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Shaping sustainable futures: Multi-stakeholder perspectives on government-business partnerships for achieving the 2030 Agenda in Latin America and the Caribbean

Fabiola Monje-Cueto, Maria Alejandra Gonzalez-Perez, Osvaldo Nicolas Barbery-Merida, Miguel Cordova, Karla Maria Nava-Aguirre

ABSTRACT

Objective: The objective of this study is to examine government-business partnerships in Latin America and the Caribbean to support the 2030 Agenda, focusing on bypassing negative future scenarios and achieving key milestones.

Research Design & Methods: Using a qualitative futures study approach, we gathered data through 28 face-to-face focus groups in seven countries, involving diverse stakeholders. Discussions centred on future scenarios balancing economic growth with climate change resilience and biodiversity conservation.

Findings: A critical need for multi-stakeholder collaboration was revealed in fostering business development that supports regenerative economic recovery post-COVID-19 while mitigating climate change impacts. The study extends the Montiel *et al*. (2021) model, demonstrating its effectiveness across various business types and economies.

Implications & Recommendations: By creating a future-positive scenario on how to circumvent detrimental outcomes and support sustainable development goals (SDGs), this study offers fresh insights for societal and economic actors on actionable strategies to close the gap in the SDG compliance.

Contribution & Value Added: The research provides a unique set of actionable opportunities in each country, along with a comparative analysis of sustainable development strategies. It also proposes refinements to Montiel *et al*.'s (2021) externality framework, contributing significant new perspectives to the literature.

Article type: research article

Keywords: sustainable development goals (SDGs); multi-stakeholder collaboration; regenerative economic recovery; climate change resilience; biodiversity conservation; Latin American and Caribbean; sustainable development

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INTRODUCTION

The United Nations' sustainable development goals (SDGs) represent a global commitment to address pressing social, economic, and environmental challenges by 2030 (Ziemba *et al*., 2024). As we approach this critical deadline, the need for effective strategies to achieve these goals becomes increasingly urgent. This study focuses on a key aspect of this global effort: the role of partnerships between governments and businesses in achieving the SDGs.

We cannot overstate the relevance of this topic. In an increasingly interconnected world, the challenges addressed by the SDGs – from climate change to poverty eradication – require collaborative

solutions that transcend traditional boundaries between public and private sectors. Understanding how these partnerships function and how they can be optimised is crucial for accelerating progress towards the 2030 targets.

Our study subject was the dynamics of government-business partnerships in the context of sustainable development, with a particular focus on Latin America and the Caribbean (LAC). This region faces unique challenges and abides in unique opportunities in pursuing sustainable development, making it a rich ground for exploring innovative partnership models.

The primary aim of this research is to identify and analyse effective strategies for multi-stakeholder collaboration in achieving the SDGs. Specifically, we sought to:

1. Examine the role of national drivers in sustainable socioeconomic growth and climate change resilience.
2. Explore how business strategies can align with global sustainability objectives.
3. Investigate the potential of scenario-based research in planning for sustainable futures.

To achieve these aims, we employed a mixed-method approach, combining literature review, focus groups with diverse stakeholders, and scenario analysis. By doing so, we addressed a significant gap in the current literature: the practical application of scenario-based research in scholarly work on sustainable development.

We aimed to highlight the pivotal role of partnerships between governments and businesses in achieving the SDGs established by the United Nations (n.d.). The topic is compelling and significant in both theory and practice, because it addresses how collaborative efforts can drive sustainable development. Understanding the dynamics of these partnerships can inform better policies and strategies, ensuring progress towards essential targets by 2030. Our focus on circumventing negative future scenarios and meeting these targets underscored the critical intersection of business strategies and global sustainability objectives.

The article is structured into several key sections. Following the Introduction, the *Literature Review* delves into the theoretical background, including the concept of future scenarios and the importance of multi-stakeholder collaboration. The *Research Methodology* details the qualitative futures study approach, including participant profiles, data collection, and analysis methods. The *Results and Discussion* section presents critical insights and strategic recommendations for sustainable development in various countries. Finally, the *Conclusions* summarize the findings, highlighting the role of public-private partnerships in supporting the SDGs.

LITERATURE REVIEW

Introduction to Future Scenarios

The concept of future scenarios has evolved from military applications to business strategies (Ryan, 2019; Schmitz & Cordova, 2023). Wilkinson and Kupers (2014) traced this evolution back to Shell's early adoption in the 1960s. More recently, Monje-Cueto and Ruiz Ayala (2023) proposed a collaborative model for businesses to work towards sustainability.

The quest for a sustainable future requires collective action that transcends traditional economic models (Gonzalez-Perez, 2022; Mohieldin *et al*., 2023). Neuvonen and Ache (2017) and Vargas *et al*. (2022) advocate for a proactive approach, utilising backcasting to create actionable paths towards these sustainable futures.

In our current context, a polycrisis is defined as multiple concurrent crises, creating compounded challenges (Gonzalez-Perez, 2023). This context underscores the necessity of a multi-stakeholder approach, as emphasised by Ferretti (2016), for adequate policy support and crisis management.

Understanding and Managing Externalities

The concept of externalities highlights the unintended impacts businesses have on third parties (Ayres & Baumol, 1972; Stern *et al*., 1973). This understanding has evolved to include both negative

and positive externalities (Helbling, 2010), leading to Montiel *et al.'s* (2021) framework for aligning multinational corporations' activities with SDGs.

While the existing literature provides valuable insights, several important gaps remain. There is limited research on how these concepts can be practically applied in the specific context of Latin America and the Caribbean to address the 2030 Agenda. Moreover, while scholars acknowledge the importance of multi-stakeholder collaboration, there is a lack of empirical studies examining how diverse sectors can effectively work together to create sustainable futures, particularly in the face of polycrises.

Based on these gaps, our research question emerged: How can public and private partnerships contribute to support the 2030 Agenda while avoiding undesirable future scenarios through collaborative efforts? This question encapsulates the essence of our study, seeking to explore and define effective strategies for multi-stakeholder collaboration in the pursuit of sustainable development.

RESEARCH METHODOLOGY

Research Design and Approach

This study, funded by Centro de los Objetivos del Desarrollo Sostenible para Latinoamérica (CODS), employs an exploratory approach through focus groups to understand mechanisms for rebuilding businesses and societies post-COVID-19 in Latin America and the Caribbean.

Participant Profile and Data Collection

We engaged 269 individuals across government, business, academia, and civil society in 28 country-based focus groups. Each group, lasting approximately 120 minutes, convened between November 2020 and March 2021 via virtual platforms. We selected participants based on specific profiles to contribute diverse perspectives on recovery and resilience-building, particularly in areas related to climate change and sustainable development.

Table 1. Participants demographics

Classification of actors	Participants by actor's classification	Acting experience (in years)	Participants count	Gender distribution	
				Male	Female
Academia	58	< 10	9	2	7
		>10	49	32	17
Private sector (Business)	114	< 10	30	12	18
		> 10	84	53	31
Public sector	50	< 10	14	7	7
		> 10	36	18	18
Civil society/Community groups/ NGOs	56	Less than 10	20	7	13
		More than 10	36	16	20
Total %, male/female:				52.88%	47.12%

Source: own study.

Participant demographics:

- 114 business professionals (50-75% C-Suite, up to 25% board members);
- 58 academics with doctorates;
- 50 government representatives;
- 56 NGO and civil society representatives;
- Gender distribution: 52.88% male, 47.12% female;
- Experience: Majority had over 10 years in their respective sectors.

Methodological Approach: Backcasting and Scenario Building

We utilised backcasting, a retrospective method defined by Robinson (1982) and refined by Phdungsilp (2011), to construct an ideal long-term scenario. This method focuses on contextual, rather than individual, scenarios, distinguishing it from traditional forecasts.

Focus Group Activities and Analysis

Focus groups analysed country-specific drivers using Pestel's analysis and developed four main future scenarios considering socio-economic recovery and climate change resilience. We used five structured activities to explore various elements of the scenarios, identify risks and opportunities, and propose public policies.

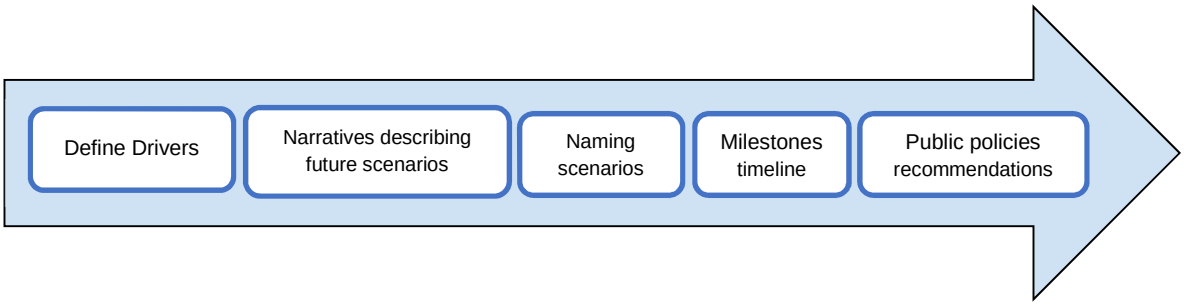

Figure 1. Steps taken in each focus group for stakeholder analysis (2024)
Source: own elaboration.

The focus groups had the following instructions to guide de-structured activities and discussions:

1. Indicate the drivers of change that will help identify trends that could significantly impact the configuration of a future scenario for each country.
2. Create narratives that describe future scenarios for each country by 2030. We created a 2x2 matrix in which socio-economic recovery was on one axis and resilience to climate change and massive biodiversity loss – on the other.
3. Name the scenarios using a name that best summarises the narrative described in the previous point.
4. Identify the key events that led to each scenario using a timeline that begins in 2020 and ends in 2030. On the one hand, participants had to think carefully about beneficial events to reach the best scenario. On the other hand, they had to come up with damaging events that led to the worst-case scenario.
5. Finally, the last activity aimed to put all the information from the previous activities to propose recommendations to reach the best scenario.

Data Coding and Analysis

Each country's research team analysed the data using Atlas.ti for a comprehensive national assessment. The process involved transcription of focus group discussions, coding, and analysis, culminating in detailed reports with recommendations. These recommendations were visualised using Rawgraph, based on the framework of Montiel *et al.* (2021) in Figure 2.

This study's unique contribution lies in its multi-stakeholder approach, bringing together diverse voices to collaboratively envision and strategize for a sustainable future. It provides a nuanced understanding of the paths businesses and societies can take to align with the 2030 Agenda for sustainable development, setting a precedent for similar research in other regions.

