(\frac{P_{Less\ capital-intensive\ measures}}{P_{No\ green\ measures}}\right) = \beta_0 + \beta_i X_i, i = 1, \dots, k \quad (1)$$

$$ln\left(\frac{P_{More\ capital-intensive\ measures}}{P_{No\ green\ measures\ 1}}\right) = \beta_0 + \beta_i X_i, i = 1, \dots, k\ . \quad (2)$$

The independent variables X_i can be dichotomous or continuous. Like binary logistic regression, multinomial logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership (Jakšić et al., 2020). Following the previous literature review, the following independent variables are used (also obtained from the World Bank Enterprise Survey 2019): age of the firm (continuous variable, in years), sector (categorical variables for manufacturing, retail, services, and other service categories), innovation (binary variable of value 1 if a firm, in the last 3 years, introduced a new or improved product or if it introduced a new or improved process), GVC participation (binary variable of value 1 if a firm is a two-way trader), financial constraints imposed by informal sector competition (binary variable of value 1 if a firm perceives informal competition as a major obstacle), regulatory constraints (proxied by a binary variable of value 1 if a firm had an inspection), gender dimension (binary variable of value 1 if there are females in the ownership), membership of associations (binary variable of value 1 if a firm has such membership), quality certificate (binary variable of value 1 if a firm has an internationally recognised certificate), incorporated climate issues within the firm strategy (binary variable of value 1 if a firm has such a strategy), and exports (binary variable of value 1 if a firm is an exporter, indirect or direct).

4.3. Discussion of the results

Table 4 presents the results obtained from the analysis. The results are presented in relative log-odds. The likelihood ratio chi-square of 254.89 with a p-value < 0.0000 tells us that the model as a whole fits significantly better than an empty model (i.e. a model with no predictors).

Table 4. Results of the multinomial logit regression

	Less capital-intensive	More capital-intensive
Foreign technology	0.713**	0.778***
	(0.293)	(0.246)
Age	-0.022***	-0.014
	(0.004)	(0.009)
Gender	0.31**	0.131
	(0.143)	(0.139)
Association	0.48***	0.47**
	(0.171)	(0.201)
GVC	-0.788***	-0.229
	(0.144)	(0.216)
Exports	0.505	0.492**
	(0.343)	(0.221)
Informal sector competition	-0.342***	-0.267***
	(0.127)	(0.087)
Innovation (product)	0.432*	1.103***
	(0.259)	(0.162)
Innovation (process)	-0.16	0.299
	(0.137)	(0.232)
Quality certificate	0.934**	0.867***
	(0.402)	(0.314)
Inspections	0.605*	0.506***
	(0.339)	(0.178)
Strategy_environment	0.391	1.336***
	(0.535)	(0.334)
Sector (Manufacturing=base)		
Other services	0.293	0.245
	(0.362)	(0.154)
Retail	0.567	0.119
	(0.564)	(0.278)
Services	-0.633	-1.244***
	(0.502)	(0.346)
cons	-1.32**	-0.36
	(0.513)	(0.457)
Observations	1160	
Pseudo R^2	0.116	
LR chi2	254.89	
Prob > chi2	0.0000	

Note: Robust standard errors are in parentheses. The robustness was also tested by including country fixed effects, and all the relevant post-estimation tests were performed (Wald test, LR test, and test on the assumption of the independence of irrelevant alternatives (IIA)).

*** $p<.01$, ** $p<.05$, and * $p<.1$

The results obtained are mostly consistent with previous studies. The results for sector variables show that firms in the services sector (compared with firms in the manufacturing sector) are less likely to implement capital-intensive green measures relative to the base category of firms with no green measures. This is due to the generally higher use of energy and environmental impact associated with manufacturing, which encourages firms to adopt more substantial measures, as well as to the more stringent regulations for this sector. Also, the largest share of SMEs is found in this sector. Furthermore, the findings indicate that the gender dimension has a significant effect, but only on less capital-intensive measures, with firms that have females in ownership being more likely to implement less capital-intensive measures relative to the base category of firms with no measures. This is also in line with existing studies, such as the previously mentioned Nguyen and Vu (2024), Jensen (2023), and Gunawan et al. (2021), who showed that women are more likely (than men) to exhibit pro-environmental day-to-day practices that reflect their personal, ecological, social, and family values.

Additionally, firms using foreign technology are more likely to adopt both less and more capital-intensive green measures, with almost the same likelihood relative to the base category. This is due to access to superior and efficient technologies, which is in line with, for example, Costantini & Mazzanti (2012). Regarding firm age, it is statistically significant only for the second category, where it is observed that older firms are less likely to implement less capital-intensive green measures relative to the base category. This could be due to the established processes and a larger focus on economic than environmental performance.

Furthermore, the results show that firms' membership in various business associations has a positive effect, implying that firms with networking, cooperation, and other benefits stemming from associations are more likely (with almost the same relative log odds) to implement both less and more capital-intensive green measures relative to the base category of firms that implement no measures (Kesidou & Demirel, 2012; Wagner & Llerena, 2011).

The GVC variable, proxied as a two-way trader, is not statistically significant for more capital-intensive green measures and has a statistically significant negative effect on less capital-intensive measures (i.e. firms that are classified as two-way

traders are less likely to implement less capital-intensive green measures compared to firms that implement no measures). The results confirm the previous findings that participation in GVCs can have a mixed impact on firm-level implementation of green measures. While GVCs promote the implementation of green technologies, they can also lead to the transfer of polluting activities to less regulated environments (see De Marchi et al., 2013; De Marchi et al., 2019). WB countries are potential examples of such regulatory environments and this finding calls for further investigation since it indicates that in order to affect the adoption of more capital-intensive green measures, GVC participation should be in interaction with some other supporting factors such as position in the value chain, specific sector, and the nature of the international interactions (De Marchi et al., 2013; De Marchi et al., 2019; Gereffi et al., 2005). Another external market pressure variable, i.e. export, is statistically significant only for more capital-intensive green measures, implying that exporters are more likely to implement such measures relative to the base category of firms with no measures. External market pressures and standards can motivate firms to improve their environmental performance. These findings have implications for WB countries, which export a significant portion of their goods to the EU market, from the aspect of the introduction of the Cross Border Adjustment Mechanism, according to which, starting from 2026, the exports will be subject to carbon pricing if they do not meet EU emission standards. Firms that fail to align with the EU's standards may find their products becoming less competitive due to the added cost of carbon tariffs. This risk could encourage exporters to adopt green measures, especially capital-intensive ones, to minimise carbon emissions and maintain their market share in the EU in the long run.

The findings concerning the two innovation variables – product and process – show that only product innovation has a statistically significant effect, implying that firms that introduced product innovation are more likely to implement less and more capital-intensive green measures relative to the base category of firms with no measures. The explanation for this stems from the definition of these two types of innovation, where product innovation captures the introduction of a good or service that is new or significantly improved concerning its characteristics or intended uses (according to the OECD/Eurostat Oslo Manual, 2005). This includes significant improvements in technical specifications, components, and materials, utilising new knowledge or technologies. Very often,

and especially in the manufacturing sector, product innovation is driven by environmental regulations, and firms may also adopt green measures in order to ensure compliance and gain a competitive advantage[2].

The quality certificate variable is more statistically significant for more capital-intensive measures, indicating that firms with such certificates are more likely to implement such measures relative to the no measures category due to compliance with certification standards. The regulatory burden variable (proxied by inspections in firms) shows that, with a higher burden, SMEs are more likely to implement capital-intensive measures relative to the no-measures outcome, also confirming the above-reviewed literature highlighting that the regulatory framework has a significant role as an example of an external factor. In addition, firms with strategic objectives that mention environmental or climate change issues are more likely to implement more capital-intensive measures relative to the base outcome of no measures, reinforcing the critical role of strategic commitment to environmental issues in driving significant green initiatives

Finally, competition from the informal sector as a proxy measure of financial constraints was used. This is because informal firms often have lower costs as they evade taxes and regulatory compliance costs (see Perry, 2007), which could also encompass expenses related to environmental regulations. The cost advantage allows them to offer goods and services at lower prices, while formally registered firms facing this price competition may be hesitant to invest in expensive more capital-intensive green technologies, deterring them from long-term investments. The results confirm that firms that are exposed to the informal sector competition are less likely to implement both types of green measures relative to the base category of no green measures.

The results obtained confirm previous findings and show that internal factors (e.g. innovation and strategy) and external factors (e.g. regulatory pressures and competition) significantly influence the adoption of green measures, particularly more capital-intensive ones. Moreover, the results contribute to the literature by

[2] It should also be a case that although process innovation alone may not be significant, when combined with product innovation, it could lead to more advanced adoption of green practices. This should be tested in future studies through inclusion of interaction variables in the model.

highlighting the complex interaction between firm characteristics, external influences, and the adoption of green practices. As a result, energy efficiency and climate-neutral policies should be shaped according to the characteristics of enterprises and the context in which they operate to be most effective. In the WB countries, it is shown, nevertheless, that external factors have more significant weight, especially for more capital-intensive measures, highlighting the need for continuous policy and regulatory pressures from the EU level and international treaties.

4.4. Some implications for policy and business practices in the Western Balkans

The findings presented might be relevant for policy-making in the WB and business practices at the SME level, especially when considering the current EU debates regarding the reshaping and adjusting the current greening sustainability agenda, as well as discussions on green transition in the WB (see, e.g., Licastro & Sergi, 2021; Reuters Events, 2024; Uvalic, 2023).

Bearing in mind each WB country's specificities and high regional disparities, the results of the analysis indicate that national policymakers should consider continuously improving the business environment and greening ecosystems, which would encourage a further green transformation of SMEs and other firms and ease their transition into a green economy. Next, taking the SME perspective into account when adopting the greening measures in regulation and financing transition packages is essential for enabling progress in the overall greening of the economy. Furthermore, policymakers should improve monitoring of the success and impact of greening policies and improve tracking indicators, especially at the firm level, such as the EU Environmental Sustainability Reporting Standards (ESRS), which could track the greening policies results achieved by the SMEs and other firms with more preciseness than occasional surveys. Moreover, the categorisation of green measures from the aspect of capital intensity used in this paper is also useful from a policy perspective since less capital-intensive measures are more accessible to firms that have limited financial resources, and enabling these measures could be achieved through instruments such as tax breaks or increased information dissemination. Conversely, more capital-intensive measures involving substantial investment would require larger government support through subsidies and grants.

In response to our first research question (RQ1), decision-makers at the firm level, especially in SMEs, need to consider investing resources in improving labour and managerial skills required for adopting green technologies, adjusting to new ecosystems, and building leadership for greening business practices. In addition, increasing investments in capital-intensive green technologies will enable a smoother transition in the long run. It is also important to increase the proportion of SMEs that offer green innovative products and services by enhancing their participation in GVCs through decarbonised supply chains and identifying competitive market niches at national and regional levels. In order to achieve the above-mentioned, it is vital to ensure the efficient use of EU, national, and commercial funding to make it easier for small businesses to access green technologies and promote the development of innovative green products and services. Finally, it is essential to improve regional and EU cooperation within the WB region and to form strong partnerships in order to enhance green business practices.

Obviously, the scope of challenges for the WB countries is huge, bearing in mind all the institutional and environmental requirements for such an enormous transition. As the Just Transition Mechanism is not available at this point for such an immense change in the WB, it is evident that faster progress in EU accession negotiations is essential for ensuring adequate financial and policy support to achieve a green transition and matching Sustainable Development Goals in WB countries.

5. CONCLUSION

This paper examined the determinants of SMEs in the WB countries (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia) going green. Specifically, the study explored which firms have a higher likelihood of implementing more and less capital-intensive green measures relative to the base category of firms with no green measures being implemented. The results show that firms from the services sector are less likely to adopt capital-intensive greening measures than SMEs in the manufacturing sector, which was not surprising. Higher energy use and environmental impact associated with manufacturing encourage firms to implement more capital-intensive measures. One of the reasons for such a trend lies in the availability of EU funding for green transformation. It has been found that SMEs using foreign technology and those

that have implemented product innovation are more likely to adopt more capital-intensive green measures, possibly due to access to more efficient technologies. This highlights innovation funding as a critical factor for firms going green. Next, it is shown that external factors (such as regulations and competition from informal sector and international actors) have more significant weight, especially for more capital-intensive measures. These results answer our RQ2.

The findings obtained from the analysis offer some policy implications, suggesting that enhancing access to advanced technologies, improving the regulatory framework, and promoting cooperation through various networks can significantly impact the implementation of green measures in SMEs, especially those that are more capital-intensive. Additionally, the findings confirm various theoretical frameworks, such as stakeholder theory, resource-based theory, or institutional theory, while filling the gap in the literature through the analysis of a sample of WB countries. Finally, it opens up a research avenue for further analysis, especially concerning the variable encompassing the firms defined as two-way traders (a proxy for GVC), since the complexity associated with GVCs can have different effects on firms, depending on their position in the chain, specific sector, and the nature of the international interactions.

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Received: May, 24, 2024
Accepted: November, 22, 2024

ECONOMIC ANNALS, Volume LXIX, No. 243 / October – December 2024
UDC: 3.33 ISSN: 0013-3264

https://doi.org/10.2298/EKA2443041S

*Dejan Stankov**

INCOME AND INEQUALITY ELASTICITY OF POVERTY: THE CASE OF CESEE COUNTRIES

ABSTRACT: *This paper examines poverty changes decomposed into two components: the growth effect and the distributive effect. This contribution is based on an empirical analysis of the Central and South-Eastern Europe (CESEE) countries, drawing on the latest years' official data. The income and inequality elasticity of poverty is estimated using the established panel data model. Based on linear regressions, the transformation of economic growth and income inequality to poverty reduction in CESEE countries is analysed. The study found that income growth contributes to poverty reduction, while the contribution of inequality is stronger and in the opposite direction. Thus, further progress in tackling poverty may be achieved under a relatively favourable income distribution. Since sub-regional differences in income inequality elasticity were not found, it would seem reasonable, therefore, to give special attention to reducing inequality in all CESEE countries.*

KEY WORDS: *growth, inequality, poverty, income elasticity, inequality elasticity*

JEL CLASSIFICATION: O40, E25, I32

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1. INTRODUCTION

Poverty reduction represents a fundamental challenge for transition countries. Although many economists in the past worked on growth, inequality and poverty in the context of developing countries[1], the available literature is focused mainly on the identification of the factors for growth and an understanding of the reasons for income distribution. Despite the increased interest in studying the link between growth, income distribution and poverty and the role of income distribution in the growth–poverty nexus in transition countries, there appears to be limited comparative evidence on the transformation of income and inequality growth to poverty alleviation in the Central and South-Eastern Europe (CESEE) region. The lack of studies and harmonised statistical data has made it difficult to compare the situation between the countries of this region and between the sub-regions. The obstacle is that in the past statistical data were produced using varied methodological concepts collected from different sources, resulting in structural breaks.

The hypothesis established in this paper is that economic growth contributes to poverty reduction, while inequality growth contributes to increased poverty. The goal of this paper is more straightforward, namely, to analyse the relative contributions of changes in income and inequality for poverty reduction in the CESEE countries. To pursue this objective, we calculate the income and inequality elasticity of poverty for the CESEE countries. For this purpose, we use a panel model based on comparable indicators for relative poverty, income and inequality from the Eurostat database[2]. We analyse the extent to which the poverty changes might be decomposed into income and inequality factors and the differences in the magnitude of changes in poverty. The results presented emphasise the important role of income distribution in reducing poverty. We shed some light on the sub-regional differences in the responsiveness of poverty to income growth and inequality changes.

We analyse the CESEE countries because of several characteristics they have in common. Firstly, they are small and open economies with strong ties with the EU

[1] For example: Fosu, A. K. (2011). Growth, inequality, and poverty reduction in developing countries: Recent global evidence. World Institute for Development Economics Research.

[2] All figures are available as a separate file in Excel format upon request.

economies. Secondly, some of them are already members of the EU (EU-CESEE), and others are candidates or potential candidates for EU membership (non-EU-CESEE)[3]. Thirdly, the transition process to market economies undertaken in the 1990s is also a shared characteristic.

The outline of this paper is as follows: First, we review the theoretical literature on the relation growth–inequality–poverty. Second, we discuss the established methodology and the data that we use, accompanied by some descriptive statistics. Then we present the results from the econometric model and the conclusion.

2. LITERATURE REVIEW

Three groups of researchers proposed specific visions on the relation between income growth–inequality–poverty. The first group confirms that growth on its own is sufficient to reduce poverty (Bhalla, 2002; ; Sala-i-Martin, 2002; Turunc, 2009). The second elaborates that growth is good for the poor (Dollar & Kraay, 2002; Ravallion & Chen, 1997, 2001, 2003; Sala-i-Martin, 2002; World Bank, 1990, 2000). The third group suggests that economic growth is an important factor, but not sufficient on its own, and inequality should not be omitted (Bourguignon, 2003 Deininger & Squire, 1998; Dollar & Kraay, 2002; Mchiri & Moudden, 2011; Ravallion, 2001, 2003; Ravallion, 2005).

The phenomena of growth, income inequality and poverty have been studied independently in different traditional theories of development. In the past, a nearly universal consensus in the empirical literature suggests that economic growth has a "first-order effect" on poverty reduction. Dominant development thinking in the 1950s and 1960s was the "trickle down" theoretical concept (Kakwani & Pernia, 2000). This concept assumes that growth will automatically reduce poverty. This exogenous view in the early debates led to tolerance of income inequality and a trade-off between growth and inequality. According to the trickle down concept, the vertical flow of income is the result of economic growth, where in the first phase benefits from economic growth are felt by the population with higher income, while the population with lower income benefits only in the second phase. Furthermore, many years ago, Adelman and Morris

[3] Analysed candidate countries for EU membership: Serbia, Montenegro and North Macedonia.

(1973) concluded that there is no automatic trickling down of the effects of growth to the people who belong to the lowest income group. Stiglitz (2016) explained that the old-fashioned version of "trickle-down economics" did not follow with evidence. According to the Nobel laureate, urgent rethinking of the trickle-down model was necessary, together with a theoretical explanation. Stiglitz (2015) argued that in some cases, economic growth can lead to higher inequality and poverty. If inequality is increasing in parallel with GDP per capita, people's well-being can become worse. Average economic growth is not a reflection of how growth is distributed among households with different characteristics.

Therefore, the transformation of income growth into lower poverty requires a deeper analysis of the nature of poverty and the pattern of growth. For a variety of reasons, most sources of growth generate unbalanced growth rates. Therefore, it is not possible to generalise about the distributional effects of growth. This virtue of sustained growth is sometimes missed because people confuse rising inequality with a failure to make progress against poverty[4]. In economies without growth, a widening gap between rich and poor does indeed entail an increase in poverty, while, in fast-growing economies, it is possible and quite normal for poverty to fall even as inequality rises.

In recent years, income distribution has had a central role in policy discussions. In the analysis of how growth may contribute to poverty reduction, it is important to understand the role of income distribution in the growth–poverty nexus. There are even cases in which higher economic growth can increase poverty if inequality is increased so much that the positive effects of the growth are neutralised by the negative effects of the increased inequality. Bhagwati (1988) called this "immiserising growth". If inequality is increasing in parallel with the GDP per capita, economic growth can lead to higher poverty (Stiglitz, 2015). Based on cross-country data, Ali and Thorbecke (2000) elaborated that the poverty trend is less sensitive to the level of income and more sensitive to income inequality. Conceptually, at a certain point and for a certain population, the level of poverty is connected with average growth and inequality. Therefore, as a direct influence

[4] Angelsen, A. and Wunder, S. (2006) Poverty and inequality: Economic growth is better than its reputation. In D. Banik (Ed.). *Poverty, Politics and Development: Interdisciplinary Perspectives* (pp. 79–103). Bergen: Fagbokforlaget.

of these functional links, the poverty change over time is determined in principle by changes in both factors. Lustig (2002) argued that "economic growth is a crucial factor in poverty reduction, but the level of inequality and its evolution affects its impact on poverty". Fosu (2011) presented evidence with findings that there is a significant discrepancy in countries' abilities to channel economic growth to poverty reduction based on different inequality profiles. Ferreira (2010) noted that poverty rate alleviation is a result not only of economic growth, as a key factor, but it is also a reflection of growth elasticity of poverty reduction concomitant with high inequality. Other modern economists (Adams, 2004; Bourguignon, 2003; Ravallion, 1997) concluded that a higher level of inequality in society neutralises the extent of the effects of growth on the level of poverty. Inequality can be harmful to the poor, but if the inequality reduction policies lead to additional distortions in the economy, the results of those policies can have ambiguous effects on economic growth and the reduction of poverty (Ravallion, 2005). (2013), in his cross-country analysis, indicates that low growth rates and high inequality are the main barriers to decreasing poverty. Bergstrom (2022) concluded that, on average, the growth elasticity of poverty reduction is lower than its inequality elasticity. At the same time, he highlighted that this growth elasticity declines sharply with a country's initial level of inequality.

Following the review of the literature in the field, poverty changes can be decomposed into two components: a growth effect (changes in poverty due to changes in income with an unchanged level of inequality) and a distributive effect (changes in poverty due to changes in the level of inequality without changes in mean income). The growth elasticity of poverty in the studies that analysed the period of the 1990s was usually estimated to be in the range of -2.0 to -3.0 (Bruno et al., 1998; Ravallion & Chen, 1997, as cited in Adams, 2003). Expressed in other words, a 1% increase in economic growth (however measured) will lead to a 2–3% decrease in poverty. Bhalla (2002) argued that the "correct" growth elasticity of poverty should be around -5.0. Using absolute poverty data, Bruno et al. found that the growth elasticity of poverty was -2.12. For this purpose, they analysed 20 developing countries in the period from 1984 to 1993. Taking into account inequality as the second factor influencing how much economic growth reduces poverty and analysing the same countries and period, the authors regressed the poverty change on both factors: the change in mean income growth and the change in the Gini coefficient, obtaining a coefficient of -2.28 for mean income

growth and 3.86 for the Gini coefficient. Analysing the growth elasticity of poverty in 126 intervals from 60 developing countries, the econometric study by Adams (2004), used survey mean income as an indicator for economic growth and found that the growth elasticity of poverty is -2.79. This estimation is in the range of the estimates suggested by the previous studies. However, the growth elasticity of poverty is lower when Adams (2004) uses GDP per capita as an indicator for economic growth, obtaining a *statistically insignificant* coefficient of -2.27. The study found that the effectiveness of growth on poverty reduction depends on how economic growth is defined. The author concluded that there is a strong, negative correlation between growth and poverty when survey mean income is used as an indicator for economic growth. The statistical link between economic growth and poverty reduction is weaker when GDP per capita is used as an indicator for growth.