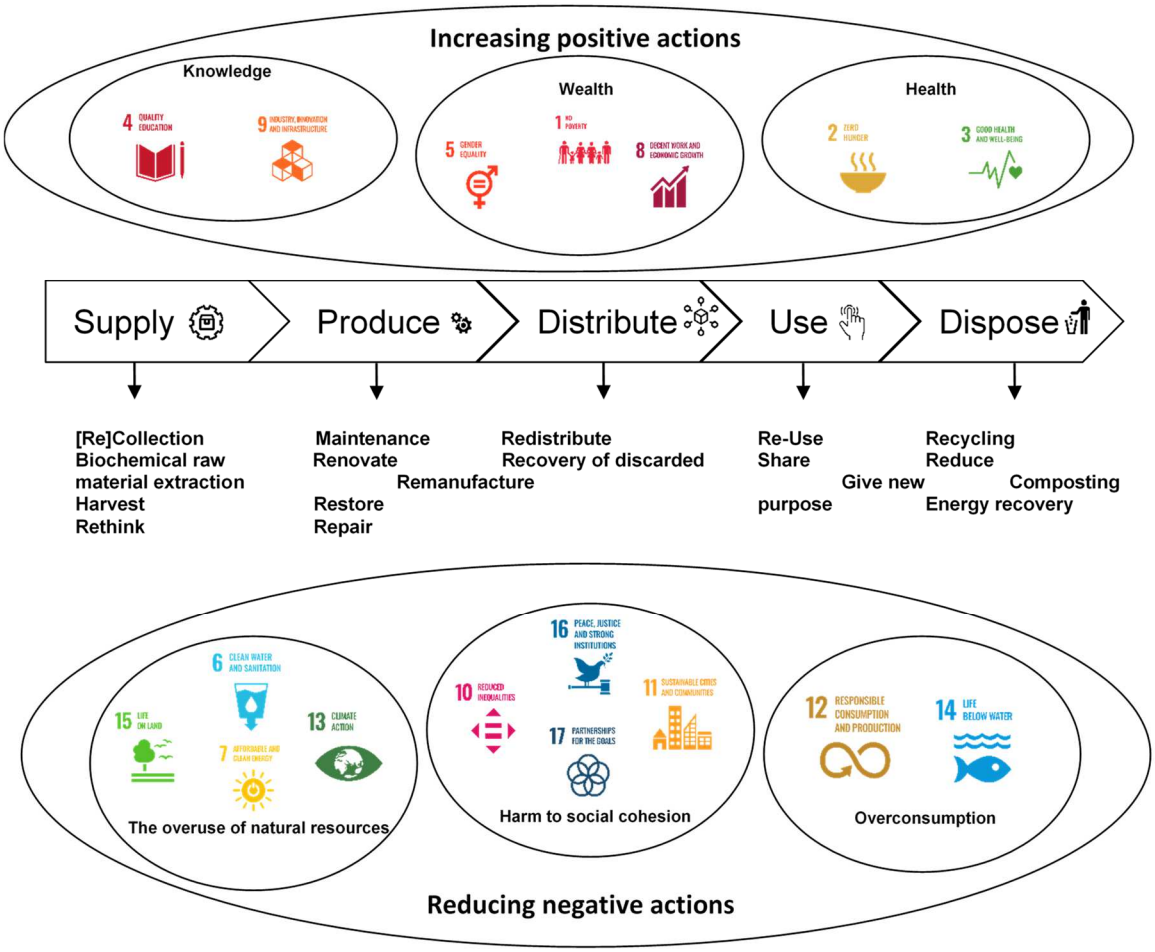

Figure 2. Proposed improvements to Montiel *et al*. (2021) framework for driving the achievement of the SDGs

Source: own elaboration based on the externality's framework from Montiel *et al.* (2021) and the butterfly model of the circular economy by the Ellen Macarthur Foundation.

RESULTS AND DISCUSSION

Findings

Building on the framework developed by Montiel *et al*. (2021), we present critical insights into how businesses (domestic, multinational, large and small and medium enterprises) contribute to the 2030 Development Agenda. We organised our findings into two main categories, as per Montiel *et al*. (2021) actions that increase positive externalities and those that reduce negative ones. This study uniquely adapts Montiel's model to encompass actions by businesses within the circular economy, offering a more inclusive understanding of business contributions across sectors.

Following Neuvonen and Ache (2017) and Vargas *et al.* (2022), to ensure a sustainable future, we had to make recommendations specific to each country's needs.

Bolivia

As Figure 3 shows, in Bolivia, focus group participants emphasised the importance of SDGs 8, 12, 9, and 13.

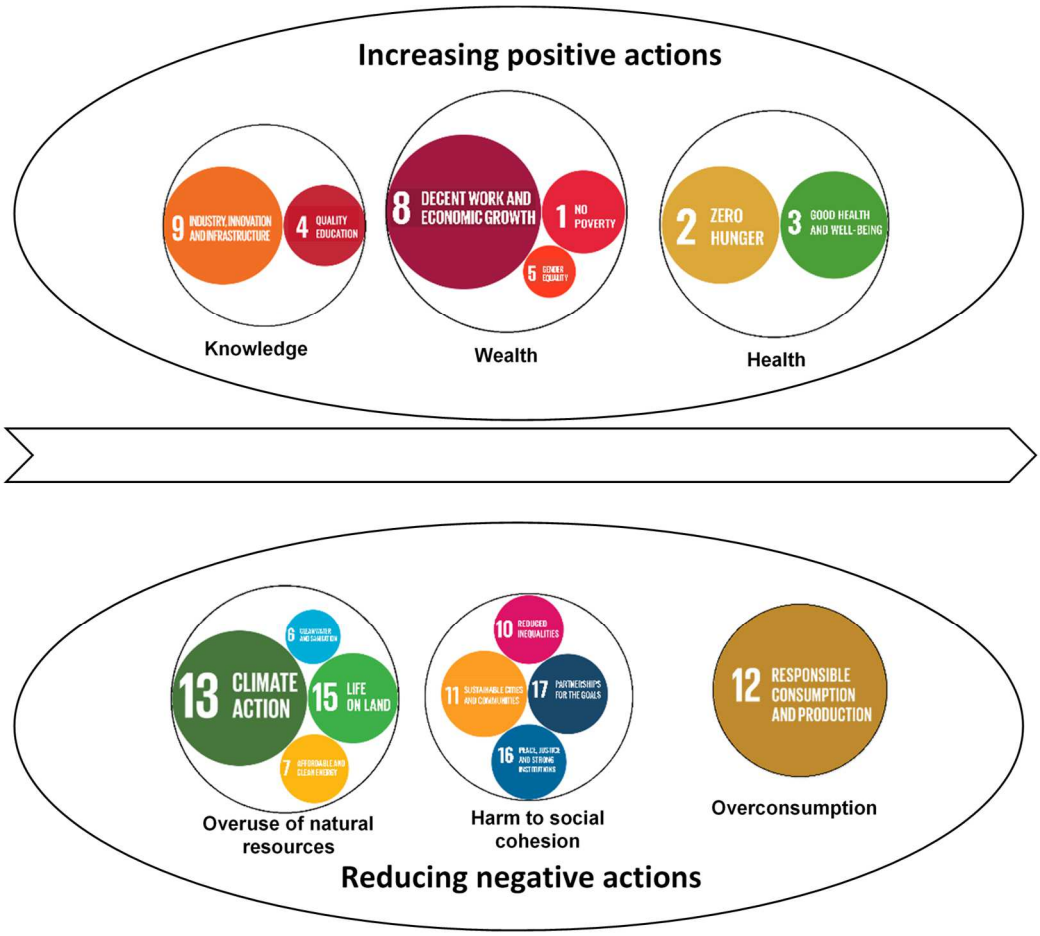

Figure 3. Proposed actions in Bolivia's focus groups to drive SDG achievement (2023)
Source: own elaboration.

The following tables present the ten most relevant strategic recommendations for each country to advance the 2030 Agenda, indicating which sectors should be involved and which specific SDGs of the agenda they would promote.

Table 2. Strategic recommendations for sustainable development in Bolivia by 2030

Recommendations	Aca-demia	Private sector	Public sector	Civil society	SDGs
Government promotion of cleaner technologies and alternative energies.	✓	✓	✓	✓	7, 13
Technology integration in agriculture to boost productivity.	✓	✓			2, 9
Diversification of the economy through innovation and circular economy principles.	✓	✓	✓		8, 9, 12
Development of iron production in Mutun for export.		✓	✓		9
Establishment of Bolivia as a lithium and renewable energy re-search hub.	✓	✓	✓		7, 9
Internationalisation of high-value production chains.		✓	✓		8, 9
Reforms in judicial and electoral systems.	✓		✓	✓	16
Market flexibilisation for equitable tax contributions.	✓	✓	✓		10, 8
Establishing Bolivia as a hub for technological and clean energy services.	✓	✓	✓		7, 9
Regulations for informal mining.			✓	✓	12, 13, 16

Source: own study.

Achieving the recommendation of 'government promotion of cleaner technologies and alternative energies' requires collaboration between stakeholders. Academia leads research and development, the private sector invests and adopts technologies, and the public sector creates supportive policies. Civil society raises awareness and advocates for sustainability.

Brazil

Focus groups in Brazil highlighted SDG 12, followed by SDGs 8 and 2 (see Figure 4).

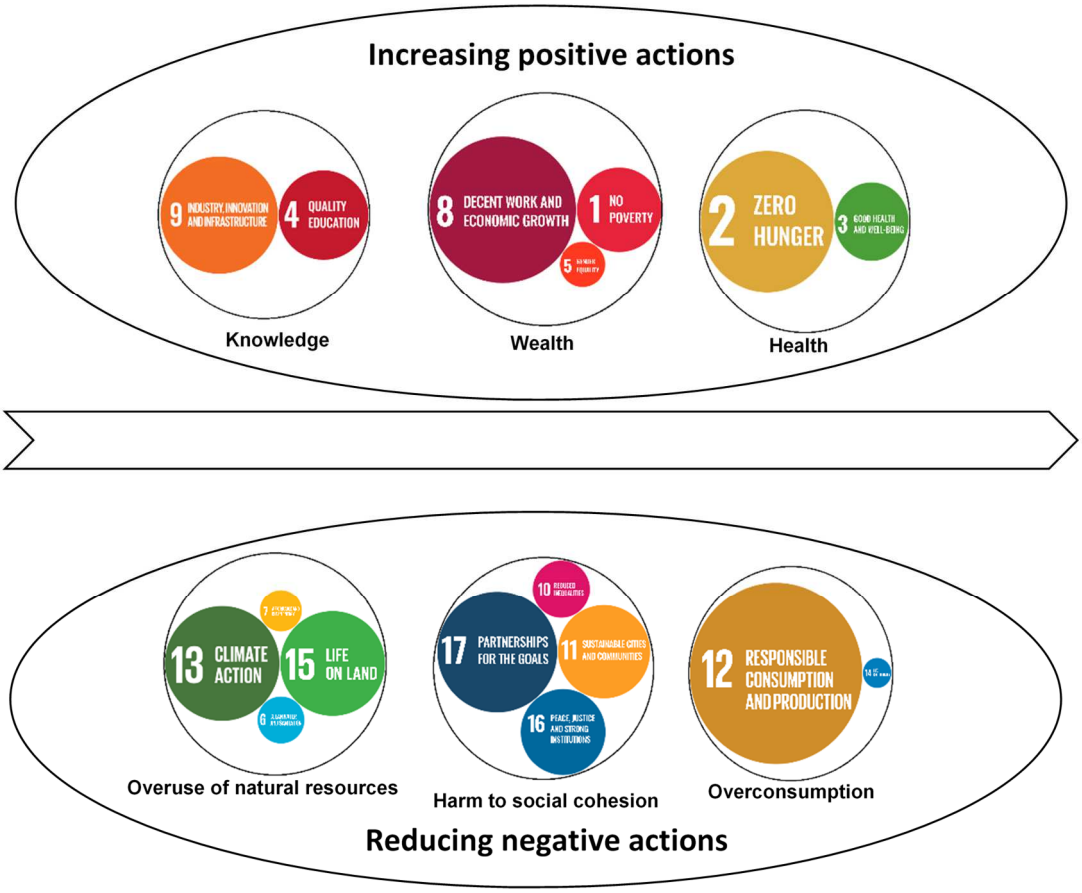

Figure 4. Proposed actions in Brazil to drive SDGs achievement (2023)
Source: own elaboration.

Table 3. Strategic recommendations for sustainable development in Brazil by 2030

Recommendations	Aca-demia	Private sector	Public sector	Civil society	SDGs
Embedding sustainability in early childhood education.	✓		✓	✓	4, 12
Growth in the creative economy to improve socio-economic conditions.	✓	✓	✓		8, 9, 12
Technological advancements in the cane and protein industries.	✓	✓			2, 9
Implementing regulations for reverse logistics and carbon credits.		✓	✓		12, 13
Promotion of environmentally friendly practices in meat production.	✓	✓		✓	12, 15
Sustainable advancements in agribusiness.	✓	✓	✓		2, 8, 12
Conversion of traditional livestock farms to *silvopastoral* systems.	✓	✓		✓	15
Entrepreneurial education initiatives.	✓		✓	✓	4, 8
Support for the collaborative economy.	✓	✓		✓	8, 12, 17
Strengthening Brazil's global economic and diplomatic roles.		✓	✓	✓	8, 10, 17

Source: own study.

Embedding sustainability in early childhood education in Brazil requires coordinated efforts. Academia can create curriculum materials and provide teacher training. The public sector can set policies, allocate funding, and support schools. Civil society can advocate, support schools, and engage the community. Together, they can create a cohesive approach to sustainability education, fostering environmentally conscious individuals committed to sustainable practices.

Chile

Chilean participants focused on SDGs 12 and 8, 13, 9, and 2 (see Figure 5).

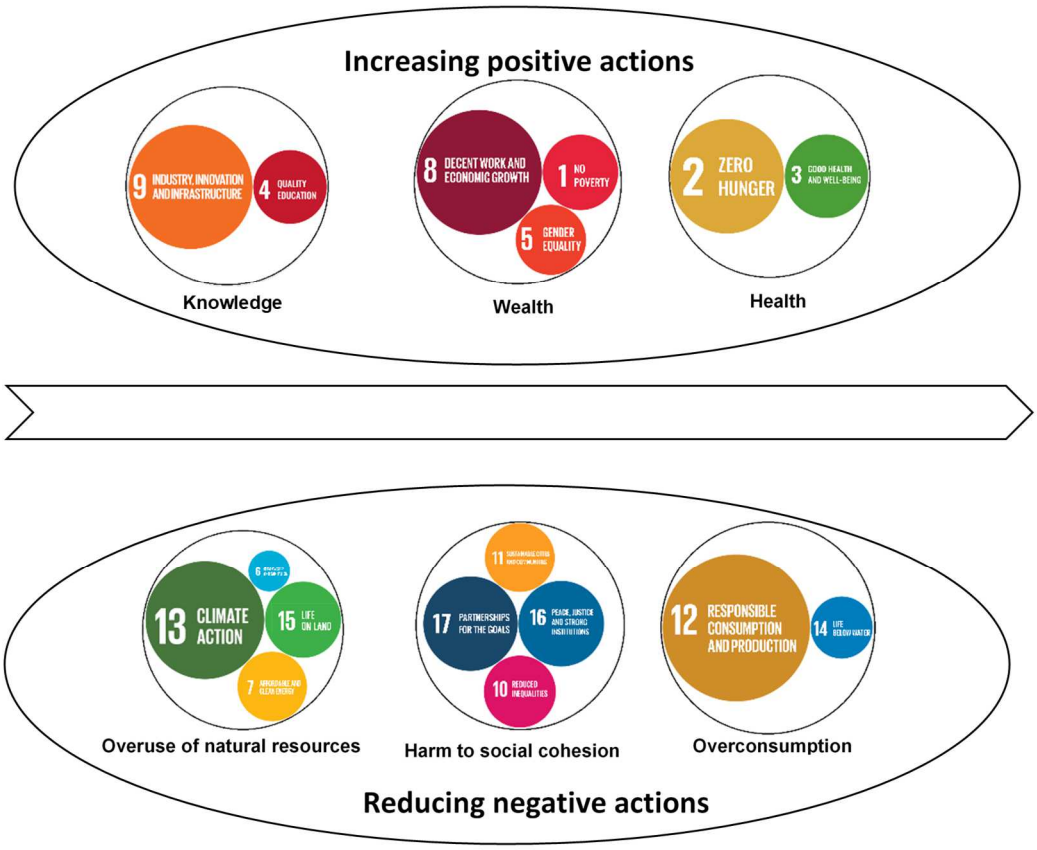

Figure 5. Proposed actions in Chile's focus groups to drive SDG achievement (2023)
Source: own elaboration.

Table 4. Strategic recommendations for sustainable development in Chile by 2030

Recommendations	Academia	Private sector	Public sector	Civil society	SDGs
Shifting the discourse from natural resources to natural assets.	✔	✔	✔	✔	12, 8
Mandatory sustainability training for all professionals.	✔	✔	✔		4, 12
Enhanced environmental education at higher education levels.	✔		✔	✔	4, 13
Collaboration between academia and government for clean energy production.	✔	✔	✔		7, 9
Tax system reforms to favour environmental contributions.		✔	✔		13, 17
Alignment of environmental standards with corporate performance and employee satisfaction.	✔	✔			8, 12
Requirement of 'B' certification for state support.		✔	✔		8, 12
Promotion of SMEs focused on sustainability.		✔		✔	8, 9, 12
Recognition of Latin America as a biodiversity powerhouse.	✔		✔	✔	15, 17
Post-pandemic appreciation of rural spaces and sustainable business development.	✔	✔		✔	11, 12

Source: own study.

Shifting the discourse from natural resources to natural assets requires collaboration. Academia researches and promotes natural assets, informing policy and business strategies. The private sector incorporates this framework into sustainability practices. The public sector enacts protective policies and incentives. Civil society raises awareness and advocates for stronger protections. Together, they can shift the discourse, promoting sustainable management of the environment.

Colombia

In Colombia, there was a greater emphasis on achieving SDGs 12 and 8, followed by SDGs 9 and 3 (see Figure 6).

> I see a negative scenario; low governance in the face of this economic and fiscal crisis of the government undoubtedly increases, and this translates into illegal activities such as deforestation, illegal mining, and cultivation. The government's capacity is low because the regulation regarding climate change is just a declaration, and government tools are very scattered, lacking articulation and are very oriented towards the mining-energy sector. However, nothing concrete has been proposed for the agricultural and industrial sectors (Actor ID MRFT2, female, Director of Sustainability, Postobon, Medellín, 1 December, 2020).

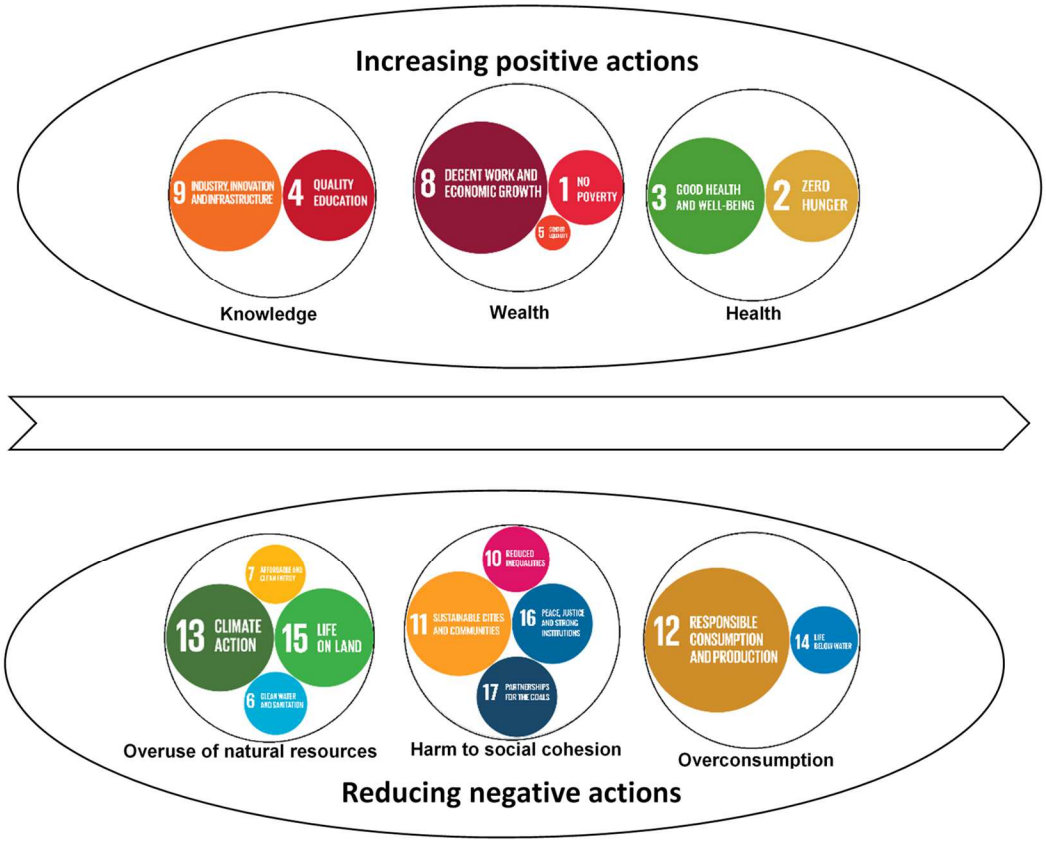

Figure 6. Proposed actions in Colombia's focus groups to drive SDG achievement (2023)
Source: own elaboration.

According to what was mentioned in workshop 2, 'circular economy topics have been gaining more traction lately. I would say that in Colombia we should be focusing a lot on these topics, which are very environmental due to our geographical location' (Actor ID MXAT2, female, especialized professional, Ecopetrol, Medellín, 1 December, 2020).

Transitioning to a multidimensional growth model beyond GDP in Colombia requires coordinated efforts. Academia can develop alternative metrics that include environmental health, social equity, and quality of life, integrating these into curricula and research. The public sector can adopt these

metrics in policy-making and planning, creating regulatory frameworks for their use. Civil society can raise awareness, advocate for adoption, and hold entities accountable. Together, they can promote a more comprehensive and sustainable growth model.

Table 5. Strategic recommendations for sustainable development in Colombia by 2030

Recommendations	Aca-demia	Private sector	Public sector	Civil society	SDGs
Transitioning to a multidimensional growth model beyond GDP.	✓	✓	✓		8, 9
Incentives for sustainable agriculture production.		✓	✓	✓	2, 12
Promotion of environmental and economic research.	✓		✓		12, 8
Enhancing waste recovery and recycling.	✓	✓	✓		12, 11
Development of an education for sustainable development policy.	✓		✓	✓	4, 12
Policy-making on socioeconomic regeneration.			✓		1, 8
Investment in research on climate change adaptation.	✓		✓	✓	13
Fostering community-based tourism for territorial development.			✓	✓	8, 11
Investment expansion in science, technology, and innovation.	✓	✓	✓		9
Energy matrix reconversion.	✓	✓	✓		7, 12

Source: own study.