3. METHODOLOGY

Economic growth, in terms of quality of standard of living, is usually analysed using two of the most important indicators: GDP per capita (macro indicator obtained from national accounts) and mean equivalised net income growth (micro indicator obtained from household surveys). The indicators in this area are developed using a variety of sources and different concepts and methodologies, which is a major challenge in conducting such an analysis. It is difficult to conclude how growth is shared among the population. Income inequality is driven by different economic factors, such as the level of unemployment, inactivity and informal employment, different (re)distributive factors, etc.

Usually, the poverty index is defined as the number of individuals in a population whose living standard is below some predetermined threshold. The absolute poverty line can be defined in terms of consumption or income, and it is assumed to be constant over time. If y is an indicator of standard of living or income per adult and z is the poverty line, income distribution at some point in time t is expressed with the distribution function $Ft(Y)$, which refers to the proportion of the population with a standard of living or income, y, less than Y. The proportion of the population below the poverty line, z, is the most commonly used poverty indicator.

$$Ht = Ft(z)$$

The change in poverty between two points of time *t* and *t'* can be expressed as:

$$\Delta H = Ht' - Ht = Ft'(z) - Ft(z) . \quad (1.1)$$

To analyse the contribution of growth to poverty change, it is appropriate to define the relative income distribution at time *t* as the income distribution after normalising it by the population mean. *Ft(X)* can be that distribution. The distribution of income may be decomposed into a "growth" effect and a "distributional" effect. The growth effect is determined when the proportional change in all incomes leaves the distribution of relative income, *Ft(X)*, unchanged. The distributional effect is referred to as the change in the distribution of relative incomes, which by definition is independent of the mean. The relative poverty decomposition can be presented as:

$$\Delta H = Ht' - Ht = [Ft'z / yt') - Ft(z / yt)] + [Ft'(z / yt') - Ft(z / yt')] . \quad (1.2)$$

The first square bracket expression corresponds to the growth effect when the relative income distribution is constant, while the second expression represents the distribution effect, i.e. the variation in the relative income distribution *Ft'(X) – Ft(X)*, at the level of the relative poverty line, which is the ratio of the absolute poverty line and the mean income $X=z/y_t$.

The variables entering the decomposition should be analysed as long as one observes any continued approximation of the distribution functions (*F*) at the different points of time, *t* and *t'*.

The growth elasticity of poverty can be expressed as:

$$\varepsilon = \lim_{t'-t} \frac{Ft\left(\frac{z}{yt}\right) - Ft\left(\frac{z}{yt}\right) / Ft\left(\frac{z}{yt}\right)}{(yt' - yt)/yt} . \quad (1.3)$$

The fact that the distribution effect cannot be presented by a scalar is a reason why it is more difficult to translate in terms of elasticity. A simple approximation

of equation 1.2 may be calculated when the distributions are assumed to be lognormal. This is a standard approximation of empirical distributions in the applied literature. In this case, the relative income distribution can be presented as:

$$Ft(X) = \Pi\,[(log(X)/\sigma) + (1/2\,\sigma)]\,, \tag{1.4}$$

where $\Pi\,(\,)$ is the cumulative distribution function of the standard normal and σ is the standard deviation of the logarithm of income. Poverty change between two time periods *t* and *t'* depends on the level of mean income at these two dates, *y/z*, expressed as a proportion of the poverty line, and on the standard deviation, σ, of the logarithm of income.

The growth elasticity of poverty, ε, may be defined as the relative change in poverty for 1 per cent growth in mean income for constant relative inequality, σ:

$$\varepsilon = (\Delta H)/(\,\Delta log(y)Ht) = ((1/\sigma)\lambda)\,[(log(z/yt)/\sigma) + 1/2\,\sigma]\,. \tag{1.5}$$

The growth elasticity of poverty is a growing function of the level of development, as measured by the inverse of the ratio z/y^t, and a declining function of the degree of relative income inequality, as measured by the standard deviation of the logarithm of income, σ. If a country becomes richer, then the elasticity increases and, at the same time, the economy becomes more sensitive to the level of inequality.

On the basis of theory, Bourguignon (2002) compared four different models. For this purpose, he used data from the World Bank, the annual growth rate of poverty and the annual growth rate of mean income. He made some modifications to the original data to eliminate all the cases where the percentage change in poverty was extremely high in relative values or the value of poverty was zero or negligible. The first model, termed the naive model, corresponds to the simple view that there is a constant elasticity between growth and poverty reduction. Regression consists of two variables: changes in poverty and changes in mean income. Concerning growth, this model suggests a negative elasticity of poverty but the R^2 coefficient is low (26 per cent). This means that the explanatory power of this model is low. In the second model, called the standard model, Bourguignon included an additional explanatory variable, the Gini coefficient, as

a measure of income inequality. With its inclusion in the regression, the R^2 coefficient becomes significantly higher (49 per cent). With this result, he concluded that despite income growth, distributional changes are also responsible for poverty reduction. In the third model, termed standard model 1, Bourguignon improved the previous model by adding the coefficient poverty line/mean income and the initial degree of inequality. These two coefficients are multiplied by mean income growth. The author concluded that these two explanatory variables are significant and reduce the growth elasticity of poverty. Bourguignon explained that the joint effect of income growth, the poverty line/mean income ratio and the initial degree of inequality follows the elaborated theoretical elasticity with the presumption that the distribution of relative income is lognormal. In the second improved standard model, these two variables, the poverty line/mean income ratio and the initial degree of inequality, are multiplied by the Gini coefficient. The author assumed that the distributional change in poverty reduction depends on the initial level of inequality and the level of poverty threshold placed in relation to the mean income. In comparison with standard model 1, the value of R^2 shows much better results in the improved model, standard model 2, because of the relation between the Gini coefficient and the initial inequality and the ratio of the poverty line and mean income.

The final model is based on the lognormal approximation, where two explanatory variables are the growth and inequality elasticities. If the lognormal approximation is satisfactory, then the coefficient of the theoretical elasticity in the regression is not considerably different from unity. The lognormal approximation has an important role in R^2. Additionally, the R^2 coefficient demonstrates higher values with the inclusion of the above explanatory variable. Bourguignon's experiment suggests that if we want to go beyond the poverty rate in the measurement of poverty, then growth approximations and distribution elasticities of the reduction of poverty could be insufficient. Satisfactory solutions, in the long run, require the use of with the full income distribution or standards of living more preferably than a few summary measures.

Generally, lower inequality would imply a higher absolute value of elasticity, so that a higher poverty reduction would arise from a given level of growth. We analyse the evidence of the transformation of growth to poverty reduction, taking into consideration inequality as an important intermediation factor. Following

Fosu (2011), Bourguignon (2002) and Epaulart (2003), we calculate the income-poverty transformation equation taking into consideration the assumption that the income is normally distributed:

$$P = b1 + b2y + b3yG' + b4y\left(\frac{Z}{Y}\right) + b5g + b6gG' + b7g(Z/Y) + b8G' + b9\,Z/Y\,, \quad (1.6)$$

where P is the at-risk-of-poverty rate, y is income (mean equivalised net income, PPS), g is the Gini coefficient, G' is the initial Gini coefficient expressed in logarithms and Z/Y is the ratio of the poverty line to income expressed in logarithms.

We can obtain income and inequality elasticities using the following equations:

$$Ey = b2 + b3G' + b4Z/Y \quad (1.7)$$

$$Eg = b5 + b6G' + b7Z/Y\,. \quad (1.8)$$

Ey is expected to be with a negative sign, which means increasing growth should decrease poverty, while *Eg* is anticipated to be positive, meaning that inequality decline results in a poverty reduction.

Including these two elasticities can be crucial in determining the nature of poverty reduction over time in a given country.

4. DATA

The data used in the present panel data model are derived from the Eurostat database[5]. We use fully harmonised and comparable micro indicators for income growth, relative poverty and inequality derived from the EU-SILC survey, which is the reason why we do not calculate annual growth rates. As an indicator of growth, the mean equivalised net income (PPS) is used. We consider mean income as a more appropriate indicator for our panel data model because of the data comparability and the fact that the other indicators are micro variables. Additionally, economic theory confirmed that the statistical link between

[5] Source: www.ec.europa.eu/eurostat/data/database

economic growth and poverty reduction is weaker when GDP per capita is used as an indicator of growth. However, despite the criticism that GDP is an imperfect measure (Stiglitz et al., 2010), GDP remains a key indicator of economic growth and the comparison of the economic performance of countries. The Gini coefficient of equivalised disposable income is used as an indicator of income inequality. Concerning poverty, we use the at-risk-of-poverty rate, where the cut-off point is 60% of median equivalised income after social transfers. In our analysis, we use panel data, combining time-series of cross-section observations. We analyse 14 CESEE countries for the period from 2010 to 2022[6], creating 14 cross-sectional units and 13 time periods, therefore generating 182 observations.

We also shed some light on the analysed indicators, comparing descriptive statistics calculated as average annual growth for the analysed period for the CESEE countries. Table 1 presents data on GDP per capita growth (PPS), income growth, growth of inequality represented by the Gini coefficient and poverty growth.

A common characteristic of the countries that registered the highest average poverty reduction in the analysed period is the significant decrease in the average annual growth of income inequality and different rates of economic growth (mean income and GDP per capita). In some countries (e.g. Romania), strong average mean income growth is not accompanied by an average poverty reduction because the resulting growth of inequality thwarts the transformation process. Estonia and Latvia are special cases because of the positive sign of income growth, while, at the same time, modest average GDP per capita growth, accompanied by an average inequality reduction, does not result in poverty reduction. The reason for this, among other factors, can be the insufficient inequality decline. Apparently, the main cause of poverty reduction appears to be the negative sign of inequality change complemented by income growth. As in the observed theory, it seems that income growth and GDP per capita are

[6] The EU-SILC survey was introduced in 2010. In order to maintain the consistency of the data and analysis, we use data only from this source. For Montenegro and Serbia, data are available from 2013; for the period from 2010 to 2012, the data in the panel are estimated by the author. Because of no data availability, 2022 data are estimated for Montenegro and Serbia, while 2022 and 2021 data are estimated for North Macedonia. More information about the methodology is available on the following link: https://ec.europa.eu/eurostat/web/income-and-living-conditions/methodology

important factors behind falling poverty. Nevertheless, income distribution has an important role in poverty behaviour. By analysing the data for different countries, we can find exceptions where the level of inequality is an important factor for the level of poverty. For example, the at-risk-of-poverty rate for Czechia for 2022 is 10.2 per cent, the lowest in the European Union, but the Gini coefficient, in comparison with the other countries is still high, 24.8 per cent.

Table 1: Indicators for average annual growth rate of poverty, GDP per capita, income and inequality in the period from 2011 to 2021[7]

	GDP per capita, PPS, average annual growth	Mean income, PPS, average annual growth	Inequality (Gini coef.), average annual growth	Poverty rate, average annual growth
Bulgaria	4.81	5.45	1.64	0.60
Czechia	3.20	3.33	-0.04	-0.41
Estonia	5.22	6.01	-0.21	2.44
Croatia	3.68	3.38	-0.72	-0.64
Latvia	5.06	6.50	-0.05	1.03
Lithuania	6.08	7.75	-0.40	-0.22
Hungary	3.63	3.83	1.24	0.22
Poland	4.40	5.18	-1.34	-1.56
Romania	5.66	8.18	0.21	0.37
Slovenia	3.02	2.52	-0.31	-0.74
Slovakia	1.67	0.49	-1.55	0.22
Montenegro	3.79	1.51	-2.10	-2.14
N. Macedonia	2.82	4.43	-2.61	-2.12
Serbia	3.64	4.20	-1.64	-1.79

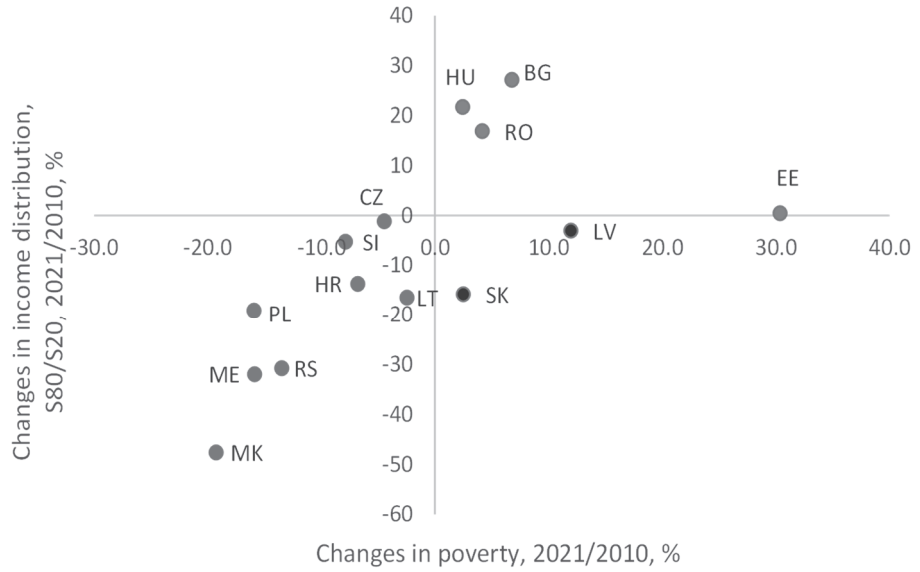
Source: Own calculation based on Eurostat data

Figure 1 illustrates the relationship between changes in poverty and in income inequality observed through the S80/S20 ratio, as a comparison between 2021 and

[7] Average growth rates for poverty, income and inequality for Serbia and Montenegro are calculated for the period from 2014 to 2019 because of the data availability.

2010. The x-axis represents the change in the at-risk-of-poverty rate and the y-axis the change in the inequality rate. Most of the CESEE countries are located in the bottom-left quadrant with a decrease in both inequality and poverty. The Macedonian economy achieved a significant improvement in income distribution in the last decade, observed through the ratio of the highest and lowest 20 per cent equivalised incomes, and at the same time, the highest reduction in poverty. Despite the achieved improvement, the reason for this is, among others, the highest level of initial poverty and inequality in 2010. Inequality reduction and a poverty increase are estimated in the case of two countries, Slovakia and Latvia. These two countries achieved higher poverty despite the improved income distribution.

Figure 1: The interaction between poverty and inequality of income distribution[8]



BG - Bulgaria	CZ - Czechia	EE - Estonia	HR - Croatia	LV - Latvia	LT - Lithuania	HU - Hungary
PL - Poland	RO - Romania	SI - Slovenia	SK - Slovakia	ME - Montenegro	MK - North Macedonia	RS - Serbia

Source: Eurostat, own calculations

[8] Data are available for Montenegro and Serbia from 2013 on; data are not available for North Macedonia for 2021.

Concerning our panel model, three types of models are usually used in theory and practice: the pooled regression, fixed effect (FE) and random effect (RE) models. The pooled regression model has constant coefficients relating to the intercept and slopes. FE explores the relationship between predictor and outcome variables within an entity. Each entity has its characteristics that may or may not influence the predictor variables. With the FE, we assume that something within the individual may impact the outcome variables and we control this. We remove the effect of the assumption of the correlation between an entity's error term and predictor variables so we can assess the net effect of the predictor on the outcome variable. The time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics. If we analyse different countries, the country's error term and the constant should not be correlated with the others. If the error terms are correlated, then FE is not suitable for use since the inferences may not be correct and we would probably need random effects, which can be determined with the Hausman test. Unlike the FE model, in the RE model, a random distribution of the individual effects between the cross-sectional units is present. To take into account the individual effects, the regression model is described with an intercept term reflecting an overall constant term. If we have reason to believe that differences across entities influence the dependent variable, then we should use random effects (Torres-Reyna, 2007). In our analysis, we have no reason to believe that entities' differences have a direct influence on poverty. Every country is a separate entity without the direct influence of the independent variables of one country on the dependent variable of other countries. In our model, we have included the initial Gini as a constant variable, which is contained in the equation, but it cannot be calculated as a separate estimation with the FE model.

We will use the Hausman test to decide which model is more suitable.

Table 2: Hausman Test – Test cross-section random effects

Test summary	Chi-sq. statistic	Chi-sq. d.f.	Prob.
Cross-section random	22.423055	7	0.0021

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(diff.)	Prob.
incgr	-0.002698	-0.001860	0.000000	0.1155
incgringini	0.001748	0.001252	0.000000	0.1779
incgrlineinc	-0.000437	0.000165	0.000000	0.0277
ginigr	-0.105262	-0.325879	0.031509	0.0151
ginigringini	0.566235	0.212841	0.023968	0.0224
ginigrlineinc	-1.437742	-2.020861	0.199466	0.1917
lineinc	176.577824	202.669301	335.117079	0.1541

Cross-section random effects test equation:
Dependent variable: Poverty
Method: Panel least squares
Cross-sections included: 14
Periods included: 13
Total panel observations: 181

Variable	Coefficient	Std.Error	*t*-Statistic	Prob.
c	31.90998	10.76127	-2.965262	0.0035
incgr	-0.002698	0.000885	-3.050397	0.0027
incgringini	0.001748	0.000590	2.960943	0.0035
incgrlineinc	-0.000437	0.000364	-1.201542	0.2313
ginigr	-0.105262	0.488204	-0.215612	0.8296
ginigringini	0.566235	0.426861	1.326510	0.1866
ginigrlineinc	-1.437742	1.102885	-1.303619	0.1942

Source: Author's estimations, results from the model

Since the fixed effect is consistent when $c_i c_i$ and $x_{it} x_{it}$ are correlated, but the regression effect is inconsistent, a statistically significant difference is interpreted as evidence against the random effects assumption. The results presented for the Hausman test in Table 2 show that the *p*-value is less than 0.05, which means that

we reject the null hypothesis. We conclude that individual effects $u_i u_i$ are strongly correlated with at least one regressor in the model and, consequently, the random effect model is problematic. Therefore, an appropriate model for our analysis is the fixed effects model with robust standard errors rather than the random effect counterpart.

5. RESULTS

In this section, on the basis of linear regressions, we estimate the relative contributions of income and inequality changes to poverty reduction in the CESEE countries.

With the fixed effects model and robust standard error, the intercept varies for each country, assuming that the slope coefficients are constant across countries, to take into account the individuality of each country. The term fixed effect in this model is useful because the intercept may differ across countries, but the intercept of the countries is time-invariant, i.e. each country's intercept does not vary over time. At the same time, it is assumed that the coefficients of the regressors do not vary over time or between individuals. The regression results seem acceptable (Table 3) and show that most of the coefficients are significant.

Table 3: Regression results, fixed effects model with robust standard errors

Method: Panel least square
Cross-sections included: 14
Periods included: 13
Total panel observations: 181

povgr	Coeff.	Std.Err.	*t*	*P*>|*t*|	[95% Conf.	interval]
incgr	-0.0017121	0.001436	-1.19	0.254	-0.0048145	0.0013903
incgringini	0.0012282	0.0009243	1.33	0.207	-0.0007687	0.003225
incgrlineinc	-0.0005869	0.0004862	-1.21	0.249	-0.0016373	0.0004634
ginigr	-0.1028423	0.6626913	-0.16	0.879	-1.5345	1.328815
ginigringini	-0.0074224	0.5650966	-0.01	0.99	-1.228239	1.213395
ginigrlineinc	-4.224317	1.682044	-2.51	0.026	-7.858152	-0.5904827
ingini	0 (omitted)					
lineinc	276.9522	62.71503	4.42	0.001	141.4646	412.4397
_Iyear_2011	0.1115122	0.1832801	0.61	0.553	-0.2844404	0.5074648
_Iyear_2012	-0.0045834	0.2359575	-0.02	0.985	-0.5143385	0.5051718
_Iyear_2013	0.0062833	0.1925252	0.03	0.974	-0.4096421	0.4222088
_Iyear_2014	-0.1143624	0.2311666	-0.49	0.629	-0.6137674	0.3850427
_Iyear_2015	-0.2540559	0.2546965	-1	0.337	-0.8042942	0.2961825
_Iyear_2016	-0.5035334	0.3701399	-1.36	0.197	-1.303172	0.2961052
_Iyear_2017	-0.9793728	0.4431037	-2.21	0.046	-1.93664	-0.0221054
_Iyear_2018	-1.040959	0.6702939	-1.55	0.144	-2.489041	0.4071228
_Iyear_2019	-1.264388	0.7180684	-1.76	0.102	-2.81568	0.2869049
_Iyear_2020	-1.386013	0.8221584	-1.69	0.116	-3.162178	0.3901526
_Iyear_2021	-1.892006	0.8800794	-2.15	0.051	-3.793302	0.0092901
_Iyear_2022	-1.672202	1.03148	-1.62	0.129	-3.900579	0.556176
_cons	60.44803	16.84034	3.59	0.003	24.06667	96.82938
sigma_u	1.565354					
sigma_e	0.71792354					
rho	0.82621102	(fraction	of	variance	due to	u_i)

Source: Author's estimations, results from the model

Based on the results from this model, we use equations (1.7) and (1.8) to estimate the income and inequality elasticities for the CESEE region:

$$Ey = -0.28 \tag{1.9}$$

$$Eg = 1.07\,. \tag{1.10}$$

From equation 1.7, we conclude that income elasticity depends on, among other things, the initial inequality and the ratio of the poverty line to income. Despite the initial inequality, the diverse level of income has an essential role in the responsiveness of poverty reduction to income growth. The level of income (ratio of poverty line/income) is an important factor that contributes to higher responsiveness of poverty reduction to income and inequality. Differences in initial income inequality and disparities in income levels determine the responsiveness of poverty reduction to inequality and income changes in many countries. Accordingly, countries with lower initial levels of income inequality and higher mean incomes relative to the poverty threshold perform better in poverty responsiveness to income changes. Likewise, from equation 1.8, we observe that countries with larger initial inequality and lower incomes relative to the poverty threshold would enjoy larger values of inequality elasticity. Higher-income countries showed higher responsiveness to transform a given growth rate to poverty reduction, while at the same time, larger inequality elasticities in these countries suggest that increased inequality would have a detrimental effect on poverty. The results for the income elasticity are negative, implying that, on average, income growth reduces poverty rates for the CESEE region as a whole. The results for the inequality estimates are positive for the CESEE region as a whole, suggesting that inequality increases poverty.