Jamaica

Jamaican discussions highlighted SDGs 2 and 8, with additional focus on SDGs 13, 11, and 12.

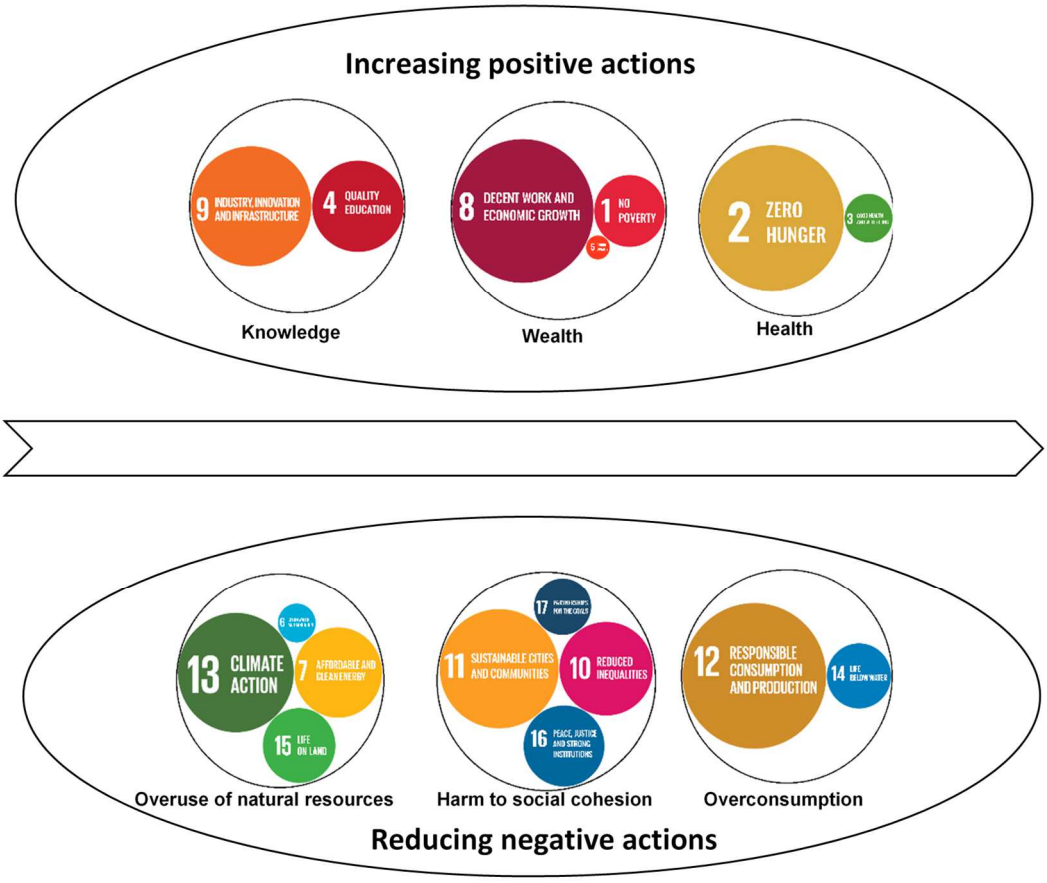

Figure 7. Proposed actions in Jamaica's focus groups to drive SDG achievement (2023)
Source: own elaboration.

In Jamaica, promoting Social Impact Assessments (SIAs) requires collaboration from each sector. Academia can develop methodologies, provide research, training, and expertise, and offer courses on

SIAs. The public sector can mandate SIAs in regulations, create guidelines, offer incentives, and provide resources. Civil society can advocate for SIAs, contribute local knowledge, and monitor implementation. Together, these stakeholders can make SIAs standard practice, leading to socially responsible and sustainable development projects.

Table 6. Strategic recommendations for sustainable development in Jamaica by 2030

Recommendations	Academia	Private sector	Public sector	Civil society	SDGs
Promotion of Social Impact Assessments.	✓		✓	✓	2, 8, 11
Linking environmental protection with holistic economic development.	✓	✓	✓		2, 8, 12
Supportive policies for sustainable farming practices.	✓	✓	✓	✓	2, 12
Enhancement of financial literacy in sustainable development.	✓		✓	✓	4, 8
Adoption of renewable energy sources to reduce costs.		✓	✓		7, 12, 13
Development of indigenous renewable energy resources.	✓	✓	✓		7, 12
Integrated urban industrial symbiosis for resource efficiency.	✓	✓	✓		9, 11, 12
Cross-sectoral policy coherence for societal benefit.	✓	✓	✓		16, 17
National programs promoting renewable resources.		✓	✓		7, 11, 12
Implementation of circular economy principles.			✓		12

Source: own study.

Mexico

In Mexico, respondents emphasised SDGs 12, 9, 8, and 13 (see Figure 8).

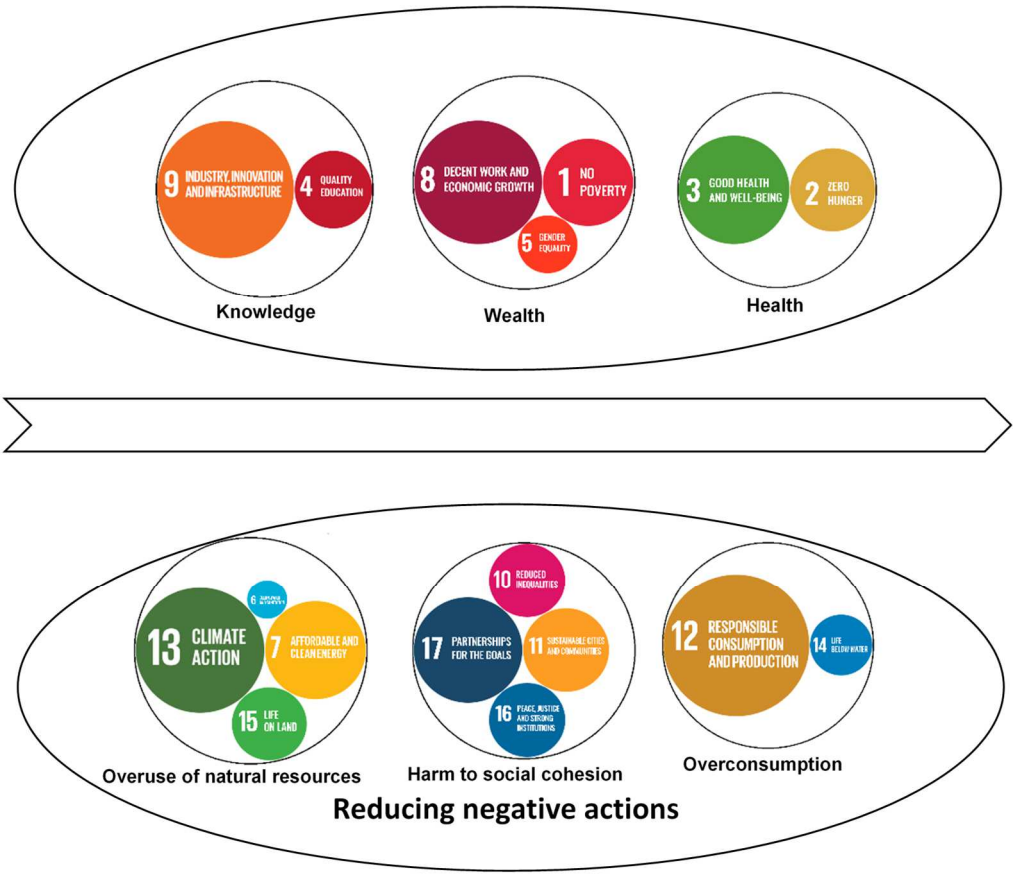

Figure 8. Proposed actions in Mexico's focus groups to drive SDG achievement (2023)
Source: own elaboration.

In Mexico, leveraging health-focused learnings from COVID-19 requires attention from sectors. Academia can conduct research and develop strategies for future health crises, integrating these into curricula and training. The public sector can improve policies, infrastructure, and emergency plans based on these insights. Civil society can spread knowledge, advocate for better policies, and build community resilience. Together, these efforts can enhance public health and preparedness.

Table 7. Strategic recommendations for sustainable development in Mexico by 2030

Recommendations	Academia	Private sector	Public sector	Civil society	SDGs
Health-focused learnings from the COVID pandemic.	✔		✔	✔	3, 12
Fair and eco-friendly renewable energy production.		✔	✔		7, 12, 13
Promotion of electric vehicles.	✔	✔	✔		7, 9
Cooperation with international organisations for clean energy transition.	✔	✔	✔		7, 13, 17
Implementation of carbon taxes.			✔		13, 12
Consistency in environmental and economic policies.	✔	✔	✔	✔	8, 12
Advances in automation and manufacturing.	✔	✔			9, 12
Ecotourism and local economy-focused economic programs.		✔	✔		8, 12
Continuity in key projects beyond political changes.			✔		16, 12
Specialised education for children and youth.	✔		✔	✔	4, 8

Source: own study.

Peru

In the Peruvian focus groups, participants emphasised the importance of achieving sustainable development goals 4, 8, and 12 (see Figure 9).

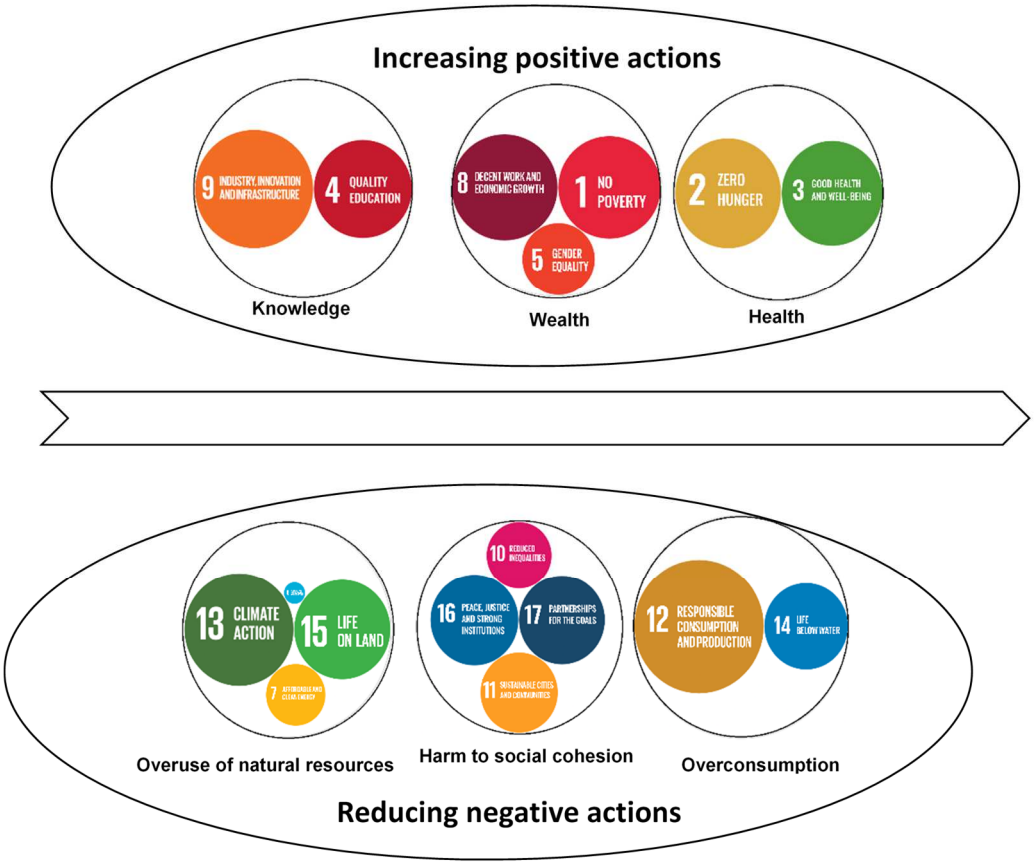

Figure 9. Proposed actions in Peru's focus groups to drive SDG achievement (2023)
Source: own elaboration.