Elasticity estimates for each of the CESEE countries based on the FE model are presented in Table 4. We analyse the extent to which the poverty changes are decomposed into income and inequality factors. Negative results for the income elasticity indicate that mean income growth reduces poverty rates for practically all the countries in the region. On the other hand, positive results for the inequality estimates imply that inequality increases poverty in all the CESEE countries. However, the obtained values of the coefficients suggest that, in terms of poverty, the impact of the positive effects of the mean income growth is lower than the influence of the negative effects of the income distributions in all the countries and the CESEE region as a whole. We cannot conclude that a large cross-country variation of responsiveness of poverty to both income and

inequality growth exists. Lower-inequality and higher-income countries exhibited greater abilities to transform a given growth rate into poverty reduction. According to the results obtained, the largest responsiveness of poverty to income is detected in Bulgaria and Lithuania. In terms of inequality elasticity, a comparison of the countries' results suggests that Bulgaria and Lithuania exhibit the largest values as well, implying that the positive effects of income responsiveness are neutralised by the negative effects of inequality elasticity.

Table 4: Income elasticity (*Ey*) and inequality elasticity (*Eg*), CESEE region, by country, 2010s

	Ey	*Eg*
Bulgaria	-0.3115	1.2092
Czechia	-0.2706	1.0368
Estonia	-0.2846	1.0960
Croatia	-0.2660	1.0173
Latvia	-0.2991	1.1572
Lithuania	-0.3074	1.1920
Hungary	-0.2703	1.0356
Poland	-0.2759	1.0590
Romania	-0.2771	1.0642
Slovenia	-0.2509	0.9536
Slovakia	-0.2476	0.9397
Montenegro	-0.2916	1.1250
North Macedonia	-0.2763	1.0606
Serbia	-0.2854	1.0991
CESEE region	-0.2796	1.0747

Source: Author's estimations, results from the model

Countries with a higher value of income elasticity also tend to show a higher value of inequality elasticity primarily because the level of income (ratio poverty line/income) influences both elasticities. As elaborated in the theory, higher-income countries will need lower income growth to achieve an expected reduction of poverty, and vice versa. Inequality tends to increase poverty relatively easily and with a higher intensity than the opposite influence of income growth.

Estimates of the relative contributions of income and inequality changes to poverty reduction are presented in Table 5. Column A predicts poverty growth by income (despite estimated income elasticity, the log of the average mean income for the analysed period is taken into consideration), Column B predicts poverty growth by inequality (despite estimated inequality elasticity, the log of the average Gini coefficient is taken into consideration), and Column A + Column B predict poverty growth by both income and inequality.

The obtained coefficient of -1.11 for the poverty growth as a result of the mean income indicates that a 1% increase in growth leads to a 1.11% decrease in poverty, on average, in the CESEE region. At the same time, a 1% increase in the Gini coefficient leads to a 1.61% increase in poverty, on average, in the CESEE region. As we can see, at the level of the region, the relative contribution of changes in inequality to poverty changes is higher in comparison with the relative contribution of income growth. While income growth contributes to a poverty decrease, inequality works to increase poverty in all the CESEE countries. Our results show that, on average, mean income growth is responsible for the predicted poverty decline in all the CESEE countries and the CESEE region as a whole, no matter whether countries are experiencing increasing or decreasing poverty. The estimations for inequality work in the opposite direction. Positive values of inequality estimates have thwarted the efforts to reduce poverty as a result of the increasing income in the countries. More specifically, inequality decreases the rates of predicted poverty reduction.

Unlike past analyses conducted before the COVID years[9], which showed sub-regional differences in income inequality elasticities between non-EU CESEE countries and EU CESEE countries, the above discussion suggests that differences in regional experiences in poverty reduction may not be attributable to a considerable extent to disparities in inequality elasticity in the CESEE region. Knowing that Bulgaria is a Balkan country and Lithuania is a Baltic country and that the behaviour of a non-EU country is similar to that of the EU countries can be an additional argument that the negative influence of inequality is a challenge

[9] Stankov, D. (2021). The influence of economic growth and inequality on poverty in the transition countries, with particular reference to the Macedonian economy. University American College Skopje.

for all CESEE countries and does not depend on the sub-region within the CESEE region.

Poverty decreased in half of the analysed countries in the analysed period (2010s), which is mainly, if not exclusively, attributable to the growth of mean equivalised income, and not to the changes in income distribution. For the CESEE countries, income growth exerts a reasonable impact on poverty reduction. Income inequality has the opposite role in changes in the poverty picture. The results obtained imply that inappropriate changes in income distribution are the primary driver of poverty change in all CESEE countries. In this respect, the variation of the inequality effect, in comparison with the income effect, demonstrates a larger influence on poverty changes. In other words, differences in the magnitude of changes in poverty are more a consequence of the effect of distribution than the effect of mean income growth.

Table 5: Contribution of mean income growth and inequality to poverty reduction, 2010s

	A	B	A+B
	*Ey*lnY*	*Eg*InG*	*Pred Povg*
Bulgaria	-1.23	1.90	0.67
Czechia	-1.12	1.44	0.32
Estonia	-1.17	1.65	0.48
Croatia	-1.07	1.50	0.44
Latvia	-1.20	1.79	0.58
Lithuania	-1.25	1.85	0.60
Hungary	-1.07	1.49	0.42
Poland	-1.13	1.55	0.42
Romania	-1.05	1.63	0.58
Slovenia	-1.06	1.31	0.25
Slovakia	-0.99	1.29	0.29
Montenegro	-1.12	1.75	0.63
N.Macedonia	-1.03	1.63	0.60
Serbia	-1.08	1.72	0.63
CESEE (mean)	-1.11	1.61	0.49

Source: Author's estimations, results from the model

The elasticity estimates for the CESEE countries lead to the expected poverty reduction mainly as a result of rising mean income growth or improving income distribution. Therefore, for the purposes of creating public policy, these estimates would be the most applicable. CESEE countries should be concerned about the high level of inequality, which is seen from the positive value of income elasticity. Changes in income distribution have significant effects on poverty reduction; consequently, the pace of income growth should be of less concern in comparison to the rate of inequality.

There are certain differences between the countries in the transformation of growth to poverty reduction, mainly depending on their inequality and income profiles. Even if positive income growth has a bearing on poverty reduction, an appropriate income distribution could be an important factor for achieving additional progress. An analysis of these individual profiles is crucial for creating suitable public policies for reducing poverty. It is reasonable, therefore, for CESEE countries to go beyond income growth as a factor for poverty reduction, creating public policies directed to a more favourable income distribution.

6. CONCLUSION

The current study examines poverty reduction performance based on the latest data available for the CESEE countries. Using the most recent comparable data from Eurostat, we first presented evidence on average GDP per capita growth, mean income and inequality growth and average poverty rate change since 2010. To calculate income and inequality elasticities and to determine the contribution of mean income growth and inequality to poverty reduction, we followed the subsequent improvement and evolution of the four models developed by Bourguignon (2002). Namely, the first model corresponds to the simple view that there is a constant elasticity between growth and poverty reduction. In the second model, Bourguignon included an additional explanatory variable for income inequality. In the third model, he added the coefficient poverty line/mean income and the initial degree of inequality. The fourth model is based on the lognormal approximation, where two explanatory variables are the growth and inequality elasticities. Following the past findings, based on linear regressions, we estimate the relative contributions of income and inequality changes to poverty reduction in the CESEE countries. For this purpose, we use a panel data model combining time-series of cross-section observations. Calculated elasticity estimates suggest

that income elasticity is negative for all the countries, implying that income growth influences poverty alleviation in all the CESEE countries. The estimations for inequality work in the opposite direction. The estimates of the relative contributions of income and inequality changes to poverty reduction show that a 1% increase in growth leads to a 1.11% decrease in poverty, and at the same time, a 1% increase in the Gini coefficient leads to a 1.61% increase in poverty, on average, in the CESEE region. In terms of intensity, income inequality tends to increase poverty to a larger degree than the opposite influence of income growth. The relative contribution of changes in inequality to poverty impedes efforts to achieve more significant poverty reduction as a result of the relative contribution of income growth. More specifically, inequality decreases the rates of predicted poverty reduction. The study finds that mean income growth is an important factor behind poverty changes, but still, income distribution has a crucial role in poverty behaviour in the CESEE countries. More precisely, it has been shown that inequality growth is the major driving force behind poverty change. Generally, high initial levels of inequality restrict the effectiveness of growth in reducing poverty, while improved income distribution decreases poverty for a given level of growth. Inequality works to increase poverty in all the CESEE countries, without sub-regional differences. The results obtained from the fixed effect panel data model confirm the hypothesis that economic growth contributes to poverty reduction, while the contribution of inequality is stronger and in the opposite direction.

Overall, the results obtained highlight the important role income inequality can play in reducing poverty despite prior beliefs of poverty changes being, in large part, a consequence of economic growth. Changes in income distribution, which have significant effects on poverty reduction, should be of greater concern than average growth acceleration. Even though mean income growth is the main driver of poverty reduction, further progress could be achieved under relatively favourable income distribution. It would seem reasonable, therefore, to give special attention to reducing inequality in all the CESEE countries.

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Received: March 28, 2024
Accepted: November, 06, 2024

ECONOMIC ANNALS, Volume LXIX, No. 243 / October – December 2024
UDC: 3.33 ISSN: 0013-3264

https://doi.org/10.2298/EKA2443069M

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BETWEEN GEOPOLITICS AND GEOECONOMICS – THE INFLUENCE OF FOREIGN DIRECT INVESTMENTS (FDI) ON THE ECONOMY OF SERBIA

ABSTRACT: *The subject of this analysis is foreign companies in Serbia, which are classified into six groups according to origin of capital. A survey of 28 companies with the largest share of gross value added (GVA) for Serbia was conducted. The research aimed to determine whether low- and medium-developed countries are able to develop when faced with conflicts and confrontations between large countries in the geopolitical and geoeconomic field using Serbia as a case study. A further goal of the research was to establish whether Serbia itself can record industrial growth in such conditions. The results presented cover a two-year period from the beginning of the Russian "special operation" in Ukraine, i.e. February 2022, to February 2024. The analysis showed that industrial production in Serbia has exhibited positive results in the last two years thanks to the participation of FDI from non-European companies. Two key data sources were used in the paper, namely Eurostat's statistical databases and data from the Statistical Office of the Republic of Serbia.*

KEY WORDS: *geoeconomics, economic growth, Serbia, foreign direct investments (FDI), nearshoring*

JEL CLASSIFICATION: E22, F21, F50, P29

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1. INTRODUCTION

At the beginning of the 21st century, the great powers continued their competitive struggle, emphasising technological development, the level of foreign direct investment (FDI) and the green transition as the most important measures of economic success. Moreover, the new economic interdependence of countries has raised issues of national security, and issues of foreign trade and the human factor have likewise become inherent components of geoeconomics. Thus, geoeconomics emerged as a combination of economics, investment and political power. The reasons for the increased influence of geoeconomics are economic crises, the emergence of multipolarity, the rise of state capitalism and increased awareness of the negative aspects of globalisation. Increased geopolitical tension and competitiveness have encouraged some countries to begin to use new geoeconomic tools (Cvetićanin & Maksimović, 2023; Maksimović, 2022; Thirlwell, 2010). However, less developed countries have become economically vulnerable due to frequent crises, and it has become an established opinion that deindustrialisation as a consequence of globalisation is a major cause of economic stagnation. In parallel to all of this, the process of breaking global value chains and creating regional value chains is taking place (Bijelić, 2022).

In the face of these new circumstances, the question arises as to what this means in terms of challenges for Serbia and FDI from a macroeconomic perspective, and how the country positions itself in such conditions. The initial hypothesis of this paper was that the current geopolitical atmosphere – especially the balance between East and West – affects the economic development of Serbia. Will Serbia be able to resist the challenges, or will it be dragged down by the negative industrial growth of the European Union? Currently, the European Union – and especially its key economy Germany – is experiencing a decline in industrial production. In 2023, average annual industrial production decreased by 2.4% in the Eurozone and by 2.0% in the EU as a whole compared to 2022 (Eurostat, 2024a).

Therefore, the aim of the paper is to find an answer to the question of whether the policy of balancing, i.e. the non-introduction of sanctions against Russia simultaneous to geopolitical cooperation with the most developed Western countries, has contributed to a favourable economic and political climate, i.e. the favourable influence of FDI, in Serbia. A further aim of the work is to determine

Serbia's attractiveness for FDI and whether it manages to achieve a successful balance between geopolitical requirements and geoeconomic opportunities. The study concluded that direct foreign investments of non-European companies have contributed to the positive performance of the Serbian economy over the past two years. A comparative analysis of Serbia with other countries of the Western Balkans showed that Serbia is comparatively more attractive for foreign investments.

The paper is divided into three parts. In the first, an overview of geoeconomic developments in the 21st century is given, framed by relevant literature related to geoeconomics and direct foreign investments. In the second part of the paper, a comparison of the countries of the Western Balkans in terms of FDI is made, while Serbia's advantages in terms of FDI inflows are also listed and presented. This, in turn, frames the research results, which indicate that the largest inflow of FDI into Serbia comes from non-European actors, specifically China, followed by Russia and other countries, such as the USA, Japan and South Korea. The third part of the paper presents a discussion that shows that the agility of the Serbian economy dates back to 2015, when a restructuring of technological and IT infrastructure was carried out and the management structure was improved, all of which had a positive effect on economic growth. Furthermore, in contrast to the pronounced economic downturn in the surrounding environment from 2023 on, Serbia continued to record noticeable growth in industrial production into the beginning of 2024.

The key data source used in this article is the statistical database of the Statistical Office of the Republic of Serbia (SORS), which collects data at the national level, including FDI and industrial production levels. By using this data, it is possible to obtain not only an overview of monthly and quarterly trends and statistical trends on an annual level, but also current conditions related to GDP. Another source is the statistical database of Eurostat, which publishes comparative and statistical data for the entire EU. The Republic of Serbia, as a candidate for EU membership, has developed a statistical system that is in line with the methodologies used by Eurostat. The data used for Table 1 is taken from statistics created by the International Monetary Fund (IMF). The observed period of comparison of direct investments in the Western Balkan region is from 2020 to 2024 (Table 1), with this period having been chosen because of the large and

frequent international crises in international relations that occurred in this time. In contrast to this, the observed period of FDI for the Republic of Serbia specifically is from February 2022 to February 2024.

1.1. Literature review

A review of the literature found that there has been a rise in geoeconomics in the 21st century, where economic security and power, access to resources and cutting-edge technology redefine national power, strengthening the influence of a country (Zarate, 2012). Eckert (2024) points to the impact of the changed geoeconomic situation on business power, lobbying and the way policymakers respond to geoeconomic pressures arising from the geopolitical situation caused by crises around the world. Increased distrust of democracies, the energy crisis stemming from Russia's "special operation" in Ukraine, as well as widespread uncertainty about disruptions to global supply chains, combined with droughts and other effects of climate change, have led to a series of market shocks and uncertainties. The same authors define geoeconomics as "the control of economic resources and their use in order to achieve national security" (Winter & Lentzler, 2024, p. 5). In the geoeconomic context, tools of economic stimulation, such as subsidising companies and economic branches that are critical for the vitality of the economy, lending under more favourable conditions, singling out selected companies to encourage development, introducing new technology, improving infrastructure as well as introducing tax incentives, are used to increase economic growth (Babić, 2019). Such measures should strengthen the resilience of the state, protect the national economy and contribute to the stability of institutions. While earlier studies indicated the key importance of economics and geography in the context of geoeconomics (Haushofer et al., 1928; Stepić, 2016; Walton, 2007), it is now economics and security that are of central importance (Jaeger & Brities, 2020; Winter & Lentzler, 2024). This means that the domestic economy – and above all its economic growth and industrial development – represent a critical aspect of national security, and as such must be the focus of other public policies.

Countries that aim to influence other less-developed economies now do so through economic means in order to gain political power over them, and this includes not only FDI as the main international factor, but also margins, import restrictions and tariffs. Not infrequently, they also demand political concessions in their favour, while simultaneously advocating for market openness and a less

restrictive regulatory environment (Clayton et al., 2023; Ghazalian & Amponsem, 2019). Many countries have tightened FDI control mechanisms, with these now seated firmly in the domain of international security and the context of international political economy. For example, the European Union (EU) has put geoeconomic tools into the function of geopolitics, primarily in the area of trade and investment. It introduced offensive and defensive economic measures to control FDI inflows to member countries. Defensive geo-economic tools include checks on inward investment, export controls to prevent the outflow of important technologies to third countries, instruments to combat coercion and efforts to expand and diversify supply chains. This all has the effect of facilitating the control of foreign investment and exports in general in order to preserve one's own dominance in a particular industry while at the same time preserving dominance in the global market. Furthermore, the subsidisation of certain infrastructure projects abroad which eliminate logistical bottlenecks, such as ports, electrical and IT networks and the like, can help maintain systems of trade, finance and information flows. Since 2017, the EU has made a geoeconomic turn towards deeper cooperation with its allies in order to prevent or inhibit the risk of fragmentation of member states into regional blocs (Bauerle Danzman & Meunier, 2023; Bauerle Danzman & Meunier, 2024). Empirical research has also indicated a positive impact of FDI inflows on human capital, technological development and innovation. However, due to the COVID-19 pandemic, FDI in 2020 decreased by 42% compared to 2019 on a global level (Ranđelović & Martinović, 2022; Saini & Singhania, 2018; Simionescu et al., 2021). However, the literature indicates that the fragmentation of capital flows has occurred precisely at the points of geopolitical conflict lines. There have been efforts to include bilateral drivers of FDI, especially for sectors that are considered strategic, taking into account the standard geographical distance and trade flows whose effects have increased since 2018. This is a major shift from the previous division of production, which had been primarily driven by international differences in labour and material costs. For example, in China, governmental directives aim to replace imported technology, favouring local suppliers in order to avoid dependence on geopolitical rivals (Aiyar et al., 2024). Geography also acts as a driver of FDI, which can foster connections due to a common history, culture, language similarity and quality of institutions (Acemoglu & James, 2001; Akhtaruzzaman et al., 2017; Sabir et al., 2019; Wackowski & Kowalczyk, 2012).

Furthermore, the review of domestic literature also shows that in 2006, one of the largest inflows of FDI up to that time was realised in Serbia, which, according to the data of the National Bank of Serbia, amounted to 4.26 billion dollars. This result was largely brought about by the investments of telecommunication companies, namely Telenor and Mobicom, through the privatisation of the National Savings Bank and Vojvođanska banka (Kastratović, 2016). The second period of increased FDI inflow to Serbia was in 2012, and the next one was achieved only ten years later. The first two periods were strongly connected to the sale of mobile operators and national banks, while the third period, i.e. 2022, can be attributed to a change in Serbia's geopolitical positioning. Serbia based its policy of attracting investors and providing financial support on the number of jobs that would be created. This was a deliberate strategy as a means of alleviating the high level of unemployment in the country. The big question is whether the investment policy model of Serbia, which provides subsidies to foreign companies to increase added value through production, would achieve better results (Bijelić, 2022). A good model for attracting and inflowing FDI which has positive effects on the whole of society can be seen through positive internal factors such as the reduction of macroeconomic instability and risk, positive incentives (both financial and non-financial), as well as fiscal consolidation and thus reduced investment risks, improvements in the fight against corruption and a countering of legislative and administrative inefficiencies. For these reasons, Serbia is more attractive for investment than other countries in the region. The countries of the Western Balkans, provided they improve their institutional framework and economic policy and carry out tax reforms, all have the potential to increase efficiency. It should be possible to direct investments towards the employment of a highly qualified workforce and introduce tax benefits for employees as well as special corporate tax relief that would encourage development and innovation within companies (Ranđelović & Martinović, 2022).

2. FDI AS A GEOECONOMIC COMPONENT IN THE REPUBLIC OF SERBIA

In spite of geopolitical limitations and geoeconomic challenges, Serbia's industry has shown resilience while at the same time managing to achieve international neutrality, thus demonstrating that it does not want to oppose countries with great economic power.

2.1. Comparison of Serbia to other countries of the Western Balkans in terms of FDI

The term "Western Balkans" came into use in 1988. Today the countries that fall under this term are Serbia, North Macedonia, Albania, Bosnia and Herzegovina, Montenegro and Kosovo[1]. Gradually the region has undergone a territorial and terminological orientation toward the EU, including the stabilisation of space, as well as the harmonisation of national regulations with those of the EU, with the ultimate aim arguably being the EU accession of Western Balkan states (Stepić, 2013).

The countries of the Western Balkans experienced a transformation from a planned to a competitive market economy after the collapse of socialism (and in the case of the former Yugoslavian states, their country). More rapid development was hindered by constant crises in the 21st century, with persistent challenges being the improvement of trade as well as attracting FDI and the (re-)building of institutional capacities. These countries began to improve until recently, when weak points such as institutional reforms, rule of law, an ineffective judiciary, corruption and inefficient public administration reached what was essentially a critical mass (Uvalić et al., 2020). However, there are other factors at play; if only the geographic proximity factor were involved, all the countries of the Western Balkans would benefit equally from the same effects, but they quite obviously do not. However, the economies of the Western Balkans were all relatively successful in attracting FDI in the second decade of the 21st century (2010–2019). Throughout that time, the inflow of FDI amounted annually to an average of 6.1% of GDP, with this being concentrated in the sectors of manufacturing, financial activities and insurance, trade, construction, mining and quarrying, real estate, electricity, gas and steam transport and storage. This figure was much higher than the average for the countries of the Central, East and South-East Europe (CESEE) region (Jovanović et al., 2021). Table 1 provides an overview of the inflow of FDI in the Western Balkan region, showing that its share was three-fifths of all FDI for the entire supra-region. The inflow of FDI in the Western Balkans (in million USD) amounted to 8,679.3 in 2023, the highest figure for the last four years (observed from 2020 to 2023). The inflow of net FDI in the gross domestic product of Serbia amounted to 56.4% in 2023. That is 6.1% less than in 2020, and

[1] All references to Kosovo in this document should be understood to be in the context of United Nations Security Council Resolution 1244 (1999).

2.6% more than in 2022. The total inflow of FDI in Serbia in 2023 was 6.5 billion dollars, a figure equal to that for 2020. The inflow of net FDI to Serbia from EU27 countries amounted to 4.9% of GDP in 2022; the highest level across these four years. The inflow of net FDI from non-European countries amounted to 3.1% in 2022 and 2.4% in 2023, with these having been predominantly Chinese investments, although investments also came from Japan, Germany and Russia. Albania and Montenegro have a slightly higher level of net FDI, namely due to investments in the field of tourism, with a total of 7.1% for both countries in 2023.

Table 1. Foreign direct investment in the Western Balkan region

	2020	**2021**	**2022**	**2023**
FDI in Western Balkan, million US$	5,577.4	7,943.3	8,578.1	8,679.3
Serbia in Western Balkans, %	62.5	57.9	53.8	56.4
		% GDP		
Albania				
FDI, net	7.0	6.8	7.6	7.1
Non-European FDI, net	1.2	1.1	1.1	1.5
Non-EU27 FDI, net	2.9	1.9	2.0	2.2
Bosnia and Herzegovina				
FDI, net	2.4	3.1	3.3	3.5
Non-European FDI, net	0.3	0.8	0.7	0.5
Non-EU27 FDI, net	0.9	1.8	1.6	1.9
Montenegro				
FDI, net	11.1	11.8	14.0	7.1
Non-European FDI, net	4.6	1.0	3.9	1.6
Non-EU27 FDI, net	8.9	8.1	9.7	4.8
North Macedonia				
FDI, net	0.1	5.0	6.2	4.8
Non-European FDI, net	0.0	0.4	0.7	1.2
Non-EU27 FDI, net	0.0	0.2	1.9	2.8
Serbia				
FDI, net	6.5	7.3	7.3	6.5
Non-European FDI, net	0.6	1.9	3.1	2.4
Non-EU27 FDI, net	2.2	3.7	4.9	3.4

Source: Authors' calculation based on IMF data (BOP/IIP statistics/statistics of national central banks) (IMF, 2024).

According to Bijelić (2022), when talking about the inflow of FDI in the Western Balkans, an econometric analysis found that the most important factors of attraction are fiscal stability, rule of law and the quality of infrastructure. However, investment in raising the qualifications of human resources through formal education and professional training on the job is of key importance for these countries. Furthermore, a survey of German companies showed that Serbia's proximity to the EU, cultural closeness and hard-working workers are decisive factors that make these companies invest in the region. The sectoral inflow of FDI shows that manufacturing, construction and ICT are leading the way. However, increasing institutional capacities and reducing corruption also contribute to a more favourable environment for FDI (Bijelić, 2022). From the above, Serbia can be seen to be the most attractive for the inflow of FDI in the region, and the reasons for this are political stability, macroeconomic stability, the relative size of the market and also the investment incentives and subsidies afforded to foreign companies. Furthermore, there is also its favourable geoeconomic position, as well as the highly significant effect of the positive experiences that foreign companies report having had to date (Ranđelović & Martinović, 2022). All declare that they are satisfied with the business climate and expect positive prospects and expansion in the market.

However, cooperation and investment between countries in the region is very important. This is supported by the theory of nearshoring, which refers to more intensive cooperation between neighbouring governments and countries. Nearshore outsourcing (or nearshoring) is a phenomenon involving the transfer of processes and IT services to a company located in a neighbouring country (Wackowski & Kowalczyk, 2012, p. 254). Doing business abroad can be difficult not only due to geographical distance, but also *psychological distance*. Psychological distance describes problems with (mis)understandings of a partner from another country with whom one does business. This phenomenon is somewhat alleviated in the case of the Western Balkans, as it is connected (especially to Central Europe) by similarities in geography, climate, cultures, customs and economic development. The advantages of nearshoring are convenient logistics, lower transportation and storage costs, a more reliable workforce, ease of upholding product quality, control of intellectual property (which is far easier in the neighbourhood), similar business experiences, lower risks due to shorter distances, certain congruence of strategic approaches and

joint work on improving digitisation (Aiyar et al., 2024; Lábaj & Majzlíková, 2023; Silveira, 2021; Slepniov et al., 2013). Also, nearshoring has become an interesting option due to the increase in labour costs in locations that were once considered a source of cheap labour, the rise of protectionism, increased uncertainty in the international context, the slow inflow of FDI and the weaker growth of trade at the global level (Pietrobelli & Seri, 2023).

2.2. Methodological framework of direct foreign investments in Serbia

Serbia's GDP increased by 4.7% year-on-year in the first quarter of 2024, according to the available data. This economic growth rate is higher than the projected 3.5% GDP growth rate for the year. The major contributor to this growth was the industry sector, which accounted for 0.67 percentage points of the GDP growth, assuming a neutral impact of agricultural production. Despite the external challenges and geopolitical constraints caused by the war in Ukraine, industry has shown resilience and adaptability, which is attributed to its transformation since 2015. The transformation includes the improvement of its technological structure and quality (Nikolić, 2021; Nikolić, 2023), which have helped the industry sector to maintain its growth momentum.

Table 2. Volume index of industrial production, % change compared with the same period of the previous year

	2023 / **2022**	**2024 Q1** / **2023 Q1**
Germany	-2.3	-7.5
Bulgaria	-8.3	-8.0
Hungary	-5.6	-4.1
Croatia	-0.3	-3.3
Romania	-3.0	-2.6
Slovenia	-5.6	-3.2
Bosnia and Herzegovina	-3.9	-5.0
Montenegro	6.4	4.9
North Macedonia	0.6	1.5
Albania*	-35.7	-
Serbia	**2.6**	**2.8**

Note: Unadjusted data (i.e. neither seasonally adjusted nor calendar adjusted data)
Source: EUROSTAT (2024c) except *Institute of Statistics – Tirana

It is uncertain whether new investments and domestic private consumption will be enough to protect against external pressures throughout 2024. This is especially concerning as the Eurozone's manufacturing sector has been in crisis, with a year-on-year decline in industrial production of 4.7%, with a 5.5% decline evident in Germany, its main economy, in Q1 2024. The countries near Serbia are also experiencing similar results (except for Montenegro, whose economy is predominantly tourism-oriented).

It is worth noting that the processing industry in Serbia has experienced widespread growth in the areas of production. Only a few areas of production witnessed a decline in activity at the beginning of 2024. Serbia has relied on diversification of foreign greenfield investments in previous years, which has been beneficial to its economy despite geopolitical chaos and a Eurozone crisis.

We will test this hypothesis by analysing the results of 28 companies that have the largest share in the gross value added (GVA) of Serbia. These companies are included in the monthly industry survey, which calculates the index of industrial production. They operate in all three sectors of industry, and contributed 9.4% to the GVA of the economy and 46.9% to the GVA of industry in 2022. The companies are classified into six groups based on the origin of their capital.

Since we have data for the physical volume of production, we will assume that this data does not significantly differ from the dynamics of real value-added in the short term. This is a common methodological assumption used when compiling quarterly national accounts due to the unavailability of direct data (SORS, 2021).

Table 3. Companies that have the largest share in the GDP of the Republic of Serbia and are included in the monthly survey of the industry with the aim of calculating the index of industrial production

Company name		Origin of capital
JP Elektroprivreda Srbije Beograd	*AD Prvi Partizan Užice*	***Serbia***
Elektrodistribucija Srbije doo	*Holding korporacija Krušik ad*	
JKS Beogradske elektrane		
Doo Dad Dräxlmaier Automotive, Zrenjanin	*Henkel Srbija doo*	***Germany***
Messer Tehnogas ad	*Leoni Wiring Systems SouthEast doo*	
Coca-Cola Hellenic Bottling Company-Srbija	*BAMBI ad Požarevac*	***USA***
Tetra Pak Production doo	*Philip-Morris Operations ad Niš*	
Naftna industrija Srbije ad	*Industrija smrznute hrane Frikom doo*	***Russia***
Serbia Zijin Bor Copper doo	*HBIS Group Serbia Iron & Steel doo*	***China***
Serbia Zijin Mining doo		
JT International ad	*APTIV Mobility Services doo*	***Others*** (other countries, foreign banks and funds)
Lafarge Beočinska fabrika cementa doo	*Hemofarm ad*	
CRH (Srbija) doo	*Tigar Tyres doo*	
Apatinska pivara Apatin doo	*AD Industrija mleka i mlečnih proizvoda IMLEK*	
Heineken Srbija doo Zaječar	*Yura Corporation doo*	

Source: SORS (2024)

2.3. Results

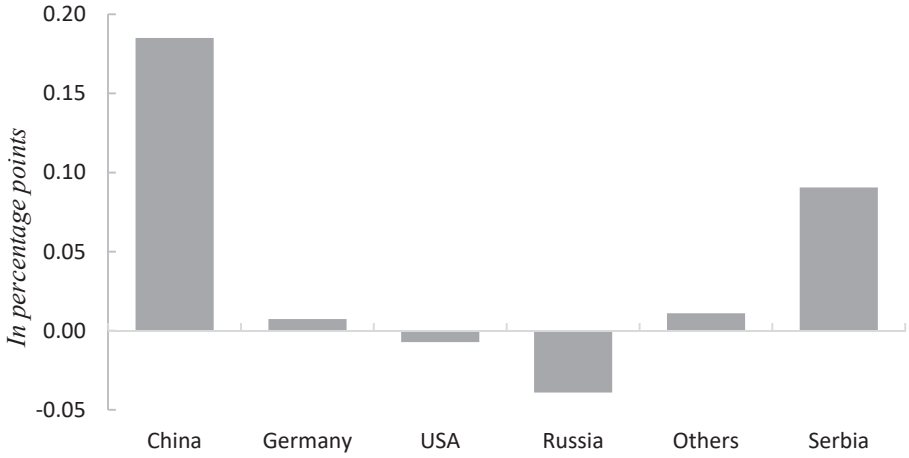
In 2023, the Serbian economy experienced 2.9% growth in real GDP. The group of companies observed contributed to this growth by 8.5%, equivalent to 0.25% of entire GDP growth. This contribution is more than half of the total contribution of industry to Serbia's GVA growth, which amounted to 0.45

percentage points in 2023. However, if one classifies the observed companies based on their investment capital origin, there is a shift in the conclusion drawn. It can be seen that this result is mostly derived from the activities of Chinese companies, particularly Serbia Zijin Bor Copper doo and Serbia Zijin Mining doo. In 2023, these companies increased production by 55.5% and 7.4%, respectively.

Serbian companies in the energy sector contributed significantly to the growth of added value, with a contribution of 0.091 percentage points. However, this growth was still excessive, and cannot be considered in any way sustainable in the long run. The growth was mainly due to favourable hydrological conditions and a low base for comparison. On the other hand, other observed subsets of companies either recorded an average stagnation of production or a more serious reduction, as was the case with Russian-owned companies.

The beginning of 2024 brought with it even more convincing results that confirm the initial hypothesis. Namely, during the first three months, on a year-on-year basis, the total GVA growth was about 4.7%. The 28 largest companies included in this analysis accounted for 6.2% of this (i.e. 0.29%). We have already mentioned that in this period, of all sectors of the economy, industry is the most impactful, with a contribution of 0.67 percentage points. This therefore means that this contingent of companies contributed to GVA growth with a large 43.5% share. Chinese companies have dominated the observed group of companies since 2023, with their dominance becoming even more apparent in the first three months of 2024. During this period, the company Serbia Zijin Bor Copper doo more than doubled its production (with a 108.1% increase), while Serbia Zijin Mining doo Bor recorded a production increase of 21.1%. Only one Chinese company, HBIS Group Serbia, recorded a decrease in production, of about 1.6%. Collectively, these three Chinese companies generated almost the entire growth in added value of the observed group of largest companies, accounting for approximately 97.6% of GVA growth.

Figure 1. The contribution of the observed group of companies to GVA growth in Serbia
(in 2023 compared with the same period of the previous year)
– companies grouped according to the origin of capital

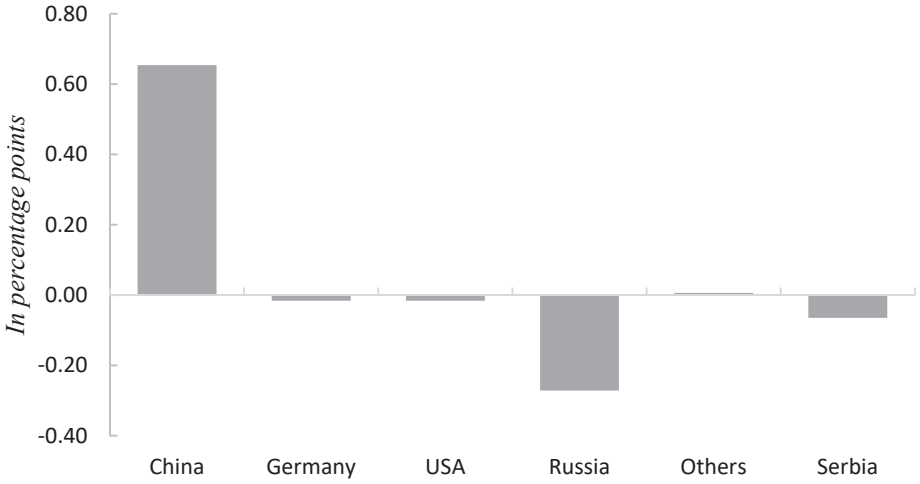


Source: Authors' calculation; SORS data (2024).

On the other hand, the results of other groups of companies are negligible in terms of growth, as their production remained almost unchanged compared to the previous year.

The initial hypothesis that the economic policy for diversification of investments from different countries and regions has been the correct decision thus far is supported by the results obtained. These results more clearly explain the performance of the industries of the observed countries, as shown in Table 1. Serbia's industrial production has been performing well for the past two years thanks to the participation of non-European companies. Without these companies, the results of industrial production in Serbia would also have been negative during this period.

Figure 2. The contribution of the observed group of companies to the growth of the total GVA of Serbia
(in the period January–March 2024 compared with the same period of the previous year)
– companies grouped according to the origin of capital



Source: Authors' calculation; SORS data, 2024.

The good result partly stems from free trade agreements (FTA) and numerous other trade arrangements that Serbia has achieved with third countries in previous years. The first is the 2019 agreement between the Republic of Serbia and the United States of America, leading to the opening of an office of the American Development Finance Corporation (DFC) (Nikolić, 2023, p. 175). Another important agreement is the free trade agreement between the Republic of Serbia and the Eurasian Economic Union (EAEU). This union has five member countries, namely the Russian Federation, the Republic of Belarus, the Republic of Armenia, the Republic of Kazakhstan and the Republic of Kyrgyzstan. In addition to Serbia, the EAEU signed an agreement on mutual cooperation with China, Iran, Egypt, Vietnam, Singapore and Tajikistan. This agreement is most important for Serbia for the food industry and agricultural products. The entry into force of this duty-free regime can be an incentive for tobacco production as well as primary and secondary agricultural production, leading to the export of certain high value-added products, including cheeses and brandies, edible fruits, canned fruits and vegetables and fruit and vegetable products such as jams and

juices. Additional products and sectors predicted to benefit are the pharmaceutical industry, the furniture industry and the ceramics industry. However, it is interesting that out of the ten exporters from Serbia to Russia that have to date taken advantage of this agreement, nine originate from foreign direct investments, and eight are from the Eurozone. This suggests that companies from Serbia must technically modernise their production, introduce more efficient technologies and enable additional investments in improving product characteristics in order to compete with companies in receipt of FDI on the territory of Serbia (Nikolić, 2022).

These agreements aim to encourage industrial production, which should be of higher technological quality, to utilise highly qualified workers, and therefore be more competitive. They should enhance economic cooperation and increase the volume of trade exchange. In this regard, one cannot ignore the fact that the market of this union is very large, arguably too large for Serbia, and, for example, Russian requirements for market access are high, with Serbian companies being poorly prepared for success in such markets. Therefore, despite constant technological restructuring, Serbia still cannot adapt to the requirements of this union. However, one other sector currently experiencing growth, namely the SME sector, may well see a chance to tap into such a large market.

Criticisms of various FTAs can be found in the literature. For example, at one time the FTA was only about the free trade of goods and services and did not consider free capital. In order to avoid the possibility of withdrawal of free capital in times of crisis, the IMF requires temporary capital controls to control investors and reduce outflows. Another example relates to research on the North American Free Trade Agreement (NAFTA) and the benefits it has had for the US in terms of growth and income distribution. In industries affected by NAFTA, workers without a high school diploma experienced a 17% drop in income compared to workers in industries not affected by NAFTA. These distributional effects can be the subject of political struggles, exemplified by former president Donald Trump, who focused his 2016 election campaign on disenfranchised American workers (Klement, 2021).

3. DISCUSSION

The beginning of the 21st century brought with it much uncertainty to both developed and less developed countries. Sudden technological changes and deindustrialisation which led to the impoverishment of society and economic stagnation were highlighted as negative consequences of globalisation. From an economic perspective, growth, industrial development and innovation and increases in foreign direct investment in order to alleviate the unemployment rate are all important for the preservation of national security. A domestic economy has to be able to withstand international pressures. Recently, governments have applied geoeconomic tools in an attempt to protect their economies, switching, as a partial result, from liberal trade to protection mechanisms. In Serbia, the first negative impact following fiscal consolidation was that of the migrant crisis in 2015 (Nikolić & Maksimović, 2023), then the market shocks caused by the COVID-19 pandemic and finally the conflict between Russia and Ukraine. Thus, in February 2024, compared to February 2023, industrial production decreased by 6.4% in the Eurozone and by 5.4% across the EU as a whole. Among the member states for which data is available, the largest monthly increases were recorded in Ireland (+23.5%), the Netherlands (+6.6%) and Denmark (+5.6%). The biggest declines in the same period were recorded in Slovenia (-7.4%), Croatia (-4.3%) and Finland (-2.7%). In the first two months of 2024, industrial production in the EU increased by 8.6% for capital goods, while production decreased by 1.3% for energy, by 1.7% for non-durable consumer goods, by 4.0% for intermediate products and by 6.4% for consumer durables (EUROSTAT, 2024b).

The countries of the Western Balkans are taking advantage of the positive externality of the global crisis and are increasingly turning to mutual cooperation. The intertwining of cooperation and competitiveness is a way to improve the geoeconomic position of Serbia and other Balkan countries in the context of the international economy. This paper emphasises the attractiveness of Serbia for FDI and shows that geopolitics has so far proven to be a positive growth factor in the country. From the analysis, we can see that Serbia is located in the space between geopolitics and geoeconomics, with this paper showing evidence of the geostrategic transformation and reindustrialisation of its economy. This has led to an improvement in the position and a positive change in the political influence of Serbia in the world through the connection of geoeconomics, security and

foreign trade. Industrial development was observed in the period from February 2022 to February 2024. The originality and agility of Serbian industry in the observed period stems from its transformation since 2015, when a technological restructuring and improvement of product quality was undertaken. 28 companies from 6 groups of countries classified by origin of capital were observed, namely Serbia, the USA, Germany, Russia, China and Others.

The empirical data obtained indicates that growth in terms of industry was achieved in the period mentioned, namely 2.6% in 2023, to as high as 7.8% in January/February 2024. When the observed companies are classified according to the origin of investment capital, it can be seen that Chinese companies have the greatest influence on these positive results. Domestic companies, such as Elektroprivreda Srbije, also made a significant contribution to that success. Conversely, stagnation in industrial development was recorded by companies from the USA, Germany and Russia.

Therefore, real GDP growth in 2022 was around 2.3%. In comparison, nine EU countries recorded a continuous decline in GDP at the end of 2022, i.e. external shocks faced by the domestic economy in the fourth quarter, with Germany being among these, recording a drop of -1.7%. The German economy is very important for the economy of Serbia because there are about 900 German companies in Serbia, employing over 80,000 workers between them, with Germany also being a consumer of around one quarter of the country's production exports. "However, most of the products of the processing sector are placed on the domestic market" (Nikolić, 2023, p. 163).

As for the agreements, they aim to encourage industrial production (which should be of a higher technological quality and therefore more competitive), to employ a highly qualified labour force and to lead to an increase in the volume of trade exchange. Examples of agreements show that they are not always beneficial. Serbia's path of adaptation to the requirements for placing products on the EU market – and likewise also on the Russian market – is arduous and far from complete. However, the SME sector, which is more agile and faster to adapt, may see a chance to tap into such a large market.

Complex geopolitical relations are characterised by the struggle for supremacy between the USA and Russia on the international stage, as was also the case

during the Cold War with the then USSR. At the same time, with the emergence of China as an economic power, the geoeconomy has become a combination of economy, investment and military and political power (Klement, 2021). While the world has focused on the conflict between the US and China, it can be stated that relationships between China and the Russian Federation are becoming ever closer. Towards the end of 2023, China and Russia worked to strengthen bilateral cooperation, giving priority to the economy, diplomacy and politics. While the conflict and threats between the USA and Russia persist, Serbia adopts a stance of non-confrontation to its own advantage. Having said that, however, it must be noted that the level of both of these countries' FDI in Serbia has declined. The situation is different with China's FDI, which has seen a continuous increase since 2023 (Figure 1 and Figure 2). To summarise, Serbia has opted for an independent foreign policy that has produced results.

4. CONCLUSION

Today's multipolar context has led to the rise of geoeconomics and the notion of the international political economy. The creation of a new international trade policy, foreign policy and economic security are the focus of all countries in the world today. Thus, the nation state has become crucial to the design of international relations, and the economy is now a crucial component of a country's military defence. All this has led to increased economic independence of nations and the question of how to reduce political sensitivity and preserve peace and economic security (Winter & Lentzler, 2024; Roberts et al., 2018). The results obtained and the analyses indicate that Serbia has resisted external pressures thus far. This statement is encouraging for Serbia, because it enables it to better position itself and develop the security-related aspects of its own economy and successfully participate in the management of international relations.

The economic vulnerability of countries since 2008 has led to national security being the focus of all public policies. Mechanisms to tighten regulations on the introduction of FDI have been used as defensive tools. Thus, geoeconomic tools were put into the function of geostrategy, primarily with the aim of protecting trade and innovation. Serbia and the other countries of the Western Balkans need to become more aware of the fact that the model of the liberalisation regime has been abandoned and free trade without barriers has been replaced by economic

security. The inflow of FDI to these countries in 2023 was 8,679 million dollars, a figure representing the highest in the observed period from 2020 to 2023. Factors in attracting FDI include fiscal stability, rule of law and quality of infrastructure. In Serbia, the inflow of FDI was encouraged by political and macroeconomic stability, the size of the market, subsidies for foreign companies and other incentive measures for investment. The analysis of 28 companies that have the largest share in the gross value added (GVA) of Serbia, operating in all 3 sectors, showed that from 2023 Chinese companies have come to dominate, with this dominance being further affirmed in the first quarter of 2024. As the paper pointed out from a variety of case studies, the effects of concluded agreements are not always in line with those projected or predicted. The conclusion drawn from the analysis presented here is that the general results confirm the initial hypothesis that the economic policy of diversification of FDI in terms of geographical origin has been successful.

But what is the counter-effect of this approach? Is there one? Could geopolitical and geoeconomic problems arise for or within Serbia as a result of this approach? Serbia's cooperation with other countries in international economic relations is multidimensional and complex. For example, its cooperation with EAEU countries has resulted in the opening-up of the Serbian market to 180 million inhabitants, and the beneficiaries can be both domestic companies and foreign companies operating on the territory of Serbia. Finally, one key issue remains the long-term sustainability of Serbia when balancing between different geopolitical blocs, and this research paper has shown that Serbia has managed to achieve geoeconomic profit *and* success in terms of geopolitical balancing.