Promoting gastronomy training for biodiversity protection is impulsed in different ways. Academia can develop programs integrating culinary arts with biodiversity principles and conduct research on its impact. The public sector can fund programs, create supportive policies, and partner internationally. Civil society can advocate for sustainable practices, support local producers, and raise awareness. Together, they can make gastronomy a key tool in global biodiversity protection and sustainable practices.

Table 8. Strategic recommendations for sustainable development in Peru by 2030

Recommendations	Aca-demia	Private sector	Public sector	Civil society	SDGs
Gastronomy training as an international model for biodiversity protection.	✔		✔	✔	4, 8, 12
Education on circular economy for all.	✔		✔		4, 12
Advancements in telemedicine, fintech, and biotech.	✔	✔	✔		9, 3
Democratisation of inclusive technologies.	✔	✔	✔	✔	10, 9
Public policy coherence with local realities.			✔	✔	16, 11
Shift from extractive to service industries.	✔	✔	✔		8, 9
Remote working to reduce carbon footprint.		✔	✔		13, 8
Tax benefits for sustainable Amazonian product trade.		✔	✔		12, 15
Public-private partnerships in managing food crises.			✔	✔	2, 17
Sustainable river basin management.	✔		✔		6, 15

Source: own study.

This study presents an extension to the Montiel *et al*. (2021) model that shows its effectiveness in various types of businesses and economies. By including the perspectives of diverse stakeholders (Ferretti, 2016), the study provides a comprehensive understanding of how businesses can strategically contribute to the 2030 Development Agenda. This approach supports the statements on including global challenges into strategic foresight processes (Gonzalez-Perez, 2022; Wilkinson, 2017) and fills the gaps in the current literature by providing practical recommendations tailored to specific contexts, enabling businesses to promote sustainable development across different economies.

DISCUSSION

Based on the preceding section, we synthesised our findings in a comprehensive table (see Table 9). This facilitated an insightful comparison of recommendations for the public and private sectors and their alignment with various SDGs. This section highlights the nuanced differences in priorities and strategies across nations, underlining the diversity of approaches to achieve the 2030 Agenda.

In Table 9, values are colour-coded to indicate the number of recommendations: ‘very low’ from 0 to 40 in red, indicating the smallest amounts; ‘low’ from 41 to 80 in orange, signifying a lower but not minimal quantity; ‘high’ from 81 to 120 in yellow, showing a significant but lesser quantity; and ‘very high’ from 120 and above in green, indicating a substantial number of recommendations. These colours reflect the recommendation ranges for each country in each group. We used the frequency column to represent the sum of recommendations for the seven countries in each group, divided into four ranges, 0-150 is ‘very low’, 151-300 aws ‘low,’ 301-450 was ‘high,’ above 451 was ‘very high.’

One pivotal finding of our study was the multifaceted nature of the recommendations. This multiplicity underscores the complexity and interconnectedness of the goals, necessitating a holistic approach to problem-solving.

To effectively synthesise recommendations that span multiple targets of various SDGs, we employed artificial intelligence to aid in clustering these complex associations. For instance, in Brazil, the proposal titled ‘entrepreneurial E\education’ intersects with several SDGs, including ‘quality education,’ ‘industry, innovation, and infrastructure,’ ‘decent work and economic growth,’ and ‘partnership for the goals.’ This approach of imparting entrepreneurial education equips students not only with the

capability to innovate and contribute to industry growth but also fosters strategic partnerships, essential for creating sustainable employment opportunities. This methodology highlights how integrated educational strategies can simultaneously advance multiple development objectives.

Table 9. Summary of the number of recommendations received in 2020-2021 in each country

Actions		SDG	Country							TOTAL	Frequency
			Bolivia	Brazil	Chile	Colombia	Jamaica	Mexico	Peru		
INCREASING	**Knowledge**	4	15	10	18	9	9	17	17		
		9	41	14	51	19	19	53	25		
		TOTAL	56	24	69	28	28	70	42	317	High
	Wealth	1	16	7	15	9	9	32	11		
		5	4	3	13	2	4	11	4		
		8	47	20	41	28	36	64	20		
		TOTAL	67	30	69	39	49	107	35	396	High
	Health	2	12	13	9	5	9	10	10		
		3	10	4	8	8	1	16	8		
		TOTAL	22	17	17	13	10	26	18	123	Very low
REDUCING	**Overuse of natural resources**	6	9	5	9	11	3	6	1		
		7	14	4	26	10	16	35	7		
		13	50	30	73	32	27	60	26		
		15	22	23	30	27	10	21	20		
		TOTAL	95	62	138	80	56	122	54	607	Very high
	Harm to social cohesion	10	18	6	36	9	7	38	12		
		11	29	12	34	23	16	46	17		
		16	19	9	51	13	13	37	22		
		17	24	22	62	14	3	75	21		
		TOTAL	90	49	183	59	39	196	72	688	Very high
	Overconsumption	12	42	35	51	23	20	54	23		
		14	0	1	9	5	4	8	10		
		TOTAL	42	36	60	28	24	62	33	285	Low
Number of recommendations			372	218	536	247	206	583	254	2416	2 416

Source: own study.

'In the positive economic scenario, private companies and research institutes, especially universities, have developed relevant clusters and innovation initiatives that have achieved a positive economic recovery.' (Actor ID GZT1, male, PhD in Education, Consultant at Universidad Mayor de San Simón, Cochabamba, 28 November, 2020).

Our frequency analysis revealed that Mexico and Chile are prominent in the frequency of recommendations across various SDGs. In the Increasing category, Mexico and Chile lead in recommendations for 'knowledge' (70 and 69 respectively) with 'low' frequency, and 'wealth' (107 and 69 respectively) with 'high' frequency. Health-related recommendations were notably low across all countries, resulting in a 'very low' frequency.

In the 'reducing' category, Chile and Mexico showed significant concern for the overuse of natural resources with 138 and 122 recommendations respectively, classified with a 'very high' frequency. The 'harm to social cohesion' was a major focus for Mexico and Chile, with 196 and 183 recommendations respectively, also classified as 'very high.' Overconsumption receives a 'low' frequency, with Chile and Mexico having the highest recommendations (60 and 62 respectively). The total number of recommendations highlights Mexico (583) and Chile (536) as leading countries, indicating key areas for sustainable development interventions across Latin America.

In one of the workshops, a member justified their recommendation, focusing on the most relevant point within socio-economic recovery and resilience to climate change and massive biodiversity loss.

'I wrote about green unicorns precisely due to a trend and new consumption patterns in this market scenario, to foster the growth of these billion-dollar unicorns with high environmental awareness and protection of various SDGs. This growth must come with societal demands and care, respecting and building a better society' (Actor ID KIACT1, female, Director, Entrepreneurship and Innovation HUB, University of Monterrey, Nuevo León, 28 November, 2020).

'Fortunately, we witness now a global trend based on the SDGs, each day more businesses and groups from civil society are changing their mindset to not only look for shareholders' benefit but get into action for the common good, without waiting for the State to solve everything or for the international agents to give fund to NGOs to begin doing something' (Actor ID B4T4, female, Corporate Compliance Director, National Port Management Agency, Peru, Lima, 3 December, 2020).

These recommendations reflect the diverse priorities and strategies across nations, underlining the variety of approaches to achieve the 2030 Agenda.

Our analysis revealed that:

1. Mexico and Chile lead in recommendations across various SDGs, particularly in 'knowledge' and 'wealth' categories.
2. Health-related recommendations were notably low across all countries.
3. Chile and Mexico showed significant concern for the 'overuse of natural resources' and 'harm to social cohesion.'
4. Mexico prioritises SDGs 12 (responsible consumption), 13 (climate action), and 15 (life on land).
5. Chile emphasises SDGs 13 and 12, showing a strong commitment to environmental sustainability.
6. Bolivia, Brazil, Jamaica, and Colombia focus on managing natural resources, reflecting a common challenge.

These findings underscore the complexity and interconnectedness of the SDGs, necessitating a holistic approach to problem-solving. The study highlights the need for integrated strategies that can simultaneously advance multiple development objectives.

Finally, our statements build upon Ferretti (2016) towards a comprehensive stakeholder contribution to the integrative challenge of sustainable development. Furthermore, we identified a set of positive and negative externalities impacting those stakeholders on their collective achievement of the SDGs, supporting Helbling (2010).

CONCLUSIONS

This study provides a comprehensive analysis of the role of public and private partnerships in achieving the 2030 Agenda across seven countries in Latin America and the Caribbean (LAC). By leveraging Montiel *et al.'s* (2021) framework, we identified actionable strategies to support SDGs, highlighting synergies between business development, economic growth, and climate action. Our findings emphasise the complexity and interconnectedness of the goals, necessitating a holistic approach to problem-solving.

Our key findings include:

1. Mexico and Chile emerged as prominent in the frequency of recommendations across various SDGs, particularly in areas of social cohesion, natural resource management, and economic growth.
2. There is a critical need for multi-stakeholder collaboration in fostering business development that supports regenerative economic recovery post-COVID-19 while mitigating climate change impacts.
3. The study extends the Montiel *et al*. (2021) model, demonstrating its effectiveness across various business types and economies.
4. Health-related proposals were limited, revealing a gap in addressing health despite the COVID-19 pandemic.
5. Countries like Mexico, Chile, Bolivia, and Peru focused strongly on SDG 12, underscoring the need for sustainable resource management amid climate concerns.

The study underscores the importance of integrating multi-stakeholder perspectives to devise effective strategies for sustainable development. For policymakers, the recommendations highlight the

need to focus on areas such as entrepreneurial education, social cohesion, and responsible consumption. For managers in the private sector, the findings suggest a shift towards proactive initiatives that contribute to SDGs, moving beyond mere compliance.

While the study provides valuable insights, it is not without limitations, including its focus on qualitative data from a limited number of countries in the LAC region. Future research could explore the integration of AI technologies to enhance data analysis and scenario modelling, providing more nuanced policy recommendations. Furthermore, expanding the study to include a broader range of countries and stakeholders would improve the findings' robustness and applicability.

In conclusion, this research bridges historical and contemporary perspectives, focusing on how multi-stakeholder collaboration can transform future scenarios towards sustainable outcomes. It uniquely contributes by synthesising diverse strands of literature into a cohesive strategy for multi-stakeholder engagement in creating sustainable futures, setting a precedent for similar research in other regions.

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Conflict of Interest

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Venturing into the future: Exploring venture capitalists' decision-making criteria for cellular agriculture startups

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ABSTRACT

Objective: The objective of the article is to explore the investment decision criteria of venture capitalists (VCs) in the cellular agriculture industry, focusing particularly on the initial screening phase. It seeks to understand the relative importance of various criteria that VCs consider when selecting cellular agriculture ventures for early-stage investment.

Research Design & Methods: The research employs a multi-method approach, including expert interviews and a survey-based choice-based conjoint (CBC) experiment. We conducted interviews with investment managers from VC firms, an incubator, and a nonprofit organisation. The CBC experiment involved 44 individual investors, focusing on various investment criteria like entrepreneurial spirit, professional background, and scalability.

Findings: The study reveals that in the cellular agriculture sector, investors place the highest importance on scalability, the entrepreneurial spirit of the founding team, and the value-added of the product and technology. Other criteria like the team's track record, proof of concept, degree of competition, and professional background are considered less important. This emphasis on scalability and product value differs from non-industry-specific studies where team-related criteria often dominate.

Implications & Recommendations: For new ventures in cellular agriculture, understanding these criteria can help tailor their investment proposals more effectively. For cellular agriculture investors and policymakers, these insights can assist in benchmarking and shaping policies to support industry development. Recommendations for policymakers include funding open-access R&D and creating critical infrastructure.

Contribution & Value Added: This article contributes significantly to the field by applying the conjoint study method in the context of finance, which is relatively novel. This approach offers valuable insights that surpass those obtained from traditional surveys, providing a more nuanced understanding of investment decision criteria. It is one of the first to systematically investigate these criteria in the growing area of cellular agriculture. The findings add a new dimension to the 'jockey (entrepreneur) vs horse (product)' debate in venture capital decisions and offer practical guidance for entrepreneurs and investors in this sector, making it a noteworthy addition to entrepreneurial finance and venture capital studies.

Article type:	research article
Keywords:	venture capital; entrepreneurial finance; conjoint analysis; investment decision; cellular agriculture
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INTRODUCTION

Venture capital (VC) is a crucial source of financing for high-tech entrepreneurial ventures, especially in the field of cellular agriculture (National Venture Capital Association, 2022; Smith & Smith, 2019; GFI, 2022a; GFI, 2022b). Cellular agriculture refers to technologies that use cell culture techniques to produce agricultural products that are typically derived from animals, such as meat and dairy (Rischer

et al., 2020; Stephens *et al.*, 2018). Cellular agriculture using tissue engineering and fermentation techniques are the most common forms of technology in this field (Stephens *et al.*, 2018; Post, 2012). The most common application of the two technologies is cultivated meat and animal-free dairy products, respectively (GFI, 2022a; 2022b). A key characteristic of both production methods is the endeavour to produce products that are biologically equivalent to conventional animal products and thus offer – when considering food products – equivalent or better products in terms of taste, nutritional value, quality, and other sensory characteristics (smell, texture, appearance, and consistency). Several survey-based studies from various countries identify high consumer acceptance and openness towards these new products (The Environmental Law Institute and New Harvest, 2017; Slade & Thomas, 2023; Thomas *et al*., 2023). The main reasons for this high acceptance are primarily animal welfare and health aspects (Thomas & Bryant, 2021; Thomas *et al*., 2023). Due to the capital-intensive nature of these novel technologies, young ventures require high initial investments, which are usually provided by equity from venture capitalists or angel investors (CE Delft, 2021b). Besides the given consumer acceptance, the industry is particularly interesting from an investor's perspective because it can contribute to reducing the ecological footprint compared to traditional agriculture (CE Delft, 2021a). Investors are also very positive about the fact that the industry has already achieved important milestones: for example, the first cultivated meat patent (van Eelen *et al.*, 1999), cultured fish research (Benjaminson *et al.*, 2002), the cultivated beef burger presented as a proof of concept in London (Fountain, 2013), and the first regulatory approval and commercialisation of animal-free dairy and cultivated meat (Kowitt, 2019; Ives, 2020). Estimates suggest that these and similar products could make up 11-22% of the total protein market by 2035 (BCG & Blue Horizon, 2021). Over 100 global startups, especially from the USA, Israel, and the UK, are working in this sector (Buxton, 2022; GFI, 2022b). Major food companies like Nestlé are partnering with startups (GFI, 2022a; 2022b), which is also seen as a positive sign for the investment environment because it creates attractive exit opportunities for investors. It is therefore not surprising that we are already seeing substantial investment spikes in the market (GFI, 2022a; 2022b) and that notable investors like Softbank's Vision Fund 2 and BlackRock have already discovered this industry (GFI, 2022b). Forecasts predict a massive capital influx by 2035 (BCG & Blue Horizon, 2021), driven by new technological opportunities that are expected to boost VC activity (Dalal, 2022). More VC money will also lead to faster progress in the industry and further advance internationalisation (Bigos & Michalik, 2023). At the same time, there is lacking technical know-how to undertake due diligence (GFI, 2021a). In summary, cellular agriculture promises sustainable and ethical food solutions but requires, among other things, deep research to better understand market actors such as investors and startups.

The article aims to explore the early-stage investment decision criteria of venture capitalists (VCs) in the cellular agriculture industry, focusing particularly on the initial screening phase, where 80% of all proposals are rejected (Petty & Gruber, 2011). In this sense, the present study fills an existing research gap. Our research reveals that in the cellular agriculture sector, investors place the highest importance on scalability, the entrepreneurial spirit of the founding team, and the value-added of the product and technology. This emphasis differs from non-industry-specific studies where team-related criteria often dominate. These findings provide valuable insights for entrepreneurs and investors in the cellular agriculture industry. In this context, the study of VC decision-making behaviour in cellular agriculture is important as it could lead to more successful ventures, better VC decisions, a better match between the parties, and advice for policymakers. We will use a conjoint approach for this purpose, which is a newer and modern method in the context of Entrepreneurial Finance Study.

The remainder of this article is structured as follows. As part of a literature review, we will highlight the theoretical and empirical insights regarding the decision criteria of venture capitalists and the current state of research. Based on this, we will derive our hypotheses. We will then describe our dataset and construct the choice-based conjoint experiment. Subsequently, we will present and critically discuss the results. The article will conclude with a conclusion, potential limitations, and an outlook on future research in this area.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Investment decisions are highly relevant in the VC market. Basically, in each phase of the investment process, VCs must decide whether to move on with the business proposal under investigation or not. Decisions must be taken along with high uncertainty in terms of the future outcome of the investment (Gompers, 1995). In fact, 35% of the ventures supported by VCs disappear within five years, and 20% of these ventures do not yield any capital returns (Wessendorf *et al.*, 2019 with further references). Therefore, the greatest challenge for VC firms is to decide in which of the many entrepreneurial ventures to invest. Both theoretical and empirical research provide insights here that aim to answer how investors make their decisions and what decision criteria play a role. Theoretical constructs offer insights into how investors make selection decisions regarding startups. Signalling theory is central to this understanding, highlighting how information is communicated and interpreted between entrepreneurs and investors (Connelly *et al.*, 2011). Investors interpret signals from startups, like business plans or slide decks, which can vary in effectiveness depending on the investor's characteristics and objectives (Andres, 2018; Janney & Folta, 2006). The importance of specific signals may depend on investors' resources, goals (resource-based view), agency structures (principal-agency theory), or cognitive structures (theory of cognitive schemata) (DiMaggio, 1997; Barney, 1991).

When examining empirical research on VCs' selection criteria, various studies consistently identify similar criteria. Across different studies, the criteria of team, product/service, market, and financials emerge as particularly relevant (Block *et al.*, 2021; Ferrati & Muffatto, 2021; Wessendorf *et al.*, 2019; Franke *et al.*, 2008; Shepherd *et al.*, 2000; Poindexter, 1976; Wells, 1974). Subfields of empirical research on selection criteria further examine specific characteristics of the investment decision and provide additional insights into potentially new or already known selection criteria. For instance, Petty and Gruber (2011) and Gompers *et al.* (2020) investigated selection criteria depending on the investment process phase, expanding on an earlier study by Tyebjee and Bruno (1984). Muzyka *et al.* (1996) examined differences in selection criteria related to the geographic origin of VCs and startups. Hall and Hofer (1993) provide insights into selection criteria depending on the investor type, comparing VCs with other investor groups. Block *et al.* (2021) focus on impact investors and empirically explore their decision criteria. Selection criteria related to the educational level and professional experience of investors are explored and compiled by Moritz *et al.* (2021) as well as Kim and Lee (2022). Scholars also identified industry-specific differences in selection criteria, with Wessendorf *et al.* (2019) examining these with a focus on technology ventures. Gompers *et al*. (2020) and Petty and Gruber (2011) have also considered industry-specific differences in selection criteria. However, a research gap exists regarding the very young and innovative field of cellular agriculture. We aimed to address the lack of empirical research on the selection criteria of early-stage investors regarding cellular agriculture ventures.

To address this research gap, we first derived hypotheses that we subsequently tested empirically. As outlined above, relevant studies in this field identify the criteria of team, product, market, and financials as the key selection criteria (Block *et al.*, 2021; Ferrati & Muffatto, 2021; Wessendorf *et al.*, 2019; Franke *et al.*, 2008; Shepherd *et al.*, 2000; Poindexter, 1976; Wells, 1974). We focused particularly on the very early phase where financials do not yet play a significant role. Therefore, we formulated our hypotheses based on the criteria of *(1) Team*, *(2) Product*, and *(3) Market*. We operationalised the measurements within these criteria using attributes derived from the results of other empirical research. Since no previous research has considered the field of cellular agriculture, we adopt a mixed methods approach. Prior to the main choice-based conjoint experiment, we conducted five interviews with investment managers from three prominent international VC firms, one incubator, and one nonprofit organisation. These expert interviews ensured that the criteria and attributes identified in the literature were also relevant in this specific industry, making them suitable for our empirical validation. Moreover, we asked in these semi-structured, recorded interviews lasting 20-30 minutes if there were any other important criteria we might had missed.

Regarding the criterion of *(1) Team*, previous research has consistently found that cognitive, personality-related, and motivational characteristics of the team are among the most important criteria.

The attribute to be tested here was *(1a) The entrepreneurial spirit of the founding team* (Block *et al.*, 2021; Hsu *et al.*, 2014). Furthermore, research has confirmed that the team's professional background influences investors' decision-making processes, specifically differentiating between business and scientific/technical backgrounds (Block *et al.*, 2021; Franke *et al.*, 2008). Therefore, we will test the attribute *(1b) The professional background of the founding team*. The track record of the team, indicating prior experience such as industry-related or entrepreneurial experience, can be a decisive quality signal for investors. Numerous studies highlight the importance of this attribute (Moritz *et al.*, 2021; Block *et al.*, 2019; Wessendorf *et al.*, 2019). Based on its practical and empirically established significance, we included the attribute *(1c) The track record of the founding team* to capture team-related criteria. We also confirmed that these attributes as particularly important in the interviews.