Acknowledgements

The paper was written as part of the Research Program of the Institute of Social Sciences for 2024, which is supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

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Received: April 23, 2024
Accepted: September, 17, 2024

ECONOMIC ANNALS, Volume LXIX, No. 243 / October – December 2024
UDC: 3.33 ISSN: 0013-3264

https://doi.org/10.2298/EKA2443093I

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HOW TRADE PARTICIPATION FUELS INNOVATION IN AFRICA: UNVEILING INSIGHTS THROUGH EMPIRICAL ANALYSIS

ABSTRACT: *By utilising a nonstationary heterogeneous approach to uncover the dynamics between foreign trade participation and innovation levels in developing economies, this empirical study investigates how trade participation fuels innovation in 25 selected African countries. The African continent is experiencing significant economic growth and globalisation, making it essential to understand the potential linkages between international trade and innovation. Using a dynamic fixed effect estimator within the framework of nonstationary heterogeneous panel models on panel data of 25 African countries from 1996 to 2021, the study revealed that national income significantly influences both exports and imports in the region. The study also identified bidirectional causal links between industrial design applications, patents, and trademarks with exports and imports, highlighting the symbiotic relationship between innovation and trade engagement. Successful exports are found to foster investments in design, patents, and branding. Recommendations on the basis of these findings include fostering innovation ecosystems through research institutes and collaborations, developing balanced trade policies to support domestic industries and SMEs, offering incentives for research and development, and strengthening trade promotion agencies to assist businesses in navigating international markets, identifying trade opportunities, and addressing export-import challenges.*

KEY WORDS: *industrial design applications, patent applications, research and development expenditure, trade participation, trademark applications.*

JEL CLASSIFICATION: F140, O32, O360

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1. INTRODUCTION

The African continent has gained increasing prominence in global economic trends in recent years due to increasing levels of globalisation. With its vast natural resources, youthful population, and expanding consumer markets, the continent presents an attractive investment destination and is seen as a frontier for business opportunities. However, the primary objective of any economy is to achieve greater national output and foster economic growth, which is widely recognised as a pivotal macroeconomic goal. Innovation serves as a potent source of productivity gains, enabling businesses to produce more with fewer resources and ensuring increased output. One of the drivers of innovation is international trade, foreign trade, or trade participation.

International trade refers to the integration of nations in terms of free trade, the free movement of capital, and financial activities (Igudia, 2004). This well-established concept, dating back to Smith's analysis of market specialisation and Ricardo's theory of comparative advantage, highlights that international trade promotes the efficient allocation of resources and allows for the dissemination of knowledge and technology, as well as improved competition in domestic and international markets (Ijirshar, 2019; Ricardo, 2001; Smith, 1776). Scholars have shown how exposure to international markets through trade participation affects incentives for innovation (Akcigit & Melitz, 2021; Gür, 2020; Kiriyama, 2012; Melitz & Redding, 2021). Firms primarily engage in foreign markets through the export of goods and services, which plays a crucial role in their worldwide expansion and is favourable for their innovation activities. Studies have increasingly focused on technological innovation since it directly impacts product characteristics (Geng & Kali, 2021). According to Geng and Kali (2021), trade affects the innovation of firms through three channels: increasing market size (driven by export opportunities), intensifying market competition (through trade-induced competition), and facilitating foreign sourcing. Foreign sourcing can either complement or substitute for domestic innovation. On the one hand, it enhances innovation by reducing production costs for domestic firms, encouraging knowledge spillovers, and improving absorptive capacity. On the other hand, it can dampen domestic innovation by allowing firms to acquire external inputs rather than developing them through in-house research and development.

While considerable research has focused on these global dynamics, significant gaps remain in understanding how trade participation specifically influences innovation in African economies, where distinct regional factors such as nascent industrial bases and unique market structures may alter the typical trade-innovation relationship. To address this gap in the literature, this study seeks to examine how trade participation operates as a catalyst for economic growth, innovation, and development across African nations. It has been argued that by actively participating in international trade, countries may expand their economic horizons, accessing larger markets that incentivise innovation and economic activity. Exposure to global competition compels domestic firms to increase their efficiency and competitiveness, fostering innovation as they adapt to meet diverse consumer demands. Trade participation also facilitates the transfer of technology and knowledge, contributing to technological advancement. Therefore, trade participation has been recognised as a key driver of innovation and development in many parts of the world, with the potential to stimulate productivity, increase competitiveness, and foster innovation. African nations, aware of these benefits, have actively participated in trade activities both within the continent and with international partners. Regional economic communities such as the African Union and the African Continental Free Trade Area (AfCFTA) have emerged to facilitate intra-African trade.

Despite the increasing participation of African nations in global trade, there remains a critical lack of empirical studies that directly assess the extent to which trade fuels innovation in this unique regional context. By addressing this void, the present study offers a rigorous empirical examination of how trade participation influences innovation in Africa. This research not only contributes to the global understanding of trade-driven innovation but also provides region-specific insights that are crucial for African policymakers and business leaders aiming to foster sustainable growth. The selection of African countries is based on the availability of innovation indicators, allowing the study to explore whether the effects of trade participation on innovation are homogenous across the region. Through this empirical analysis, the study aims to bridge existing knowledge gaps and offer actionable insights into how trade participation catalyses innovation across selected African countries. Consequently, this research has significant implications for development agencies, policymakers, and businesses striving to

harness innovation-centric strategies for economic diversification and global competitiveness.

2. LITERATURE REVIEW

The study hinges on the export-led growth hypothesis and the innovation-led growth model. These theories posit that increased trade participation can stimulate innovation, resulting in greater economic growth. The export-led growth hypothesis posits that an increase in exports can drive economic growth (Dreger & Herzer, 2013). In the context of African economies, the theory is closely related to the impact of trade participation on innovation. As African countries actively engage in international trade, they expand their export opportunities, leading to increased revenue. This additional income can be reinvested in innovation-related activities, such as research and development (R&D) and technology adoption. Moreover, trade exposes African firms to global competition, encouraging them to innovate to remain competitive in international markets. The pressure to improve product quality, reduce costs, and introduce new products or services serves as a powerful incentive for innovation. Moreover, trade facilitates knowledge transfer and technology adoption, further fostering innovation within African economies. In a closely related manner, innovation-led growth theory also asserts that innovation is the primary driver of sustained economic growth (Smorodinskaya et al., 2019). In the context of African economies and their trade participation, this theory is pertinent. Trade can serve as a catalyst for innovation in Africa by expanding market opportunities, promoting competition, and facilitating knowledge transfer. As African nations actively engage in global trade, they create conditions conducive to innovation, emphasising the critical role of trade participation in fostering innovation-led growth in the region.

The catch-up theory explores the dynamics of economic development in less advanced countries. It posits that these countries can experience rapid industrial growth by importing technology and innovation from more developed nations (Veblen, 1915). In the context of Africa, this theory suggests that the region which is seen as a developing area with potential for significant industrial growth can achieve convergence with wealthier nations through technological advancements and innovation. However, challenges exist, including technology transfer difficulties, institutional limitations, and policy effectiveness.

Product cycle theory posits that affluent nations typically innovate new products, often enjoying a monopolistic advantage fuelled by domestic market needs (Gerschenkron, 1962). However, they might lack knowledge of foreign market conditions, leading rival firms in other countries to imitate and eventually dominate the global market. The theory delineates stages: initial monopoly, foreign expansion, competitive advantage of lower costs, and eventual global dominance by foreign producers, turning innovating nations into net importers (Gerschenkron, 1962). In the context of African countries, this theory emphasises the role of trade and innovation. Initially, African nations may import innovative products, but as these mature, they can engage in trade and domestic innovation to adapt and enhance these technologies, fostering economic growth. However, the theory's applicability today is challenged by rapid technological advancements and evolving consumer preferences that can significantly alter product life cycles, highlighting the need for a nuanced understanding of innovation and trade dynamics.

The escape-competition effect theory, initially proposed by Arrow (1962) and further developed by Aghion et al. (2005), posits that import competition can stimulate business innovation. Arrow argued that competition prompts companies to invent as a means of outperforming rivals, whereas in the absence of competition, firms may lack the incentive to innovate. The Aghion et al. (2005) model emphasised the conditions under which competition encourages innovation, particularly when rival firms possess similar technological potential, leading to increased returns on innovation. This theory suggests that innovation can be employed by businesses to evade trade rivalry, ultimately driving higher levels of innovation in response to increased competition. In the context of African countries, escape-competition effect theory highlights the importance of innovation as a tool to break free from stagnation caused by diminishing returns to capital and labour. By investing in R&D and cultivating entrepreneurial ecosystems, African nations can create new products and technologies, fostering economic growth and trade participation, especially in innovation-rich sectors. However, challenges such as inadequate infrastructure, limited access to financing, and human capital deficiencies may impede the effective implementation of innovation policies in these countries.

A few studies have explored the impact of trade participation on innovation. For example, Damijan and Kostevc (2015) analysed data from Spanish manufacturing firms from 1990 to 2008, employing ordinary least squares analysis. Their findings indicated that firms glean insights from trade activities, leading to the introduction of novel products or processes influenced by their foreign trade connections. Notably, the study suggested that import links play a significant role in fostering innovation, allowing firms to prepare for entry into export markets. More recently, Cai et al. (2020) investigated Chinese data from 2001 to 2007, revealing a link between participation in export trade and product innovation. Additionally, Geng and Kali (2021) delved into the effects of trade participation, with a focus on technological innovation. Their research highlighted that international trade fosters innovation by intensifying market competition, expanding market size, and facilitating foreign sourcing, ultimately resulting in a positive impact on domestic innovation.

3. METHODOLOGY

Our study relied on secondary data obtained from various sources, including the World Bank (2021). and the World Intellectual Property Organization. (2021). Panel data were collected on 25 selected African countries covering all variables in the models from 1996 to 2021, a period of 26 years. The variables of interest include industrial design applications, patent applications, trademark applications, research and development expenditure, GDP per capita (PPP, constant 2017 international $), exports and imports of goods and services (current US$), and overall logistics performance index. The data on innovation indicators are limited to a few periods, and only countries with data covering at least three periods were selected, with the study interpolating missing observations. Specifically, data for some innovation measures (industrial designs, patents, and trademark applications) were sourced from the World Intellectual Property Organization. (2021). Industrial design applications measure only the appearance or aesthetic features of a product, whereas a patent protects an invention that offers a new technical solution to a problem. The study used the applications (industrial designs, patents, and trademarks) taken out by the country's residents in the respective country. On the other hand, research and development was sourced from the World Bank (2021) as gross domestic expenditures on R&D, expressed as a percentage of GDP. Other variables, such

as the logistics performance index, assess real-world trade logistics performance, providing valuable insights to national leaders, influential policymakers, and private sector traders. It aids in comprehending the obstacles encountered by these stakeholders and their trading counterparts, as they work to diminish logistical hindrances in international trade. The data on exports and imports were sourced from the World Bank (2021). The export of goods and services constitutes the total value of all commodities and additional market-related services supplied to the global market, whereas the import of goods and services signifies the total value of all commodities and additional market-related services acquired from the global market.

3.1. Theoretical model and empirical model specification

To examine the influence of trade participation on innovation, our study uses the approach employed by Geng and Kali (2021) and is anchored in the escape-competition effect theory propounded by Arrow (1962), who claimed that import competition fosters business innovation. In addition, enterprises with the same technological potential often experience increased returns on innovation (Aghion et al., 2005; Meza-González & Sepulveda, 2019; Sedgley, 2022). Our study uses the market size effect and competition effects on innovation. It has been stated that trade exposes countries to competition, which dampens innovation by restricting firm size, whereas less trade competition may have less of an effect on innovation (Aghion & Howitt, 1992; Arrows, 1962; Geng & Kali, 2021; Griffith & Van Reenen, 2023; Tingvall & Poldahl, 2006). According to Gür (2020), a country's trade is very instrumental in increasing innovation capabilities in developing economies. The GDP per capita, PPP (constant 2017 international $) (GDPP) and the overall logistics performance index (LPI) both play crucial roles in driving innovation. A higher GDPP provides the financial resources necessary for research and development, education, and infrastructure, fostering an environment where innovation can thrive. Additionally, a larger domestic market resulting from a strong GDPP encourages firms to invest in innovation to gain a competitive edge. The LPI, on the other hand, impacts innovation by streamlining supply chains, reducing costs, and improving the efficiency of logistics systems. Efficient logistics enable companies to bring new products to market more quickly and engage in international trade, facilitating the exchange of ideas and technologies. Together, a robust national income (GDPP) and a high LPI score create an ecosystem that supports innovation by providing the

necessary resources, incentives, and infrastructure for research, development, and market access. Thus, the model for assessing the influence of trade participation on innovation can be stated as follows:

$$INV_{it} = f(Trade_{it}, \ln GDPP_{it}, ALPI_{it}), \quad (1)$$

where *INV* is innovation and *Trade* is the trade participation component. Importantly, trade participation occurs through either exports or imports. Decomposing trade participation into the exports and imports of goods and services, the model can be specified as follows:

$$INV_{it} = f(EXPT_{it}, IMPT_{it}, \ln GDPP_{it}, ALPI_{it}). \quad (2)$$

The variables represent each country i in year t for each variable. The model was used to estimate the impact of exports and imports on all innovation indicators, including the IND model for industrial design applications, the PAT model for patent applications, the TRD model for trademark applications, and the RAD model for research and development expenditure. The stochastic form of equation (2) can be specified as:

$$INV_{it} = \beta_0 + \beta_1 \ln EXPT_{it} + \beta_2 \ln IMPT_{it} + \beta_3 \ln GDPP_{it} + \beta_4 ALPI_{it} + \varepsilon_t, \quad (3)$$

where $\varepsilon_{it} = \mu_i + \eta_{it}$, β_0 is the intercept, $\beta_1 to \beta_4$ represent the parameters to be estimated, μ_i represents the individual-specific effect, η_{it} represents the idiosyncratic error, and $i = 1,...,n$ (for all countries in each region), $t = 1996,...,2021$. Following equation (3), the dynamic panel models that were estimated are as follows:

$$IND_{it} = \beta_0 + \beta_1 IND_{it-1} + \beta_2 \ln EXPT_{it} + \beta_3 \ln IMPT_{it} + \beta_4 \ln GDPP_{it} + \beta_5 ALPI_{it} + \varepsilon_t \quad (4)$$

$$PAT_{it} = \beta_0 + \beta_1 PAT_{it-1} + \beta_2 \ln EXPT_{it} + \beta_3 \ln IMPT_{it} + \beta_4 \ln GDPP_{it} + \beta_5 ALPI_{it} + \varepsilon_t \quad (5)$$

$$\ln TRD_{it} = \beta_0 + \beta_1 \ln TRD_{it-1} + \beta_2 \ln EXPT_{it} + \beta_3 \ln IMPT_{it} + \beta_4 \ln GDPP_{it} + \beta_5 ALPI_{it} + \varepsilon_t \quad (6)$$

$$RAD_{it} = \beta_0 + \beta_1 RAD_{it-1} + \beta_2 \ln EXPT_{it} + \beta_3 \ln IMPT_{it} + \beta_4 \ln GDPP_{it} + \beta_5 ALPI_{it} + \varepsilon_t \quad (7)$$

The theoretical a priori expectations are that the influence of trade participation on innovation is either positive or negative, depending on whether the countries that are trading have copied the technology or upscaled in their process because participation in the global market or trade competition constrains performance.

3.2. Method of data analysis

Our study focuses on analysing the relationships between trade participation and innovation among African countries. To ensure robust and reliable estimations via panel data, the analysis begins by testing for stationarity and the presence of unit roots, which is critical for avoiding spurious regressions. Panel unit root tests were conducted via both first- and second-generation methods, particularly to account for cross-sectional dependency when present. These tests included the Levin, Lin, and Chu (LLC) (2002), Hadri (2000), Pesaran (2003), and Maddala and Wu (1999) tests, which assume common persistent parameters across cross-sections, with the exception of the Breitung test (Breitung, 2001). Additionally, the Im, Pesaran, and Shin (IPS) (2003) test was employed to allow for parameter variation across cross-sections (Im et al., 2003; Im et al., 2023).

To analyse the long-term relationships between trade participation and innovation, the study employed nonstationary heterogeneous panel estimators, specifically the pooled mean group (PMG), dynamic fixed effect (DFE), and mean group (MG). These estimators were chosen to accommodate the diverse economic dynamics, nonstationarity, and long-run equilibrium relationships among African countries. They also enabled the analysis to account for both country-specific effects and the heterogeneity or homogeneity of the panel. The selection of the appropriate estimator was based on Hausman-type tests, ensuring both efficiency and robustness in the analysis. The study ultimately selected the DFE estimator on the basis of the results of the Hausman (1978) test, which indicated its suitability for the panel structure. The analysis assumed that cross-sectional dependence could affect the validity of panel unit root tests, particularly given the interconnectedness of African economies. Thus, second-generation unit root tests (such as Pesaran's [2003] cross-sectional augmented tests) were employed where appropriate. Additionally, the assumption of long-run homogeneity was tested via the Hausman test to determine whether pooling the data across countries would be valid or whether a country-specific approach would be more appropriate. The Juodis, Karavias and Sarafidis (2021) Granger

noncausality test was used to assess the direction of causality between trade participation and innovation, offering insights into whether trade participation directly stimulates innovation or whether the causality operates in reverse. The limitations encountered during the analysis included potential data constraints, especially regarding the availability of consistent innovation indicators across all African countries. However, this limitation was carefully considered in the interpretation of the results, and appropriate robustness checks were performed to mitigate their impact.

4. RESULTS AND DISCUSSION

4.1. Panel unit root test results

The results of these tests, presented in Table 1, provide insights into whether the variables are stationary or nonstationary. The null hypothesis for these tests is that the variable has a unit root and is nonstationary, whereas the alternative hypothesis suggests that the variable is stationary. The significance level for the tests is set at the 5% critical level.

The results in Table 1 indicate that while some of the variables were initially found to be stationary at their original level, all the variables exhibited stationarity after applying a first difference transformation.

Table 1: Panel unit root test results

Panel Unit Root Tests	**lnimpt**	**d.lnimpt**	**lngdpp**	**d. lngdpp**	**lnexpt**	**d.lnexpt**
Harris-Tzavalis (rho)	0.9249	-0.1486***b	0.9706	0.1207***b	0.9254	-0.0630***b
Breitung (lambda)	5.6169	-5.8208***b	11.6048	-8.3938***b	5.7147	-4.8003***b
Levin-Lin-Chu	-9.6805***a	-1.1649***	-3.8136***a	-4.7758***	-10.7720***a	-1.7943***
Im–Pesaran–Shin	3.8792	-9.6502***b	1.2939	-10.8485***b	3.7596	-9.7921***b
Fisher-Type	2.9942***a	-0.7062	1.4535*	-0.8283	1.2304***a	-1.0137
Pesaran's CADF	1.092	-1.221	-1.412	1.413	-1.110	0.888
Hadri LM	60.6129***	-0.1389 b	75.0793***	9.4630***	60.0899***	0.5905 b
Panel Unit Root Tests	**ind**	**d.ind**	**rad**	**d.rad**	**alpi**	**d.alpi**
Harris-Tzavalis (rho)	0.6055***a	-0.2383***	1.031	0.3341***b	0.9089	0.3516***b
Breitung (lambda)	9.0394	-5.6515***b	9.1162	-5.9085***b	1.8871	-8.8698**b
Levin-Lin-Chu	0.5231*	-5.1256***b	0.5843	-5.7283***b	-0.1428	-8.8493***b
Im–Pesaran–Shin	-	-	6.8806		1.2385	-5.6891***b
Fisher-Type	0.5563	1.9659***b	5.2991***a	-9.143***	0.2492	-1.1639
Pesaran's CADF	4.955	4.383	1.726	2.431	6.016	-3.138***b
Hadri LM	25.7843***	-3.5150 b	56.4971***	13.3743***	44.1506***	6.5872***
Panel Unit Root Tests	**pat**	**d.pat**	**lntrd**	**d.lntrd**		
Harris-Tzavalis (rho)	0.8176***a	0.0527***	0.8748	-0.1756***b		
Breitung (lambda)	4.4588	-8.0935***b	4.9131	1.0882		
Levin-Lin-Chu	-0.0230*	-26.0678***b	-42.867***a	1.9894		
Im–Pesaran–Shin	-0.5704	-12.8431***b	3.4536	-6.9075***b		
Fisher-Type	-3.2415	18.0431***b	2.6515	5.8026***b		
Pesaran's CADF	3.569	1.012	-0.537	-1.201		
Hadri LM	35.7291***	-1.7836 b	41.5165***	1.8039**		

Source: Extracts from STATA 15 Output. **Note:** The asterisks (***, **, and *) denote rejection of the null hypothesis at the 1%, 5%, and 10% levels of significance, whereas a and b indicate stationarity at the level and first difference, respectively. CADF=cross-sectional augmented Dickey–Fuller, LM= Lagrange multiplier

4.2. Correlation test for multicollinearity

Table 2 presents the correlation matrix of the predictor variables. Correlation coefficients ranging from -1 to 1 indicate the strength and direction of linear relationships between pairs of variables. High absolute correlation coefficients may indicate multicollinearity. However, it is important to note that correlation does not imply causation, and further diagnostics are necessary to address multicollinearity concerns.

Table 2: Results of the correlation test for multicollinearity

Innovation Model	lnexpt	lnimpt	lngdpp	alpi
lnexpt	1			
lnimpt	0.7745	1		
lngdpp	0.5412	0.4836	1	
alpi	0.2306	0.26	0.2588	1

Source: Extracts from STATA 15 Output.

The results from Table 2 indicate the absence of substantial multicollinearity. The observed weak relationships among the explanatory variables suggest that they do not redundantly convey the same information. This is favourable for the reliability of the models' coefficients and predictions, as the presence of multicollinearity can lead to unstable and less interpretable results or indeterminate estimates. Therefore, the results from the correlation test provide evidence that the examined model is free from severe multicollinearity issues, reinforcing the credibility of their analytical outcomes, and enhancing the models' utility for informed decision-making.

4.3. Nature of causality between trade participation and innovation for the selected African countries

The results are presented in Table 3, and a discussion is provided below on the results presented in Table 3.