For the criterion of *(2) Product*, we first tested attribute *(2a) The proof of concept*, which describes if a proof of concept is available for the venture's product/business model, serving as a quality signal for investors. Block *et al.* (2021) attributed considerable importance to this criterion. With attribute *(2b) the value-added of product and technology*, we combined aspects such as competitive advantage, uniqueness (USP), and degree of innovation in one attribute, describing the value-added for the customer or industry (*e.g.* cost reduction, product quality, or emission reduction). This attribute has also been empirically classified as particularly important (Moritz *et al.*, 2021; Block *et al.*, 2019). The third attribute for the product criterion was *(2c) the scalability*, describing the possibility and difficulty of scaling the venture's project (*e.g.* concerning time and investment required). This attribute is important not only financially but also for the social impact to be achieved. The results from Block *et al.* (2021) motivated us to include this attribute. Although other empirical studies indicate that intellectual property is important, we excluded this criterion as it is not significant in the initial screening phase of startups but becomes important in later stages. We also validated our chosen attributes as important in the interviews, with other attributes being deemed less relevant due to the early phase focus.

To represent the criterion of *(3) market*, we selected attribute *(3) the degree of competition*, describing the intensity of competition among industry members during development (*e.g.* in the race for patents). This differentiates from the value-added aspect by focusing on the number of competitors aiming for similar advancements. A study on biotechnology startups highlighted the importance of this attribute (Jung *et al.*, 2011). We assumed it was the most suitable for our case based on its empirical validation. Other market-related attributes found in the literature are seen as redundant in industry-focused studies like ours since startups in this field operate under the same market conditions (Block *et al.*, 2021). This was also confirmed by the experts we interviewed.

Based on the above, we derive hypotheses for the team criterion (1) and the attributes (1a) the entrepreneurial spirit of the founding team, (1b) the professional background of the founding team, and (1c) the track record of the founding team, forming hypotheses H1a to H1c. For the product criterion (2) and the attributes (2a) the proof of concept, (2b) the value-added of product and technology, and (2c) the scalability, we derive hypotheses H2a to H2c. Finally, for the market criterion (3) and the attribute (3) the degree of competition, we formulated hypothesis 3. In hypotheses 4a and 4b, we examined the relative importance of different criteria by comparing them. Publications by Block *et al*. (2021), Wessendorf *et al*. (2019), and Franke *et al*. (2008) highlight the importance of considering the relative significance of team versus product and product versus market in such studies. Below, we outline the derived and justified hypotheses:

H1a: Venture capitals are more likely to select a cellular agriculture venture that has a (founding) team with a high entrepreneurial spirit compared to a cellular agriculture venture that has a (founding) team with a low entrepreneurial spirit.

H1b: Venture capitals are more likely to select a cellular agriculture venture that has a (founding) team with a scientific/technical professional background compared to a cellular agriculture venture that has a (founding) team with a business professional background.

H1c: Venture capitals are more likely to select a cellular agriculture venture that has a (founding) team with a strong track record compared to a cellular agriculture venture that has a (founding) team with a weak track record.

H2a: Venture capitals are more likely to select a cellular agriculture venture that can provide a proof of concept than a cellular agriculture venture that cannot provide proof of concept.

H2b: Venture capitals are more likely to select a cellular agriculture venture that offers a high value-added through their product and technology than a cellular agriculture venture that offers a low value-added through their product and technology.

H2c: Venture capitals are more likely to select a cellular agriculture venture with a high degree of scalability than a cellular agriculture venture with a low degree of scalability.

H3: Venture capitals are more likely to select a cellular agriculture venture with a low degree of competition than a cellular agriculture venture with a high degree of competition.

H4a: Venture capitals estimate the team dimension of decision criteria as more important than the product dimension.

H4b: Venture capitals estimate the product dimension of decision criteria as more important than the market dimension.

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Data and Sample

To evaluate cellular agriculture investors' selection criteria, we conducted a survey-based conjoint study. At the time of data collection, there was a population size of 453 investors in cultivated meat and seafood (GFI, 2022a). Since cellular agriculture also encompasses precision fermentation, it can be inferred that the total number of investors in cellular agriculture is somewhat higher than this figure. In our conjoint analysis, 44 investors participated, making 26 decisions each, resulting in a total of 1 144 decisions. This means our empirical study captured approximately 10% of the population size. In comparison to previous conjoint studies by Franke *et al.* (2006), Franke *et al.* (2008), and Jung *et al.* (2011), the sample size of this experiment was appropriate. There is no reliable database of cellular agriculture investors. Thus, we manually compiled initial lists of relevant investors based on various GFI's State of the Industry Reports (GFI, 2021b; 2021c; 2020a; 2020b; 2019). Investors were later contacted and invited to participate via the personal network of the authors, particularly through email and LinkedIn outreach. We conducted the survey-based conjoint from 9 February until 25 March 2022. During this period, we sent two reminders to investors who had not yet participated. A total of 101 respondents began answering the survey, of which 51 completed it. Of these 51, a further 7 respondents were excluded because they had not been involved in real (screening) decision-making processes regarding cellular agriculture ventures. This ensured that participants were familiar with what we wanted to examine. In detail, we also examined how long the investors took to participate and would have excluded participants if their responses seemed too quick and therefore not completed with the desired diligence. However, we did not have to disregard any entries for this reason.

Descriptive Statistics

Each participant completed a questionnaire with individual-level, organisational-level, and investment portfolio-level questions. Most investors were men (77.3%), aged 30-40, holding a master's or MBA (61.4%). Most had entrepreneurial experience (61.4%) and made over ten decisions on cellular agriculture ventures. The prevalent affiliation was with VC funds (72.7%), and many were partners or CEOs (45.5%). They favoured impact and ESG investing, scoring 6.05 and 5.55 out of 7. Organisational-wise, most had assets between USD 26m-250m, with 47.6% making 2-4 investments in cellular agriculture. A notable 61.4% viewed cellular agriculture as their core activity, mainly investing in North America (77.3%) and Europe (54.5%). The leading investment areas were B2C end product commercialisation and whole muscle seafood (70.7%). For further details, please refer to the following descriptive statistics.

The individual investor characteristics were as follows. For gender distribution, 22.7% of the investors were women, 77.3% – men, and 0.0% – non-binary. The average investor age was 38.41 years with a median age of 35 years. Regarding the level of education, 2.3% had less than a high school education,

18.2% held a bachelor's degree, 61.4% had a Master's or MBA, and 18.2% – a PhD. In terms of the field of education, 50.0% studied business/economics, 11.4% – humanities & social sciences, 18.2% – natural sciences, 34.1% – engineering & technology, 11.4% – medical & health sciences, 4.5% agricultural sciences, and 4.5% law. Experience in various sectors shows that 81.8% had a background in science/tech, 88.6% in finance, and 38.6% in non-profit. When it comes to roles, 61.4% had experience as entrepreneurs, 77.3% as managers, and 97.7% as investors. Involvement in cellular agriculture revealed that 2.3% made 1 investment, 25.0% – 2 to 4 investments, 15.9% – 5 to 10 investments, and 56.8% – more than 10 investments. Regarding investor type, 72.7% were associated with venture capital funds, 6.8% with incubators/accelerators, 4.5% with business angels, 9.1% with family offices, 2.3% with corporate venture capital funds, 2.3% with endowments/foundations, and 2.3% with venture studios. The current positions held by these investors were as follows: 45.5% were partner/CEO, 22.7% – director/principal, 9.1% – investment managers, 20.5% – associate/analyst, and 2.3% – VC fellows. In terms of personal perspective, on a scale of 7 (7 = very strongly resonates), traditional investing had an average score of 5.34 and a median score of 6. Socially responsible investing (SRI) averaged 5.18 and a median score of 5. Moreover, ESG investing had a mean score of 5.55 and a median score of 6. Cleantech investing averaged 5.34 with a median score of 6. Impact investing had a mean score of 6.05 and a median score of 6. Venture philanthropy had a mean score of 3.77 and a median score of 4.

The characteristics of the investment entities were as follows. Assets under management (AuM) in USD for the sample (n = 44) were distributed as follows: 15.9% managed less than 10 million USD, 20.5% – between 11 million and 25 million USD, 29.5% – between 26 million and 100 million USD, 25.0% – between 101 million and 250 million USD, 4.5% – between 251 million and 1000 million USD, and 4.5% – more than 1 billion USD. The internal rate of return (IRR) for the sample (n = 30) was as follows: 6.7% had an IRR of 1-10%, 20.0% – 11-20%, 20.0% – 21-30%, 16.7% – 31-40%, and 36.7% – more than 40%. Regarding syndication preference, 6.8% preferred one investor, 56.8% – more than one investor, and 36.4% were indifferent. The location of headquarters was distributed as follows: 40.9% in North America, 2.3% – South America, 2.3% – Oceania, 9.1% – Asia, and 45.5% – Europe. The number of employees (n = 42) was as follows: 4.8% had 1 employee, 50.0% – 2 to 5 employees, 23.8% – 6 to 10 employees, and 21.4% – more than 10 employees. Financial instruments used (multiple choice) included equity at 97.7%, debt at 6.8%, convertible loans at 75.0%, and SAFE[1] at 9.1%. Non-financial support provided (multiple choice) included coaching/mentoring at 81.8%, strategic advice at 81.8%, recruitment at 34.1%, PR/marketing at 50.0%, business development at 70.5%, fundraising support at 84.1%, legal support at 9.1%, infrastructure at 4.5%, network support at 90.9%, and team building at 2.3%. The industry focus was primarily on food, food tech, and alternative protein. The number of investments made (n = 42) was distributed as follows: 9.5% had made no investments, 9.5% – 1 investment, 47.6% – 2 to 4 investments, 14.3% – 5 to 10 investments, and 19.0% – more than 10 investments. Prior investor types (n = 4) included 75.0% venture capital funds and 25.0% – family offices.

The characteristics of the cellular agriculture portfolio companies were as follows: 61.4% had cellular agriculture as their core activity. Regarding the investment stage (multiple choice), 59.1% were in the pre-seed stage, 75.0% in the seed stage, 56.8% in the startup stage, 22.7% in the growth/expansion stage, and 6.8% in the buy-in/buy-out or exit stage. The location of the investees (multiple choice) was distributed as follows: 77.3% in North America, 13.6% in South America, 13.6% in Oceania, 36.4% in Asia, 11.4% in Africa, 54.5% in Europe, and 6.8% in the Middle East. In terms of cellular agriculture categories, 6.8% focused on cultivated products, 11.4% on precision fermentation, and 81.8% on both. For the cultivated business model (n = 39), 51.3% were involved in cell lines (B2B), 53.8% in cell culture media (B2B), 41.0% in scaffolding (B2B), 46.2% in bioprocessing design (B2B), 74.4% in end product (B2C), 33.3% in ingredients (B2C), and 66.7% in ingredients (B2B). For the precision fermentation business model (n = 41), 65.9% were involved in target metabolites (B2B),

[1] The term SAFE stands for a simple agreement for future equity which 'is an investment contract that provides rights to an investor for future equity, obtainable upon a liquidity event or equity financing' (see Akingbemila, 2022). The underlying idea is to simplify the process of raising new capital for early-stage ventures, and it was established to replace convertible bonds (see *e.g.* Akingbemila, 2022 with further references. Noteworthy, four individuals (9.5%) indicated that they had not invested in cellular agriculture at their current organisation but had invested at their previous organisation.