Table 3: Juodis, Karavias and Sarafidis (2021) Granger noncausality test results

Hypothesis	HPJ Wald Test	*P*-value HPJ
lnexpt does not Granger-cause lngdpp.	1.822455	0.1770
lngdpp does not Granger-cause lnexpt.	6.222917**	0.0126
lnimpt does not Granger-cause lngdpp.	571712	0.9397
lngdpp does not Granger-cause lnimpt.	36.98981***	0.0000
ind does not Granger-cause lnexpt.	4.780569**	0.0288
lnexpt does not Granger-cause ind.	4.856023**	0.0275
pat does not Granger-cause lnexpt.	12.4831***	0.0004
lnexpt does not Granger-cause pat.	0.040775	0.8400
lntrd does not Granger-cause lnexpt.	50966551	0.4753
lnexpt does not Granger-cause lntrd.	102.7355***	0.0000
rad does not Granger-cause lnexpt.	0.050205	0.8227
lnexpt does not Granger-cause rad.	5.62997**	0.0177
ind does not Granger-cause lnimpt.	9.306808***	0.0023
lnimpt does not Granger-cause ind.	11.67317***	0.0006
pat does not Granger-cause lnimpt.	11.34989***	0.0008
lnimpt does not Granger-cause pat.	10070539	0.7510
lntrd does not Granger-cause lnimpt.	10.32785***	0.0013
lnimpt does not Granger-cause lntrd.	107.6093***	0.0000
rad does not Granger-cause lnimpt.	1.392559	0.2380
lnimpt does not Granger-cause rad.	2.57651	0.1085
ind does not Granger-cause lngdpp.	3.39781*	0.0653
lngdpp does not Granger-cause ind.	13.56904***	0.0002
pat does not Granger-cause lngdpp.	37407229	0.5408
lngdpp does not Granger-cause pat.	2.496329	0.1141
lntrd does not Granger-cause lngdpp.	0.025771	0.8725
lngdpp does not Granger-cause lntrd.	4.108367**	0.0427
rad does not Granger-cause lngdpp.	4.72E-05	0.9945

Note: Standard errors in parentheses – *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Extracts from STATA.

The results reveal several causal relationships among economic indicators and innovation-related activities in selected African countries. First, there is a unidirectional causal relationship from the GDPP to exports of goods and services, indicating that GDP growth positively influences exports. The GDPP generates more resources and demand for domestic goods and services, increasing export activities. However, the reverse relationship is not significant, indicating that changes in exports do not substantially affect the GDPP. Similarly, a unidirectional causal relationship runs from the GDPP to imports of goods and services, highlighting that GDPP growth significantly and positively impacts imports. A flourishing economy generates greater purchasing power and demand for foreign goods, driving import activities. Conversely, the causal link from imports to the GDPP is not statistically significant.

The study also identifies a bidirectional causal relationship between industrial design applications and exports, emphasising how design enhances the competitiveness of exported products, whereas export success prompts investment in design innovation. Similarly, there is a unidirectional causal link from patent applications to exports, highlighting the role of patent protection in fostering innovation and export growth. Moreover, a unidirectional causal relationship exists from the export of goods and services to trademark applications, showing that successful exports drive trademark protection efforts. Additionally, there is a unidirectional causal relationship from exports to R&D activities, underlining how export success encourages investment in research and innovation.

Furthermore, a bidirectional causal relationship is observed between the import of goods and services and industrial design applications, illustrating the interplay between design and import activities. A unidirectional causal relationship also runs from the GDPP to trademark applications, highlighting the role of economic growth in fostering an environment conducive to innovation and branding. Finally, there is a unidirectional causal relationship from the GDPP to R&D activities, underscoring the importance of economic prosperity in promoting investment in research and technological advancement.

4.3. Impact of trade participation on innovation in selected African countries

The results concerning the impact of trade participation on innovation in selected African countries are presented in Table 4 and discussed below.

Table 4: Impact of trade participation on innovation in selected African countries

Variables	ind Model (4)	pat Model (5)	lntrd Model (6)	rad Model (7)
ect	-0.414***	-0.252***	-0.140***	-0.0137
	(0.0414)	(0.0273)	(0.0238)	(0.0134)
d.lind	-0.0359			
	(0.0431)			
d.lpat		0.191***		
		(0.0402)		
d.llntrd			-0.120***	
			(0.0436)	
d.lrad				0.340***
				(0.0418)
d.lnexpt	12.05	-8.409	-0.101	-0.00565
	(44.20)	(13.14)	(0.103)	(0.0103)
d.lnimpt	-29.20	5.451	-0.00951	0.00716
	(42.70)	(12.70)	(0.0998)	(0.00992)
d.lngdpp	85.46	-14.82	-0.419	-0.00787
	(149.2)	(44.28)	(0.350)	(0.0346)
d.alpi	78.08	34.18*	-0.0513	0.0110
	(61.92)	(18.58)	(0.144)	(0.0143)
lnexpt	125.2*	-43.30	-0.808	-0.569
	(75.24)	(36.75)	(0.523)	(0.671)
lnimpt	130.8*	48.22	0.534	0.163
	(77.83)	(37.96)	(0.538)	(0.548)
lngdpp	36.03	21.92	1.582***	0.994
	(73.46)	(36.10)	(0.590)	(0.934)
alpi	-99.08	75.52**	0.153	-0.103
	(73.49)	(35.46)	(0.511)	(0.527)
Constant	87.30	-96.96	-0.00494	0.0239
	(210.3)	(62.27)	(0.501)	(0.0490)
Observations	.	.	.	.

Note: Standard errors in parentheses. ect=error correction term

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Extracts from STATA Output

From the results in Table 4, the estimated impact of the export and import of goods and services has a substantial and statistically significant positive effect on industrial design applications in Africa in the long run at the 10% level of significance. This dynamic is driven by several factors. First, international trade facilitates the exchange of knowledge, technology, and innovative ideas, thereby promoting the adoption of advanced design methodologies and practices within African industries. Second, access to global markets through trade encourages local industries to enhance the quality and aesthetic appeal of their products, resulting in improved industrial designs that can better compete internationally. Third, trade-driven economic growth increases domestic demand for creative and aesthetically pleasing goods, encouraging firms to invest in design innovation. Finally, exposure to diverse design trends from different markets fosters a cross-pollination of ideas, leading to a richer and more vibrant African design landscape. Thus, the symbiotic relationship between trade and industrial design applications propels Africa's creative industries forward.

The results also showed an estimated coefficient of 75.52, which signifies a highly significant positive impact of the logistics performance index on patent applications in Africa (p-value < 0.05) in the long run. This means that for every unit increase in the logistics performance index, there is an expected increase of 75.52 units in patent applications. The robust logistics performance index indicates efficient infrastructure and streamlined trade processes, which foster an environment conducive to innovation and research. The substantial coefficient underscores the pivotal role of effective logistics in driving intellectual property creation across the continent. This finding validates the logistics performance index's significance in facilitating a favourable ecosystem for innovation and contributing to increased patent applications in Africa.

The study also reveals a coefficient of 1.582, which signifies a robust and statistically significant positive impact of gross domestic product per capita (GDP per capita) on trademark applications in Africa (p-value < 0.01) in the long run. This finding indicates that each unit increase in GDP per capita leads to an increase of 1.582 units in trademark applications in Africa. A higher GDP per capita reflects increased economic prosperity and resources, enabling businesses to invest in brand development and protection. Wealthier economies can afford to allocate funds to marketing and branding efforts, leading to more trademark

applications to safeguard their intellectual property. The significant coefficient highlights the pivotal role of economic well-being in driving brand consciousness and trademark creation on the continent. This finding shows the significant influence of GDP per capita in fostering an environment conducive to trademark applications in Africa.

The estimated coefficient of 75.52 signifies a strong and statistically significant positive effect of the logistics performance index on patent applications in Africa (p-value < 0.10) in the short run. This implies that for every unit increase in the logistics performance index, there is an anticipated increase of 75.52 units in patent applications in Africa. This means that an enhanced logistics performance index reflects efficient trade infrastructure and streamlined logistics, which foster an environment conducive to innovation and research. Improved logistics enable the seamless exchange of knowledge and resources, contributing to increased patent filings. The significant coefficient highlights the crucial role of well-organised logistics in driving intellectual property creation in the short run across the continent. Although the significance level is at the 10% critical level, the coefficient still suggests the potential influence of the logistics performance index in promoting innovation and, subsequently, patent applications in Africa.

The estimated lagged patent applications exert a strong positive influence on current patent filings in Africa, which is evident at the 1% significance level. This suggests that previous patent applications stimulate contemporary innovation efforts. As inventors build upon prior research, technological advancements accumulate, fostering a culture of innovation. The causal relationship implies that each earlier application fuels subsequent creativity, potentially driven by knowledge spillovers, economic incentives, or collaborative momentum. Consequently, leveraging historical patent applications as a foundation propels a surge in novel inventions, amplifying Africa's patent landscape and accelerating technological progress in the short term.

The study also revealed that at the 1% significance level, a strong positive effect of lagged research and development on current R&D endeavours in Africa emerges. This phenomenon implies that prior R&D investments propel ongoing innovation initiatives. As previous research efforts have yielded insights and knowledge, they have become catalysts for contemporary scientific exploration.

The statistical significance underscores a clear causal linkage, suggesting that each preceding R&D endeavour stimulates subsequent creative pursuits. This could be attributed to knowledge accumulation, learning curves, or collaborative synergies. The outcome highlights the vital role of historical R&D activities in boosting current scientific progress, fostering a cycle of innovation and driving short-term advancements across various fields.

The study additionally revealed significant findings at the 1% significance level showing a notable adverse influence of lagged trademark applications on present trademark filings in Africa. This counterintuitive result suggests that past trademark applications may discourage current filing efforts. Possible justifications include heightened competition due to a surge in previous filings, potential saturation in certain industries, or shifts in market dynamics. This shows the need for strategic considerations when filing trademarks, as excessive past applications might hinder current attempts. Balancing brand protection with market trends becomes crucial for optimising short-term trademark application outcomes and aligning them with evolving business landscapes.

4.4. Discussion

The study also examined the impact of trade participation on innovation in selected African countries. It assessed the pivotal role of trade participation in driving innovation (industrial design applications, patent filings, and trademark creations) among the selected African countries. This is consistent with the findings of Damijan and Kostevc (2015), Cai et al. (2020), and Geng and Kali (2021). The significant and positive impact of the export and import of goods and services on industrial design applications highlights the mutually reinforcing dynamics between trade participation and design innovation. International trade acts as a conduit for the exchange of knowledge, technology, and ideas, fostering the adoption of advanced design practices in African industries. Access to global markets incentivises local businesses to enhance the aesthetic quality of their products, promoting better industrial designs that can compete effectively in the global stage. Furthermore, trade-driven economic growth stimulates domestic demand for aesthetically pleasing goods, encouraging firms to invest in design innovation. The exposure to diverse design trends from various markets cultivates a cross-fertilisation of ideas, contributing to a richer African design

landscape. This symbiotic relationship between trade and industrial design applications has amplified the growth of Africa's creative industries.

The causal relationship between lagged patent applications and current patent filings signifies the accumulation of technological advancements and the cultivation of a culture of innovation. As previous patent applications provide a foundation for further research and development, they stimulate ongoing creativity. This suggests that innovation begets innovation, with earlier applications acting as catalysts for subsequent inventive efforts. This finding underscores the importance of leveraging historical patent applications to drive contemporary innovation and technological progress. The strong positive effect of lagged R&D on current R&D endeavours reinforces the idea that past research efforts serve as stepping stones for ongoing innovation initiatives. Each previous research endeavour contributes to a collective knowledge pool that fuels current scientific exploration. This emphasises the iterative nature of research and the importance of building upon prior findings to drive scientific progress in the short term. The counterintuitive adverse influence of lagged trademark applications on present trademark filings raises important strategic considerations for brand protection. Excessive past trademark applications might create a competitive landscape that hinders current filing efforts. This suggests the need for careful brand management strategies that balance protection with evolving market trends. By understanding the potential saturation in certain industries and adapting to changing market dynamics, businesses can optimise their trademark application outcomes and navigate the complex landscape of intellectual property protection.

Thus, the study's findings highlight the interplay between international trade participation, innovation, and intellectual property protection in Africa. The results underscore the importance of well-functioning logistics, economic prosperity, and strategic decision-making in fostering industrial design, patent applications, and trademark creations. These insights have practical implications for policymakers and businesses seeking to drive innovation and protect intellectual property across the continent.

5. CONCLUSION AND POLICY RECOMMENDATIONS

Our study concludes that national income drives both exports and imports in the region and that there are bidirectional causal links identified between industrial design applications and exports, patents and exports, and trademarks and imports, highlighting the symbiotic relationship between innovation and trade engagement. The study also emphasises that successful exports foster investments in design, patents, and branding.

On the basis of the insightful findings of the study, several practical policy recommendations can be proposed to increase trade participation and innovation in selected African countries:

Governments of African countries should focus on fostering innovation ecosystems that support research and development activities. This can be achieved through the establishment of research institutes, innovation hubs, and collaboration between universities, research centres, and industries. These initiatives facilitate knowledge exchange, technological advancements, and the creation of high-value products.

Governments of African countries should develop balanced trade policies that promote both export growth and import sustainability. This involves nurturing domestic industries while fostering trade relationships, ensuring that excessive import reliance does not undermine local production capabilities. SMEs often drive innovation and contribute significantly to trade.

Governments of African countries should offer incentives for research and development activities, such as tax breaks, grants, and subsidies. This would encourage businesses to invest in innovative solutions, leading to the creation of higher-value products and enhancing trade competitiveness. Moreover, establishing or strengthening trade promotion agencies can help businesses navigate international markets, identify trade opportunities, and overcome export and import challenges. These agencies can provide market research, networking, and export-import assistance.

Glossary of Terms and Abbreviations

1. **AfCFTA (African Continental Free Trade Area)**: A regional trade agreement among African Union member states that aims to create a single market for goods and services, facilitating intra-African trade.
2. **Breitung test**: A panel unit root test that assumes no trend in the data and is more powerful in small samples than other tests.
3. **CADF (cross-sectional augmented Dickey–Fuller)**: A second-generation panel unit root test used to check for stationarity, accounting for cross-sectional dependencies.
4. **Cross-sectional dependency**: A condition in panel data analysis where cross-sections (e.g., countries) are not independent of each other, often owing to economic linkages or global factors.
5. **DFE (dynamic fixed effects)**: A panel data estimation method that accounts for time-invariant country-specific effects and dynamics within a dataset.
6. **GDP (gross domestic product)**: A measure of the total economic output of a country.
7. **IND (industrial design applications)**: The number of applications for industrial design protection, which measures innovation in product appearance and aesthetics.
8. **IP (intellectual property)**: Legal rights protecting the creations of the mind, such as inventions (patents), designs (industrial designs), and symbols or names (trademarks) used in commerce.
9. **IPS (Im, Pesaran, and Shin)**: A panel unit root test allowing for heterogeneous unit roots across cross-sections, used to determine stationarity in panel data.
10. **LLC (Levin, Lin, and Chu)**: A panel unit root test assuming homogeneity of unit root processes across cross-sections.
11. **LPI (logistics performance index)**: A measure that evaluates a country's logistics performance on the basis of factors such as efficiency, infrastructure, and trade processes.
12. **MG (mean group)**: A panel data estimation technique allowing for both short- and long-run heterogeneity across individual cross-sections.
13. **PAT (patent applications)**: The number of patent applications filed in a country, which serves as a key indicator of technological innovation.

14. **PMG (pooled mean group)**: A dynamic panel data estimation method that assumes long-run homogeneity while allowing for short-run heterogeneity across cross-sections.
15. **PPP (purchasing power parity)**: A method of measuring economic variables in different countries to account for differences in price levels.
16. **R&D (research and development)**: Activities undertaken by firms or governments to innovate and introduce new products or processes.
17. **Trade participation**: Engagement in the exchange of goods and services across borders.
18. **Trademark applications**: Requests for legal protection of brand identifiers such as logos, names, and slogans to prevent unauthorised use by others.
19. **WIPO (World Intellectual Property Organisation)**: A global organisation that promotes IP protection through cooperation among nations and the management of IP rights.

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Received: May 27, 2024
Accepted: October, 19, 2024

ECONOMIC ANNALS, Volume LXIX, No. 243 / October – December 2024
UDC: 3.33 ISSN: 0013-3264

https://doi.org/10.2298/EKA2443117A

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THE ASYMMETRIC EFFECT OF EXCHANGE RATE PASS-THROUGH TO DOMESTIC PRICES: EVIDENCE FROM NIGERIA

ABSTRACT: *The linear relationship between exchange rates and domestic prices has been extensively researched but little is known about their asymmetric relationship, particularly in Nigeria. This study examined nominal exchange rate pass-through to domestic prices using the official and parallel market exchange rates. The non-linear autoregressive distributed lag (NARDL) estimation technique was adopted to analyse data of relevant variables from 2011M1 to 2021M3. The results showed that the parallel market exchange rate, not the official exchange rate, is the driver of domestic prices in Nigeria due to the huge discrepancies in the two rates, which economic agents exploit to their advantage. The Wald test results confirmed the existence of short-run asymmetry between parallel market exchange rates and domestic prices in Nigeria. This suggests the need for the Nigerian monetary authorities to close the gap between the official and parallel market exchange rates to minimise arbitrage.*

KEY WORDS: *exchange rate pass-through, domestic prices, Central Bank of Nigeria, parallel market, non-linear autoregressive distributed lag.*

JEL CLASSIFICATION: C32, E31, E50, N27

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1. INTRODUCTION

Price stability remains unarguably the key objective of every central or reserve bank. However, the increasing rates of globalisation and trade interactions among economies of the world threaten the achievement of this goal, especially in emerging economies (Revelli, 2020). Theoretical postulations and empirical evidence suggest that the domestic price level responds to exchange rate movements, a phenomenon termed "exchange rate pass-through". The pass-through can be complete[1] or partial[2] (see Choudhri & Hakura, 2006; Jaffri, 2010; Mendali & Das, 2016). Exchange rate pass-through (ERPT) has far-reaching implications for the effectiveness of monetary policy. Partial ERPT fosters the pursuit of an independent monetary policy and makes implementing inflation targeting easier, while complete ERPT constrains the ability of central banks to implement an independent monetary policy (Adegboyega & Olayiwola, 2017).

Precisely speaking, exchange rate dynamics influence domestic prices directly and indirectly. As regards the direct effect, exchange rate depreciation (appreciation) raises (decreases) import prices in the domestic currency and decreases (increases) the purchasing power of importers. Nonetheless, ERPT to domestic prices will be complete if the markup of prices over costs and the marginal cost of foreign exporting firms are constant (Goldberg & Knetter, 1997). For the indirect effect, depreciation (appreciation) of the exchange rate reduces (increases) the relative price of export products while raising (reducing) the purchasing power of foreign customers. Nevertheless, production costs and domestic price levels will grow gradually as real wage approaches their initial level (Helmy et al., 2018; Jaffri, 2010). Consequently, in countries where the Marshall–Lerner condition[3] holds, aggregate demand for domestic products could surge and instigate a rise in domestic price level but a fall in the real wage, given the fixed nature of wage contracts in the short run. Extant studies have shown that

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1 ERPT is said to be complete when domestic and import prices exhibit a one-to-one response to changes in exchange rate.

2 ERPT is incomplete or partial when the response of domestic and import prices to exchange rate dynamics is less than one-to-one.

3 The Marshall–Lerner condition states that devaluating/depreciating a country's currency will improve its balance of trade position if the sum of its export and import elasticities exceed unity.

the Marshall–Lerner condition holds in Nigeria (Duru et al., 2022; Sulaimon et al., 2017).

The Nigerian economy is highly import-dependent with a wide range of consumer and capital goods in its import portfolio, which can be traced, in part, to the neglect of the agricultural and manufacturing sectors when crude oil prices rose astronomically in the international market in the early 1970s (Afolabi & Ogunjimi, 2020; Ogunjimi, 2020a, 2020b). Furthermore, the lack of inter-sectoral linkages and the quest for industrialisation have aggravated the pressure on the demand for foreign exchange as industrialists depend heavily on imports of raw materials and intermediate products that ought to be sourced locally, thereby limiting domestic sectors' relative importance and global competitiveness. The foregoing has implications for inflation as empirical evidence suggests that highly import-reliant economies have a higher rate of ERPT to domestic prices (Campa & Goldberg, 2001).

This study makes three key contributions to the extant literature. First, the study employs the nonlinear autoregressive distributed lag (NARDL) estimation technique to examine the asymmetric effect of ERPT on domestic prices in Nigeria. Previous studies have also confirmed the asymmetry in ERPT to domestic prices in Nigeria (Bello & Sanusi, 2019, Chuku et al., 2017). Thus, it is important to model ERPT to domestic prices in a nonlinear framework. Second, the study investigates the pass-through effect of multiple exchange rate regimes on domestic prices in Nigeria by incorporating the official exchange rate and the market-determined exchange rate (parallel market exchange rate) in the inflation model. Extant studies have utilised only the official exchange rate in their analysis of ERPT to domestic prices, neglecting the parallel market exchange rate. Nigeria, a small open economy, operates a multiple exchange rate regime and it is important to examine how the multiple market exchange rates influence domestic prices for appropriate policy formulation. Third, this study tests for a structural break and accounts for this in the ERPT to domestic prices in Nigeria.

Following this introduction, the rest of this study is structured as follows. Section 2 contains a review of related literature, while Section 3 presents the methodological framework. Section 4 comprises the empirical analysis. The last section concludes the study.

2. LITERATURE REVIEW

2.1. Empirical review

Several empirical studies have been conducted on the extent to which exchange rate movement passes through to import prices and domestic prices in the form of country-specific and panel studies for both developing and developed countries, albeit with mixed findings. Goldberg & Knetter (1997) argued for the role of price discrimination and market forces in the ERPT to import prices, while further studies revealed that microeconomic factors exogenous to monetary policy were the determinants of this pass-through effect (Devereux & Engel, 2002). Taylor (2002) explained that a low inflation environment was responsible for some reduction in pass-through to total prices. Taylor argued that firms' setting of future prices changes as costs increase (owing to the depreciation of exchange rate and other factors) and in expectation of a consistent increase in cost. He further attributed the rate of pass-through to the existing policy regime as a high inflation regime raises the rate of pass-through, but a low regime reduces it.

This view revolutionised the ERPT literature as many studies tilted towards evaluating the pass-through within the framework of monetary policy regimes. Campa & Goldberg (2001) lent support to the finding of Taylor (2002) in their study on OECD countries, although import-related microeconomic factors exerted a much more significant influence in the determination of the pass-through. In a panel study comprising 71 countries, Choudhri & Hakura (2006) found a dominance of the inflation rate in influencing cross-regime variance in ERPT across the countries under study. Similarly, in another panel study comprising 55 countries, Ha et al. (2020) found low ERPT in countries with a mix of credible inflation goals and flexible exchange rate regimes. They argued that the independence of the central bank would foster credibility and enhance its role of price stability through the use of the exchange rate as a buffer against external shocks.

Similarly, Kassi et al. (2019) evaluated the asymmetric effect of ERPT in 40 Sub-Saharan African countries from 1990Q1 to 2017Q4. They provided evidence of asymmetry but incomplete ERPT to consumer prices in the short run and mixed findings in the long run. Specifically, they found a higher ERPT during exchange rate depreciation especially in economies with low inflationary environments

under a fixed exchange rate regime. In addition, Jaffri (2010) argued that ERPT to consumer prices in Pakistan was low owing to the prevailing managed floating exchange rate regime. Mirdala (2014) also found differences in ERPT patterns in line with the diversity in exchange rate regimes among European transition economies. This suggests that the rate of ERPT to aggregate prices depends on the exchange rate regime in the economy. Economic agents, under a fixed exchange rate regime, expect an alteration in the exchange rate to be long-lasting; hence, their price adjustment is instantaneous. Conversely, economic agents, under a flexible exchange rate regime, see exchange rate dynamics as transient; therefore, their price adjustment is slow.

Concerning the extent of ERPT, Berga (2012) confirmed a moderate ERPT to import prices but a low ERPT to consumer prices in Ethiopia, while Helmy et al. (2018), Pham (2019), and Revelli (2020) found a partial ERPT in Egypt, Vietnam, and Cameroon and Kenya, respectively. Soon & Baharumshah (2017) found an asymmetric and incomplete ERPT to consumer prices in Malaysia, while Kuncoro (2015) found a complete ERPT for only producer and import prices in Indonesia. On the other hand, Khundrakpam (2007) found an asymmetric ERPT to domestic prices in India with no definite evidence of a decline in ERPT, while Mendali & Das (2016) found a modest ERPT to the wholesale price index in India. However, Shintani et al. (2013) found a nonlinear nexus between ERPT and consumer prices in the United States and that low ERPT was associated with low inflation. Kotil (2020) found evidence of a greater impact of ERPT on consumer prices than on producer prices in Turkey.

On the ERPT literature in Nigeria, many studies found evidence in support of an incomplete ERPT to domestic prices (Adekunle & Tiamiyu, 2018; Fatai & Akinbobola, 2015; Mohammed et al., 2017; Omisakin, 2009; Oyinlola & Babatunde, 2009; Zubair et al., 2013), while others found a considerably large ERPT to domestic price in Nigeria (Musti & Siddiki, 2018; Ogundipe & Egbetokun, 2013). Moreover, Fatai & Akinbobola (2015) found low ERPT to consumer prices but moderate ERPT to import prices in Nigeria. However, Ogundipe & Egbetokun (2013) found that the exchange rate influenced inflation more than the money supply in Nigeria. The low ERPT to domestic prices in Nigeria despite its huge dependence on importation was attributed to importers' use of the pricing-to-market price-setting tactics in the domestic market.

Furthermore, whereas Bello & Sanusi (2019) argued that exchange rate movement led to changes in inflation regimes in Nigeria, Omisakin (2009) alluded that money supply and output level, not the exchange rate, had a significant impact on the inflation rate in the country. Moreover, Adetiloye (2010) showed that the parallel market exchange rate exerted less influence on inflation than the official exchange rate in Nigeria.

The ERPT literature on Nigeria shows that most studies employed the vector autoregression (VAR) model to estimate the relationship and focused more on the linear ERPT effect to domestic prices without accounting for the probable nonlinear relationship between ERPT and domestic prices as theoretically postulated by the pricing-to-market models. Recent studies examine the asymmetric effect of ERPT on domestic prices in different emerging and developed countries (see Adekunle & Tiamiyu, 2018; Kassi et al., 2019; Soon & Baharumshah, 2017). Thus, it is pertinent to do the same for Nigeria to investigate the asymmetric impact of exchange rate on domestic prices in the country.

The mixed results on the ERPT–inflation nexus in the literature can be explained by the differences in methodological framework, data type, data source, scope, and contexts employed in each study. It is startling that the studies that found complete or incomplete ERPT to aggregate price differed on the magnitude of the impact and the channel of transmission. In light of the lack of consensus on the nature of ERPT to the domestic price level in Nigeria, it becomes imperative to reconsider this relationship by disaggregating exchange rates into official and parallel market rates to see which of the rates has the greatest impact on domestic prices for effective policy formulation and implementation. Also, adopting the novel NARDL framework to examine this relationship is crucial given the current realities of possible asymmetry in ERPT. The predictions of the pricing-to-market theory, a modern microeconomic theory, signal the asymmetric behaviour of the exchange rate and, hence, the need to test its validity in the case of Nigeria, a country with high import dependence. This study is the first attempt at investigating ERPT (using different exchange rates) to domestic prices using the NARDL framework for Nigeria.

2.2. Theoretical Framework

The asymmetric behaviour associated with changes in the exchange rate is underscored by the microeconomic framework of pricing-to-market theory, which posits that exporters tend to alter their mark-ups in a foreign country in response to exchange rate movement (Krugman, 1986). Pricing-to-market is inversely related to the degree of ERPT such that an increase in the rate of pricing-to-market lessens the degree of ERPT. A proportional change in import price and exchange rate results in complete ERPT and zero pricing-to-market. Conversely, an inversely proportional change in export prices and exchange rate leads to zero ERPT and full pricing-to-market. Generally, a less than one-to-one alteration of export prices in the domestic currency in response to exchange rate movement leads to incomplete or partial ERPT.

A high pricing-to-market behaviour associated with low ERPT lowers the effectiveness of exchange rate-based efforts geared towards improving trade balance. Furthermore, exporters tend to willingly absorb a fraction of exchange rate changes to preserve their market share, especially in highly competitive and large export markets where domestic consumers can choose among several alternatives. Conversely, export prices in less competitive markets with highly differentiated products are likely to be fairly unresponsive to exchange rate changes, instigating low pricing-to-market behaviour and high ERPT. In sum, export market price, competition in export markets, and exchange rate dynamics determine the degree of pricing-to-market and ERPT (Krugman, 1986). The pricing-to-market theory is often adopted to explain the low degree of ERPT common in import-dependent economies. This provides the backdrop for its adoption in this study as Nigeria is highly import-dependent.

3. METHODOLOGY

The main thrust of this study is to examine the extent to which the various exchange rates, the Central Bank of Nigeria (CBN) rate and the parallel market rate, filter into domestic prices. From empirical evidence, it takes about three months for imported goods to get into Nigeria. Thus, changes in exchange rate influence the prices of imported goods after three months. In addition, imported goods' prices are instantaneously affected by current changes in the exchange rate, especially in the case of exchange rate depreciation. Hence, high-frequency

data is appropriate data for a study of this nature. This study relies on monthly data (2011M1–2021M3) from the CBN (2021) on two exchange rates (the official rate and the parallel market rate), real GDP, and the monetary policy rate (interest rate). The exchange rates are in nominal terms, comparing the Nigerian naira with the US dollar, which is a vehicle currency. However, real GDP data is quarterly in nature and was therefore converted to monthly series using the quadratic data smoothing statistical method (Oloko & Yusuf, 2021)

Following the specification of Kassi et al. (2019), the following baseline models (a model with the official market exchange rate and a model with the parallel market exchange rate) and an alternative model (a model incorporating both the official and parallel market exchange rates) are specified:

Baseline models

$$INF_t = \Omega_0 + \Omega_1^+ CBN_t^+ + \Omega_2^- CBN_t^- + \Omega_3 LRDGP_t + \Omega_4 MPR_t + \varepsilon_{1t} \quad (1)$$

$$INF_t = \beta_0 + \beta_1^+ LPRM_t^+ + \beta_2^- LPRM_t^- + \beta_3 LRDGP_t + \beta_4 MPR_t + \varepsilon_{2t} \quad (2)$$

Alternative Model

$$INF_t = \alpha_0 + \alpha_1^+ CBN_t^+ + \alpha_2^- CBN_t^- + \alpha_3^+ LPRM_t^+ + \alpha_4^- LPRM_t^- + \alpha_5 LRDGP_t + \alpha_6 MPR_t + \varepsilon_{3t}\,, \quad (3)$$

where *INF*, CBN^+, CBN^-, PRM^+, PRM^-, *LRGDP*, and *MPR* are inflation rate (a proxy for domestic prices), positive and negative changes in the official exchange rate, positive and negative changes in the parallel market exchange rate, the natural logarithm of real gross domestic product, and the monetary policy rate, respectively, while α_0–α_7 are the model parameters. Real GDP is expressed in a natural logarithm to aid the interpretation of the results in elasticity form since the other variables are already expressed in percentages.

The NARDL framework developed by Shin et al. (2014) is employed to estimate the specified model given the likely asymmetry documented in the literature on the relationship between the exchange rate and domestic prices. This technique is important for two major reasons. First, it provides an approach (bounds test) for determining the long-run relationship between variables, especially when the

variables are stationary at level [I(0)] or first difference [I(1)]. Second, it can capture the dynamic effects of exchange rate depreciation and appreciation on domestic prices in the same model. The Augmented Dickey-Fuller (ADF) and Phillips–Perron (PP) unit root tests are also employed to determine the time-series properties of the variables and to ensure that none of the variables is integrated of order two [I(2)] (Dickey and Fuller, 1979; Phillips and Perron, 1988).

Allowing for asymmetry or nonlinearity according to Shin et al. (2014), equations 1, 2, and 3 can be rewritten in the NARDL form as:

Baseline models

$$\Delta INF_t = \pi INF_{t-1} + \infty_1^+ CBN_{t-1}^+ + \infty_2^- CBN_{t-1}^- + \infty_{\mathbf{3}} LRGDP_{t-1} + \infty_{\mathbf{4}} MPR_{t-1} + \sum_{i=1}^{p-1} \Psi_i \Delta INF_{t-i} + \sum_{j=0}^{q_1-1} \Psi_j^+ \Delta CBN_{t-j}^+ + \sum_{j=0}^{q_2-1} \Psi_j^- \Delta CBN_{t-j}^- + \sum_{j=0}^{q_3-1} \Psi_j \Delta LRGDP_{t-j} + \sum_{j=0}^{q_4-1} \Psi_j \Delta MPR_{t-j} + \varepsilon_{1t} \quad (4)$$

$$\Delta INF_t = \lambda INF_{t-1} + + \Phi_1^+ PRM_{t-1}^+ + \Phi_2^- PRM_{t-1}^- + \Phi_{\mathbf{3}} LRGDP_{t-1} + \delta_{\mathbf{4}} MPR_{t-1} + \sum_{i=1}^{p-1} \varpi_i \Delta INF_{t-i} + \sum_{j=0}^{q_1-1} \varpi_j^+ \Delta PRM_{t-j}^+ + \sum_{j=0}^{q_2-1} \varpi_j^- \Delta PRM_{t-j}^- + \sum_{j=0}^{q_3-1} \varpi_j \Delta LRGDP_{t-j} + \sum_{j=0}^{q_4-1} \varpi_j \Delta MPR_{t-j} + \varepsilon_{2t} \quad (5)$$

Alternative Model

$$\Delta INF_t = \rho INF_{t-1} + \delta_1^+ CBN_{t-1}^+ + \delta_2^- CBN_{t-1}^- + \delta_3^+ PRM_{t-1}^+ + \delta_4^- PRM_{t-1}^- + \delta_{\mathbf{5}} LRGDP_{t-1} + \delta_{\mathbf{6}} MPR_{t-1} + \sum_{i=1}^{p-1} \S_i \Delta INF_{t-i} + \sum_{j=0}^{q_1-1} \S_j^+ \Delta CBN_{t-j}^+ + \sum_{j=0}^{q_2-1} \S_j^- \Delta CBN_{t-j}^- + \sum_{j=0}^{q_3-1} \S_j^+ \Delta PRM_{t-j}^+ + \sum_{j=0}^{q_4-1} \S_j^- \Delta PRM_{t-j}^- + \sum_{j=0}^{q_5-1} \S_j \Delta LRGDP_{t-j} + \sum_{j=0}^{q_6-1} \S_j \Delta MPR_{t-j} + \varepsilon_{3t} \quad (6)$$

where Δ is the difference operator, while π, ϖ, Φ, Ψ, λ, ∞, ρ, δ and § are parameters, q_i is a vector of optimal lag length based on the Akaike information criterion (AIC), and p is the lag length of the consumer price index.

4. EMPIRICAL ANALYSIS

The empirical analysis of this study is done in three phases. First, the preliminary analysis presents the data description, describing the properties of the data; the unit root test examines the stationarity status of the variables; the structural break test determines the break date(s) in the dataset; and the cointegration test checks for the long-run association. Second, the specified models are estimated (using the NARDL framework) and interpreted. Third, diagnostic tests are carried out to determine the reliability of the estimated models.

4.1. Preliminary analysis

An overview of the descriptive statistics of the variables used in this study is presented in Table 1. It shows that the average value of inflation in Nigeria is in double digits, indicating that the country is under inflationary pressures, as double-digit inflation hurts an economy. Inflationary pressures reduce the general purchasing power and, consequently, lower the value of the domestic currency against a basket of foreign currencies. This is reflected in the average value of both the official and parallel market exchange rates. More worrisome are the maximum values of both the official and parallel exchange rates, which signal the low value of the Nigerian currency in relation to the US dollar. Given that the US dollar is a vehicle currency, an import-dependent country like Nigeria will have to exchange a huge volume of its currency to trade in the international market (Afolabi and Oji, 2021). This explains the country's persistent current account deficit as well as its unfavourable balance of payments. Similarly, the monetary policy rate in Nigeria ranged between 6.5 per cent and 14 per cent, revealing that interest on savings in the country is fairly impressive. This attracts savers and makes domestic resources available for investment purposes, which could foster economic growth. Nigeria's economy grew slightly as its real GDP ranged between ₦13.3 trillion and ₦20 trillion during the review period.

Table 1: Descriptive statistics

Variables	Observations	Mean	Maximum	Minimum	Std. Dev.
INF (%)	123	11.90	18.72	7.70	3.06
CBN (₦:US$)	123	240.05	381.00	152.36	79.20
PRM (₦:US$)	123	284.81	494.70	155.11	114.38
MPR (%)	123	12.44	14.00	6.50	1.61
RGDP (₦' Trillion)	123	16.80	20.00	13.30	1.68

Note: This table shows the descriptive statistical properties of all estimated variables
Source: Authors

It is a routine practice to test the unit root properties of time-series variables to circumvent spurious regression phenomena. The results of the ADF and PP unit root tests are presented in Table 2. The results show that positive and negative changes in the official exchange rate, positive and negative changes in the parallel market exchange rate, and the monetary policy rate are integrated of order zero [I(0)], whereas the inflation rate and the log of real GDP are integrated of order one [I(1)], denoting that the variables of interest are both stationary and non-stationary. This mixed order of integration fulfills the condition for employing the bounds test cointegration approach.

Table 2: Unit root test results

	Augmented Dickey–Fuller statistic				**Phillips–Perron statistic**				
	Level		First difference		Level		First difference		Order of integration
	Constant	Constant & trend	Constant	Constant & trend	Constant	Constant & trend	Constant	Constant & trend	
INF	-1.40	-1.97	-4.84*	-4.99*	-1.23	-1.80	-10.47*	-10.54*	I(1)
CBN^{+}	-4.85*	-4.85*	-12.91*	-12.85*	-6.16*	-6.14*	-24.30*	-24.17*	I(0)
CBN^{-}	-9.21*	-10.03*	-9.78*	-9.74*	-9.22*	-10.12*	-51.36*	-49.72*	I(0)
PRM^{+}	-5.82*	-5.89*	-12.63*	-12.58*	-5.93*	-6.00*	-18.72*	-18.62*	I(0)
PRM^{-}	-8.36*	-8.36*	-12.70*	-12.65*	-8.71*	-8.70*	-21.91*	-21.80*	I(0)
MPR	-3.97*	-2.91	-10.34*	-10.89*	-3.92*	-2.92	-10.44*	-10.90*	I(0)
LRGDP	-2.04	-1.38	2.07	-3.92**	-3.04**	-3.67**	-4.60*	-4.66*	I(1)

Note: This table shows the stationarity properties of all variables. The Akaike information criterion (AIC) was used to determine the lag length. * and ** denote statistical significance at 1% and 5%, respectively.
Source: Authors

The Zivot–Andrews (variable-based test) and the Quandt–Andrews (model-based test) structural break tests are employed to detect the structural breaks in the variables and models (Andrews, 1993; Zivot and Andrews, 1992). These structural break methods test the null hypothesis of no breakpoint, which is rejected if the probability value of the F-statistic falls below 5 per cent but accepted if otherwise. Accordingly, the Quandt–Andrews F-statistics of both the maximum LR and maximum Wald statistic, reported in Table 3, reveal that the null hypotheses should be rejected for the three models. This implies that there is a structural break in the baseline and alternative models and the break date is found to be in the third month of 2016. Similarly, the Zivot–Andrews intercept test results show that inflation and the exchange rates had breakpoints in various months in 2016. This was the period the CBN switched from operating the Retail Dutch Auction System (RDAS), the Wholesale Dutch Auction System (WDAS), and the Interbank Rate System regimes to adopting the managed floating exchange rate regime.[4] Therefore, subsequent analyses, including the cointegration test to the main analysis, take structural breaks into account.

Following the results of the ADF and PP unit root tests as well as the Quandt–Andrews and Zivot–Andrews breakpoint tests, the bounds test cointegration test is conducted based on the NARDL framework to determine the existence of a long-run relationship among variables incorporated in the model. The decision to determine the cointegration status of the variables is based on whether the F-statistic falls below, between, or above the lower-bound and upper-bound critical values. There is no cointegration if the F-statistic is less than the lower bound value; there is cointegration if the F-statistic exceeds the upper bound value; and cointegration is not ascertained if the F-statistic falls between the two bound values. Accordingly, the bounds test results, reported in Table 4, show that none of the F-statistics of the models with and without structural break fall above the upper bound values at all levels of significance. This signals the non-existence of long-run relationships among the variables and suggests that the variables diverge at the steady state. Therefore, only the short-run NARDL models are estimated in the subsequent subsection.

[4] See https://www.cbn.gov.ng/IntOps/FXManagement.asp

Table 3: Result of structural breakpoint tests

Zivot–Andrews breakpoint test			
Variables	Intercept	Trend	Intercept and trend
INF	-2.93*** (2016M02)	-2.07 (2016M08)	-2.89*** (2016M02)
CBN^+	-5.86** (2016M01)	-5.38 (2016M07)	-5.84** (2017M01)
CBN^-	-9.11* (2016M09)	-8.69 (2015M03)	-9.14 (2012M11)
PRM^+	-5.80* (2016M02)	-4.05*** (2016M02)	-5.78* (2017M02)
PRM^-	-4.52* (2016M07)	-3.85*** (2017M04)	-4.65** (2016M11)
MPR	-3.49** (2019M09)	-3.93* (2018M11)	-4.30* (2016M07)
LRGDP	-5.89** (2013M07)	-6.12** (2014M10)	-6.54** (2016M01)
Quandt–Andrews breakpoint test			
Statistic	Baseline model 1	Baseline model 2	Alternative model
Maximum LR			
F-statistic	28.59 (0.000)	31.38 (0.000)	20.81 (0.000)
Break date	2016M03	2016M03	2016M03
Maximum Wald			
F-statistic	114.35 (0.000)	125.52 (0.000)	124.8447 (0.000)
Break date	2016M03	2016M03	2016M03

Note: This table reports the structural breakpoints of each variable. *, **, and *** denote statistical significance at 1%, 5%, and 10%, respectively.
Source: Authors

Table 4: Result of bounds test

Models without structural breaks					
Significance level (k=4)	Lower bound	Upper bound	Significance level (k=6)	Lower bound	Upper bound
1%	3.74	5.06	1%	2.88	3.99
5%	2.86	4.01	5%	2.27	3.28
10%	2.45	3.52	10%	1.99	2.94
	Baseline model 1	Baseline model 2	Alternative model		
F-Statistics	1.80	2.49	2.02		
Models with structural breaks					
Significance level (k=9)	Lower bound	Upper bound	Significance level (k=13)	Lower bound	Upper bound
1%	2.65	3.97	1%	6.36	3.79
5%	2.14	3.30	5%	4.85	4.41
10%	1.88	2.99	10%	4.14	3.79
	Baseline model 1	Baseline model 2	Alternative model		
F-statistics	2.84	2.03	2.86		

Note: k denotes the number of explanatory variables. Baseline model 1, baseline model 2, and the alternative model are models with the official exchange rate, parallel market exchange rate, and both the official and parallel market exchange rates, respectively.
Source: Authors

4.2. Exchange rate pass-through and domestic prices in Nigeria

The short-run estimation results of the ERPT models together with their diagnostic tests are presented in Table 5. The second, third, and fourth columns of the table are the results of the models without structural breaks, while the last three columns are the results of the models with structural breaks. Of utmost importance to this study are the coefficients of positive and negative changes in the official and parallel market exchange rates. The results of the first baseline models without structural breaks show that official exchange rate depreciation and appreciation have an insignificant positive relationship with the inflation rate in Nigeria, whereas the model with structural breaks shows that, while exchange depreciation does not influence inflation in Nigeria, exchange rate appreciation

does. This suggests that domestic prices are responsive to official exchange rate appreciation but insensitive to exchange rate depreciation in Nigeria. This partly aligns with the view of Ogundipe and Egbetokun (2013) that the inflation rate in Nigeria is sensitive to exchange rate movements.

Conversely, the results of the second baseline models with and without structural breaks show that parallel market exchange rate depreciation exerts a significant positive influence on the inflation rate, implying that inflation pressures rise with increasing parallel market exchange rate depreciation. This further confirms the earlier notion that the parallel market exchange rate is a major driver of the inflation rate and has a significant pass-through effect on domestic prices. However, parallel market exchange rate appreciation has an insignificant inverse relationship with the inflation rate such that the inflation rate shrinks as the Nigerian naira appreciates in the parallel market. More importantly, parallel market exchange rate depreciation has a higher magnitude of impact on inflation than parallel market exchange rate appreciation. This suggests that domestic prices are sticky downward when the parallel market exchange rate appreciates but flexible in the case of parallel market exchange rate depreciation. Put simply, economic agents swiftly alter the prices of their products in response to exchange rate depreciation but are reluctant to do the same when the value of the domestic currency appreciates in the parallel market. They do this to take advantage of the arbitrage associated with exchange rate movement.

Because Nigeria operates a multiple exchange rate regime, where both the official and parallel market exchange rates coexist, movements in the two exchange rates were incorporated into the same models. Expectedly, this changed the narrative slightly. While official exchange rate depreciation remains insignificant in determining the inflation rate in both the models with and without structural breaks, its appreciation became a key determinant of the inflation rate. However, concerning the direction of the relationship between the inflation rate and official exchange rate appreciation and depreciation, the result suggests that the official exchange rate lowers inflation pressure in Nigeria. On the other hand, the narrative remains unchanged for the parallel market exchange rate movements. While parallel market exchange rate depreciation still has a significant positive relationship with the inflation rate, the relationship of its corollary remains insignificantly negative. This supports the earlier assertion that parallel market

exchange rate depreciation drives domestic prices in Nigeria and economic agents leverage exchange rate movement to earn super profits. It also corroborates the findings of Ogundipe and Egbetokun (2013) and Musti and Siddiki (2018), who found a considerably large ERPT to domestic price in Nigeria

Given the import-dependent nature of the Nigerian economy and the limited supply of foreign exchange by the CBN, economic agents source foreign exchange from alternative windows, especially the parallel market, usually at higher rates, which ultimately filter into domestic prices. This raises doubts about the relevance of adopting multiple exchange rates in Nigeria as it is evident that multiple exchange rates widen the pass-through effect of exchange rates to domestic prices and expose the economy to external shocks (Emenike, 2016). This is because some economic agents take advantage of the differentials in the multiple exchange rates to earn arbitrage at the expense of the general price level. They do this by sourcing foreign exchange at the official rate for the import of manufactured goods, intermediate goods, raw materials, and capital equipment but price/sell their products at the prevailing exchange rate in the parallel market, thereby making super-normal profits. This practice results in distortion in resource allocation and makes importation much more lucrative than domestic production, a situation which could consequently worsen Nigeria's trade balance and balance of payments position (Afolabi, 2022; Afolabi et al., 2022).

Concerning the other explanatory variables, our findings revealed that inflation follows adaptive expectation across the models without structural breaks as its lag value has a significant positive relationship with its current value in the models with and without structural breaks. Thus, the previous month's value of the inflation rate should be taken into account in the determination of the current inflation rate. Intuitively, the current month's inflation rate could offer a clue to the prediction of next month's inflation rate. In line with a priori expectation, real GDP has a positive relationship with the inflation rate across the six estimated models, indicating that domestic prices rise with the increasing volume of economic activities in Nigeria. More importantly, the inflation rate is highly responsive to changes in real GDP as its rate of increase ranges between 0.3 per cent and 1.4 per cent when real GDP rises by only one per cent. This situation requires the intervention of monetary authorities to keep the inflation rate at bay, as rising inflation hurts an economy. In line with the conjecture of the Taylor rule,

which posits a direct relationship between the inflation rate (domestic prices) and the interest rate (monetary policy rate), the results show that the monetary policy rate is directly related to consumer prices (inflation rate) in the second baseline model and the alternative model. The first-period lag values of these two models suggest that the previous month's monetary policy rate should be considered in determining the present month's inflation rate.

The coefficients of the dummy variables are statistically significant across the three models accounting for structural breaks, signalling the imperativeness of considering structural breaks in the ERPT to domestic prices analysis. Moreover, the coefficients of determination of the three estimated models suggest that more than 95 per cent of the variation in the inflation rate (domestic prices) is explained by positive and negative changes in the official exchange rate, positive and negative changes in the parallel market exchange rate, the log of real GDP, and the monetary policy rate. Furthermore, these explanatory variables jointly influence the dynamics of consumer prices in Nigeria, as shown by the probability values of the F-statistic. The Wald tests for short-run asymmetry show that the null hypothesis of no short-run asymmetry is rejected for all the models with structural breaks since the probability values are below 10 per cent. This indicates that depreciation and appreciation of the official and parallel market exchange rates have different effects on Nigeria's inflation rate in the short run. This existence of short-run asymmetry lends support to the pricing-to-market model and the finding of Kassi et al. (2019), who showed that the exchange rate has an asymmetric effect on domestic prices in 40 Sub-Saharan African countries, including Nigeria.

Finally, diagnostic tests are carried out to determine the suitability of the estimated models for policy recommendations. The probability values of the serial correlation, correct specification (Ramsey RESET), and heteroscedasticity tests show that the three models are free from serial correlation and heteroscedasticity and are correctly specified. In addition, the stability test conducted using the cumulative sum (CUSUM) and cumulative sum of squares (CUSUM of squares) tests shows that the models are stable (see Figure 1). However, the error terms are not normally distributed. The estimates remain unbiased nevertheless. Overall, the foregoing shows that the empirical models are suitable for policy recommendations.

Table 5: Estimation results

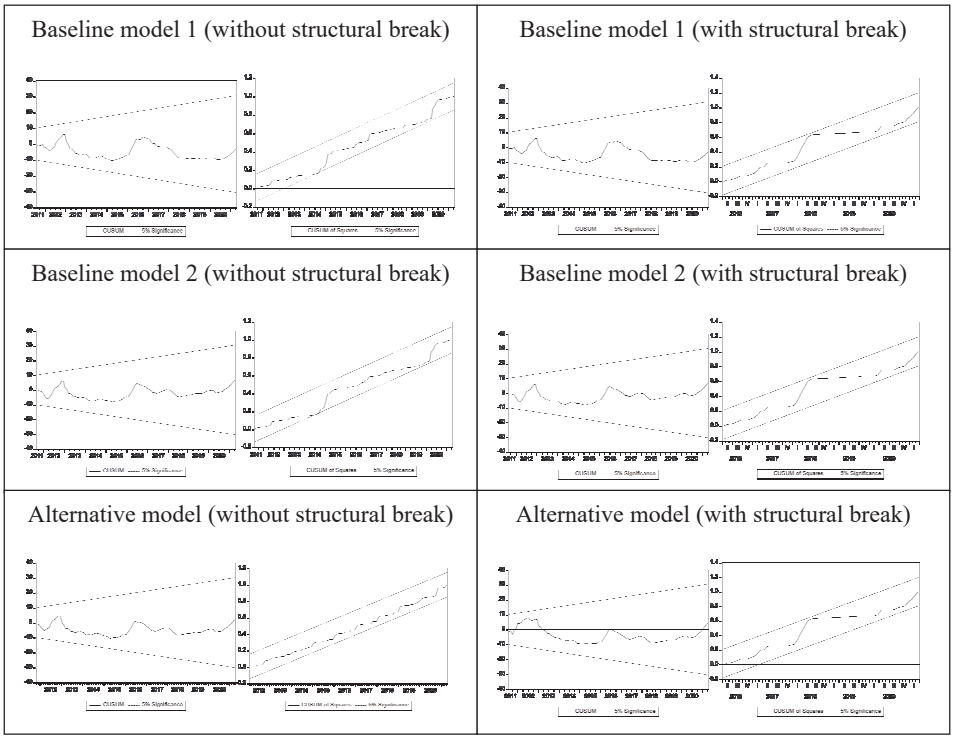
	Without Structural Break			With Structural Break		
	Baseline model 1	Baseline model 2	Alternative model	Baseline model 1	Baseline model 2	Alternative model
Variables	Coefficients	Coefficients	Coefficients	Coefficients	Coefficients	Coefficients
D(INF(-1))	0.996*	0.983*	0.984*			
	[0.021]	[0.022]	[0.022]			
D(CBN^{+})	0.011		-0.001	0.002		-0.017
	[0.008]		[0.009]	[0.036]		(0.036)
D(CBN^{+}*DUM)				0.005		0.017
				[0.037]		[0.036]
D(CBN^{-})	0.133		0.161***	0.218***		0.172
	[0.093]		[0.092]	[0.117]		(0.114)
D(CBN^{-}(-1))				0.171***		0.228**
				[0.088]		(0.090)
D(CBN^{-}*DUM)				-0.348***		-0.226
				[0.181]		[0.182]
D(PRM^{+})		0.016**	0.018**		0.029*	0.032*
		[0.006]	[0.007]		[0.011]	(0.011)
D(PRM^{+}*DUM)					0.013*	0.016*
					[0.005]	[0.004]
D(PRM^{-})		-0.004	-0.004		-0.020	-0.021
		[0.008]	[0.008]		[0.025]	(0.025)
D(PRM^{-}*DUM)					0.013	0.019
					[0.026]	[0.026]
D(LRGDP)	1.277***	1.438***	1.19	0.261	1.164	1.284
	[0.739]	[0.746]	[0.757]	[1.123]	[1.145]	(1.133)
D(LRGDP*DUM)				0.538	1.430	1.200
				[1.502]	[1.517]	[1.507]
D(MPR)	-0.077	0.202	0.21	0.272	0.389	0.381**
	[0.050]	[0.151]	[0.164]	[0.164]	[0.147]	[0.162]
D(MPR(-1))		-0.270***	-0.27***			
		[0.144]	[0.157]			

D(MPR*DUM)				-0.478* [0.113]	-0.502* [0.108]	-0.507* [0.111]
D(DUM)				-1.770* [0.506]	-1.512* [0.624]	-1.316* (0.387)
C	-37.83*** [22.178]	-42.79 [22.377]	-35.06 [22.742]	8.080 [33.842]	34.94 [34.483]	38.88 (34.129)
Adj. R-squared	0.953	0.955	0.955	0.961	0.962	0.964
F-statistic	493.70 (0.000)	423.54 (0.000)	321.02 (0.000)	231.41 (0.000)	279.30 (0.000)	190.15 (0.000)
NARDL (AIC)	1,0,0,0,0	1,0,0,1,0	1,0,0,0,0,1,0	1,0,2,0,1,0,0, 0,0,0	1,0,0,1,0,0,0 ,0,0,0	1,0,2,0,0,1,0, 0,0,0,0,0,0,0
Diagnostic tests						
Jarque-Bera normality test	155.91 (0.000)	123.30 (0.000)	149.16 (0.000)	302.51 (0.000)	223.13 (0.000)	292.90 (0.000)
Breusch-Godfrey serial correlation LM test	0.25 (0.616)	0.24 (0.624)	0.25 (0.617)	0.92 (0.338)	2.13 (0.145)	1.94 (0.164)
Heteroscedasticity test (ARCH)	0.97 (0.325)	1.74 (0.187)	0.54 (0.462)	0.03 (0.856)	0.51 (0.477)	0.19 (0.660)
Ramsey RESET	0.688 (0.408)	0.004 (0.950)	0.001 (0.981)	2.278 (0.198)	2.288 (0.192)	2.348 (0.129)
Wald test (short-run asymmetry)	1.71 (0.194)	3.52 (0.063)	6.27 (0.0991)	9.42 (0.024)	2.75 (0.097)	15.33 (0.009)

Note: *, **, and *** denote probability values at 1%, 5%, and 10% significance levels, respectively; the numbers in square brackets and round brackets are standard errors and probability values, respectively.

Source: Authors

Figure 1: Stability tests



Note: This figure shows the stability status of the estimated models. The blue lines are the model lines. Because the blue line falls within the red line, the model is stable and fit.
Source: Authors

5. CONCLUSION

Nigeria's import dependence has subjected it to macroeconomic shocks, including a rising inflation rate. The country has had to grapple with the choice of an effective monetary policy to reduce the prevailing inflationary pressure. Moreover, existing studies focused on the linear relationship between the exchange rate and the inflation rate, with little evidence of their nonlinear relationship in import-dependent countries like Nigeria. This study, therefore, adopts the NARDL technique to investigate the asymmetric nexus between the exchange rate and the inflation rate in Nigeria using monthly data from 2011M1 and 2021M3. For robustness, the exchange rate is disaggregated into the official

exchange rate and the parallel market exchange rate before examining how their dynamics pass-through to domestic prices. The co-integration results confirm the non-existence of a long-run relationship between the variables. The study also found short-run asymmetry between exchange rates and consumer prices in the official exchange rate (without structural break) model. Further findings showed that the inflation rate does not respond to official exchange rate depreciation, while inflation pressures rise with increasing parallel market exchange rate depreciation, indicating that the parallel market exchange rate is a major driver of the inflation rate with a significant pass-through effect on domestic prices. Overall, parallel market exchange rate depreciation drives domestic prices in Nigeria and economic agents leverage exchange rate movement to earn super profits, a practice which distorts resource allocation and makes importation much more lucrative than domestic production. It was also found that the inflation rate follows adaptive expectation and real GDP has a positive relationship with the inflation rate across the three estimated models. However, the effect of the monetary policy rate on the inflation rate is mixed.

In light of this, it is imperative for the country's monetary authority to devise means of effectively managing exchange rates by ensuring that the wide gaps between the official and parallel market exchange rates are bridged to eliminate arbitrage that can result in resource allocation distortion. Specifically, the CBN needs to harmonise or eliminate multiple exchange rate regimes and take pragmatic approaches toward effectively managing exogenous (exchange rate) and endogenous prices (monetary policy rate and inflation rate) in its pursuit of price stability in Nigeria. However, this effort must be carefully calibrated to avoid unintended consequences, such as a free fall of the value of the domestic currency, which could exacerbate the current economic realities in Nigeria. Concerted efforts must also be made to diversify the productive and export bases of the Nigerian economy given its import-dependent nature, which engenders high demand for foreign exchange.

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Received: August 30, 2024
Accepted: October, 29, 2024

ECONOMIC ANNALS, Volume LXIX, No. 243 / October – December 2024
UDC: 3.33 ISSN: 0013-3264

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BOOK REVIEW:
Dependency Theory After Fifty Years: The Continuing Relevance of Latin American Critical Thought, by Claudio Katz, Chicago: Haymarket Books, 2022.

JEL CLASSIFICATION: Y30

DEPENDENCY THEORY: THE FUNDAMENTALS

This book by the prominent Argentinian economist Claudio Katz explores the contemporary relevance of dependency theory: to what extent does it explain today's world? Like Marxist theory in general, dependency theory faced marginalisation and obscurity in the 1990s and early 2000s following the perceived triumph of neoliberalism after the collapse of the socialist system. It was dismissed as outdated and replaced by fervent neoliberal optimism. However, subsequent global events, including Western military interventions, the Arab Spring, the 2007–08 financial crisis, and rising inequality in developed countries, challenged the universal applicability of neoliberalism as an explanatory framework. Additionally, global capitalism's failure to address impending ecological crises, the emergence of illiberal regimes, the Russian invasion of Ukraine in 2022, and increasing geopolitical fragmentation have further undermined confidence in neoliberalism's efficacy.

Although the author focuses mostly on dependency theory explanations developed in the 1970s (hence the name, Dependency Theory After 50 Years), his analysis goes back to the Marxist roots of dependency theory (before it became known by this name) and covers the views of Marx, Lenin, Rosa Luxembourg, and Trotsky.

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Dependency theory, as outlined by key theorists such as Samir Amin, Mauro Marini, Dos Santos, Ernest Mandel, Immanuel Wallerstein, and others, asserts that underdevelopment is inherent to dependent capitalism. According to this view, the global capitalist system perpetuates dependency between developed core nations and underdeveloped periphery nations. This perspective challenges the idea of convergence theory, arguing that global capitalism sustains unequal relations between countries as essential for its operation.

The book's approach is as follows: it disassembles dependency theory into its key concepts, analyses them from today's perspective, and then assembles them into an updated version of the theory in the last chapter.

IMPLICATIONS FOR DEVELOPMENT AND THE ROLE OF THE UN

Katz argues that traditional approaches to combating underdevelopment, such as simple corrective policies or increased investment, are inadequate. Dependency theorists challenge the idea of states as independent drivers of growth and critique the UN's concept of underdevelopment from the 1950s–60s. This concept blamed underdevelopment on deterioration in the terms of trade and economic structural issues. It became a blueprint for UN intervention, promoting import-substitution industrialisation and public investment, but also reinforcing national bourgeoisie interests.

Dependency theory, following Prebisch and Singer, acknowledges unequal exchange and deterioration in the terms of trade. Unequal exchange refers to a situation where developing countries export primary commodities at low prices and import manufactured goods at high prices, resulting in an unfavourable balance of trade. The UN's recent focus on the private sector and financial development, seen in the Addis Ababa Action Agenda (UN 2015), perpetuates dependency by integrating developing countries into global capitalist systems through increased credit finance. In most cases, the expansion of credit finance in developing countries results in greater financial dependency: the increased domination of foreign capital, growing indebtedness of businesses and individuals, capital flight, and outflows of capital (and hence surplus value) to the developed countries. Katz rightly points out that accumulation in developing countries required for breaking out of the cycle of dependency and underdevelopment is impeded by external factors, such as imperialism, not by lack of capital. Although few recent developments demonstrate the continuing relevance of dependency theory better than the financialisation of modern capitalism, this issue is not, unfortunately, covered in Katz's book.

INTERNATIONAL SURPLUS VALUE TRANSFERS

Katz reconfirms the relevance of some key principles of dependency theory, such as surplus value transfers. This is the specific economic mechanism through which the relationship of dependency is produced and reproduced between the periphery and the centre. This drainage is carried out through the prices prevailing in the world market. The concentration of activities that require complex labour, developed technologies, and significant investment in advanced economies determines that the prices of their production are higher than their value. For example, they exchange one day's work for three from another country, while the inverse occurs with underdeveloped economies.

GEOPOLITICAL-MILITARY RELATIONS OF DEPENDENCY

The book then explores concepts from the 1970s and 1980s: sub-imperialism, super-exploitation, dependency status classification, dependent cycle, and rent. Katz notes shifts in sub-imperial forms post-Cold War, moving from ideological to economic competition. He defines "sub-empire" in a geopolitical-military sense, including countries with strong militaries and regional ambitions aligned with the US, such as Turkey and Saudi Arabia, but excluding those with powerful economies and small armies, such as South Korea or Japan. The major criterion for Katz is the alignment with, and commitment to, the dominant imperialist power, i.e. the US. Hence, Iran is not a sub-imperial power whereas Turkey and Saudi Arabia are.

Katz adds two categories for clarity: "co-imperial appendages" such as Israel, Canada, and Australia, which directly extend the centres, and "empire in formation" including Russia and China. Russia's opposition to the US does not make it anti-imperialist, as it is governed by capitalists prioritising their own welfare. Katz sees the Ukraine conflict as inter-imperialist rivalry, not an anti-imperialist struggle. He cites Russian Marxist Boris Kagarlitsky (Dolcerocca & Terzioglu, 2015), who describes how the Russian capitalist regime blocked the autonomous and radical action of the rebel movement in East Ukraine. While subsequent developments saw Russia providing significant support to the rebel movement, this support hollowed out its liberating potential (in terms of labour liberation) and transformed it into a movement serving the interests of big Russian capital. Nonetheless, Russia and China, due to their tensions with the US, are not considered sub-empires, unlike Turkey and India.

ECONOMIC RELATIONS OF DEPENDENCY

Katz expands on the economic dimension of dependency, retaining the centre, periphery, and semi-periphery classifications while introducing new ones: advanced and new centres, as well as rising and declining semi-peripheries.

Advanced centres such as the US and Japan maintain their status due to their leading role in global production, while new centres such as China rise in prominence through increased participation in global production. Semi-peripheries such as South Korea advance by specialising further, while declining semi-peripheries such as Brazil regress industrially.

Katz revisits Marini's concept of super-exploitation, where periphery ruling classes compensate for their position by underpaying labour. Katz suggests replacing this notion with a focus on low labour remuneration across all countries and prioritising explanations of dependency through international surplus value transfers. He argues that the level of labour valuation depends on internal development and global market integration, with surplus value flow direction determining a nation's status. Katz also considers two facets of exploitation: labour appropriation magnitude is higher in productive centre economies, while the burden on wage workers is greater in underdeveloped countries.

Financial dependency and exploitation are not covered in the book. But the centre clearly keeps the semi-periphery and periphery on a short financial leash. An IMF analysis (2023) suggests that banks' funding costs in low capital ratio economies (that is, periphery countries) jump by 55 basis points as the "geopolitical distance" with foreign lenders increases by one standard deviation. Geopolitical distance in this context is a euphemism to denote how much a country's voting behaviour in the UN General Assembly differs from the voting of the collective West. Behave yourself or else…

IMPERIALIST RENT TRANSFERS

Katz highlights imperialist rent transfers alongside surplus value transfers to elucidate dependency, which forms international value transfers that perpetuate the periphery's subordination to the centre. Imperialist rent challenges the neoliberal notion of "rentier states" in the periphery used to justify transnational exploitation while condemning regional corruption. For instance, oil economies suffer deficits, capital flight, and debt due to profit repatriation and patent payments, deepening dependency imbalances.

Social struggles determine whether ruling classes or the populace capture rents, with states influencing appropriation. States play a role in how the resources are appropriated and whether the rent is retained, drained, or absorbed. But, as the example of Argentina in the late 19th century illustrates, even if the international rent was absorbed, it benefitted domestic large landowners as their rents went up and foreign firms as rents flowed back into the English storage plants, banks, and railroads.

DEVELOPMENT

The book examines three dimensions of (under)development: global stratification (centre, semi-periphery, or periphery); internal development level (advanced, intermediate, or backward economies); and political independence (empires, appendages, semi-/sub-empires, semi-colonies, colonies). It concludes by stating that capitalism is a stratified system hindering collective welfare, where the development of some economies comes at the expense of others due to unequal accumulation dynamics.

Beyond the current dependent world order, alternatives are rarely discussed, but ongoing geopolitical separation prompts research on possible alternate arrangements, such as trade restrictions and technological decoupling. Recent IMF research (Hakobyan et al., 2023) suggests these changes will have varying impacts, with Latin America and the Caribbean forecasted to benefit, unlike the majority of peripheral countries. Why? Because these countries are expected to retain a higher share of international transfers due to their improved bargaining position. The improved bargaining position of Latin America and the Caribbean stems from their rich natural resources and strategic importance in global supply chains. Additionally, the region's increasing economic integration and diversification of trade partnerships enhance its leverage in international negotiations, allowing for better terms and higher retention of financial inflows.

As the world reconfigures, it may produce other surprising developments. States of the semi-periphery and periphery are not entirely powerless but severely limited by their position of subordination to the interest of the capitalist centre. In this respect, Katz's book provides a systematic, informed, and evidence-based critique of this situation from a dependency theory perspective.

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Received: July 11, 2024
Accepted: November, 06, 2024

ACKNOWLEDGEMENT TO REVIEWERS

Economic Annals owes much to the expertise of our reviewers and to their willingness to generously offer their time to the review process. Their constructively critical reading of submitted manuscripts, and the provision of considered comments to authors, is instrumental in ensuring the highest academic standards of the articles published in the journal. The Editorial Board therefore gratefully acknowledges the assistance of the following scholars who have reviewed manuscripts for Economic Annals during January-December 2024:

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