53.7% in microbial strains (B2B), 70.7% in feedstock discovery (B2B), 24.4% in bioprocessing design (B2B), 46.3% in end products (B2C), 58.5% in ingredients (B2C), and 26.8% in ingredients (B2B). Regarding product type (n = 41), 29.3% produce whole muscle meat, 24.4% produce ground meat, 41.5% produce whole muscle seafood, 31.7% produce ground seafood, 36.6% produce milk, 17.1% produce cheese, 2.4% produce other dairy products, 65.9% produce eggs, 53.7% produce pet food, 70.7% produce collagen and gelatine, 24.4% produce fats and oils, 46.3% produce functional ingredients, 58.5% produce textiles and materials, and 26.8% produce chocolate.

Design of the Choice-based Conjoint Experiment

We applied a survey-based conjoint experiment[2] to quantitatively evaluate the decision-making of cellular agriculture investors. Initially, conjoint analysis has been used in marketing to assess the relative importance of product attributes (Green & Srinivasan, 1990). The experimental design has then been transferred to the assessment of investor's decision-making (Shepherd & Zacharakis, 1999). Conjoint experiments can overcome several limitations associated with previous decision-making research that rely heavily on post-hoc methods (*e.g.* interviews or questionnaires) (Block *et al.*, 2021). Among the limitations are several heuristics and biases, such as the self-reporting bias, and recall as well as rationalisation bias due to the use of past information in post hoc methodologies (see *e.g.* Zacharakis & Meyer, 2000; Andres, 2018; Franke *et al.*, 2006; 2008). Conjoint analysis addresses these limitations by collecting data in real-time experiments, meaning data is collected while investment decisions are being made (Block *et al.*, 2021). Consequently, conjoint analysis allows for a better capture of investors' real decision-making behaviour and thus produces more valid results (Block *et al.*, 2019; Franke *et al.*, 2006; 2008). Conjoint analyses are a valuable tool for evaluating investment decisions because investment criteria can be measured conjointly, reflecting investor's holistic decisions (Dane & Pratt, 2007). Hence, for deciding in favour of or against an investment, trade-offs must be made between different criteria. This decision-making process can be modelled through a conjoint experiment. The advantages of using conjoint experiments over traditional post-hoc methods are increasingly recognised by researchers seeking to study decision-making behaviour in the entrepreneurial finance domain and have thus led to the increased use of the method (Block *et al.*, 2021; Hsu *et al.*, 2014; Valliere & Peterson, 2007; Silva, 2004; Shepherd & Zacharakis, 1999). Monika and Sharma (2015) recommend conjoint experiments as particularly suitable for researching VCs' selection criteria, making this methodology ideal for the purpose of our research.

For the purpose of this article, we applied a discrete choice-based conjoint (CBC) experiment. More specifically, cellular agriculture investors were required to make several choices between two hypothetical cellular agriculture investment opportunities that only differ in their specification of screening criteria (*e.g.* entrepreneurial spirit, degree of competition, and scalability). Prior to the experiment, participants were presented with two introductory slides explaining the decision task to ensure that they were assessing the same cellular agriculture ventures when making their decision (like Moritz *et al.*, 2021). Indeed, this is necessary because investors seek to align with the strategy between the companies in their portfolio and their investment approach during screening (Block *et al.*, 2021 with further resources). Therefore, it was made clear that the geographical, investment size, and strategic preferences of each hypothetical venture align the investor's interests (Block *et al.*, 2021; Moritz *et al.*, 2021). Moreover, we informed participants that the task aimed at the initial screening phase for a pre-selection of proposals, with a focus on evaluating early-stage cellular agriculture ventures (*i.e.* pre-seed, seed, and startup). The respondents to this experiment were required to make a discrete decision with respect to each investment case (*i.e.* yes or no) (Block *et al.*, 2021). This approach was beneficial in that the decision criteria can be assessed conjointly, and detailed descriptions of the investment possibilities can be provided to investors. Like any type of conjoint experiment, participants completed several decisions about hypothetical investments (15 in this case) based on predetermined screening criteria. In addition to a brief

[2] The conjoint experiment was designed using 'Sawtooth,' a commonly used tool for conducting and hosting conjoint analyses (*e.g.* Block *et al.*, 2021). See https://www.sawtoothsoftware.com/

description of the respondents' task, the information provided also contained a definition[3] of the seven investment screening criteria used. Each decision criterion had exactly two distinct attribute levels.

The attributes of the (founding) team were as follows:

- The entrepreneurial spirit is an ordinal attribute with levels ranging from low to high. It represents the cognitive, personality-related, and motivational characteristics, such as energy level, passion, and risk tolerance. Research emphasizes the importance of these characteristics (*e.g.* Block *et al.*, 2021; Hsu *et al.*, 2014), which was also confirmed in expert interviews.
- The professional background is a nominal attribute with levels indicating whether the team has a business or scientific/technical background. This attribute describes the professional background of the team, which significantly influences investor decisions (*e.g.* Block *et al.*, 2021; Franke *et al.*, 2008), as described in expert interviews.
- The track record is an ordinal attribute with levels ranging from weak to strong. It indicates whether the team has relevant previous experience, including an industry-related or entrepreneurial track record. A strong track record can serve as a quality signal for investors, and its importance is highlighted in various studies (*e.g.* Moritz *et al.*, 2021; Block *et al.*, 2019; Wessendorf *et al.*, 2019).

The attributes of the product were as follows:

- The proof of concept is an ordinal attribute with levels ranging from not (yet) provided to provided. It describes whether a validation of the concept is provided, which is crucial for demonstrating the feasibility of the project and serves as a quality signal for investors. The importance of this attribute is highlighted in research (Block *et al.*, 2021) and confirmed in expert interviews.
- The value-added of product and technology is an ordinal attribute with levels ranging from low to high. It describes the value added through the product or technology, such as cost reduction, quality improvement, or emission reduction. This attribute emphasizes competitive advantage, uniqueness, and innovation. Its importance is underscored in research (*e.g.* Moritz *et al.*, 2021; Block *et al.*, 2019) and expert interviews.
- The scalability is an ordinal attribute with levels ranging from low to high. It describes the potential for transfer and large-scale implementation of the product. This attribute focuses on the ease and challenges of scaling, considering factors like time, investment, and social impact. The importance of scalability is noted among cellular agriculture and impact investors (Block *et al.*, 2021).

The attributes of the market were as follows:

- The degree of competition is an ordinal attribute with levels ranging from low to high. It describes the intensity of competition among industry members during development. This attribute highlights the level of competition, especially during industry developments like patent races, and emphasizes the number of competitors vying for similar advancements in products and technologies. The significance of this attribute is emphasized in research, notably by a study on biotechnology startups (Jung *et al.*, 2011), and corroborated by expert interviews.

By ensuring that participants could holistically evaluate hypothetical investments in cellular agriculture, we utilised a full-profile CBC that contains all attributes at once (Block *et al.*, 2019). Considering the expected number of participants and the various attributes and attribute levels, we developed a set of 50 unique experimental designs,[4] in which each version presented a distinct sequence of decision tasks with different attribute level combinations. Each design comprised seven attributes with randomly assigned levels to two investment options. The cellular agriculture investors then had to decide which of the ventures they would like to invest in. To prevent respondents from being overwhelmed by too many choice tasks, we employed a reduced conjoint design (Chrzan & Orme, 2000). In this way, each participant had to perform 15 decisions, 13 of which were randomly assigned tasks, while the remaining

[3] We informed participants that they can always hover over each decision criterion to view a brief definition of that criterion.
[4] The number of questionnaire versions is recommended to be equal to the sample size so that all participants will obtain their own unique set of 13 choice tasks.

two served as so-called fixed tasks[5] that were the same for all participants.[6] Following the approach of prior research, we implemented the two fixed tasks as a proxy to check the test-retest reliability (here: the so-called hit rate method) of investors' decisions (Moritz *et al.*, 2021; Block *et al.*, 2021; Block *et al.*, 2019). For this purpose, the individual part-worth utilities based on the 13 randomly assigned choice tasks of each participant were assessed using hierarchical bayes (HB) validation tests.[7] Then, we computed the total utility of each decision maker and for each fixed task concept. The decision maker's estimated choice was the concept with the higher total utility in each of the two fixed tasks. Eventually, we compared the predicted choice of each participant to their actual choice. This led to a 69% accuracy rate, which was only slightly lower than in previous studies (see *e.g.* Moritz *et al.*, 2021; Block *et al.*, 2019).[8] On average, participants required 23 seconds to complete one choice task, although the first choice task took 48 seconds, which is consistent with other research (Block *et al.*, 2021; Moritz *et al.*, 2021). Moreover, since CBC experiments depended on a particular order in which the decision criteria were presented, they may be subject to different ordering effects (Chrzan, 1994). To address these effects, we employed three different measures based on Block *et al*. (2021). Firstly, we implemented a random order of decision tasks for all experimental designs to account for biases resulting from the order of the decision tasks. Secondly, we randomly arranged the two investment possibilities within the 50 distinct experimental designs within all decision tasks to circumvent the impact of the order of options in a decision task. Thirdly, to avoid the effect of how the attributes were ordered within one choice task, the order of attributes displayed to respondents was randomized across different respondents but kept constant within one respondent. In this way, we eliminated the effect of assigning the highest individual importance to the attribute at the top of the list. To ensure the external face validity of the experimental conjoint design, we asked two cellular agriculture investors to have a look at the investment decision task, including the introductory slide as well as the attributes and respective levels used. Both investors confirmed the experimental design in terms of task comprehensibility and screening criteria used. To analyse the relative importance of cellular agriculture investors' screening criteria, we applied a multi-level logit regression. The hypothetical investment decision made by participants represents the binary dependent variable (equals 1 if the respondent chose the respective venture and 0 if the respondent did not), while the attribute levels serve as the independent variable. A multi-level regression is performed as there are two levels in the data, which allows to nest each individual (first level) with multiple decisions of the whole sample (second level) (Block *et al.*, 2021; Aguinis *et al.*, 2013). This approach was required because both levels cannot be considered independent from each other.

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Table 1 presents our results of the multi-level logit regression analysis with regard to the full sample of cellular agriculture investors. The coefficients (also called part-worth or utility) express the importance that investors in cellular agriculture place on each attribute or attribute level in their investment decisions. The higher the coefficient, the more preferred the level. Hence, levels showing high utilities had a major positive impact on the respondents' decision to invest. As one level within each attribute functions as a reference group and is omitted in doing the estimation, and the raw utilities are zero-centred (sum to zero) within each attribute in the logit model, the omitted level was basically the negative of the other level. The results demonstrated that all attributes except the

[5] Also called holdout tasks.

[6] The fixed tasks specified are designed to reflect as realistic and common a combination of venture attributes as possible. For example, while a scientific/technical background is combined with a provided proof of concept because of the expertise to build a product is available, a business background is combined with a not yet provided proof of concept because the scientific/technical expertise is lacking.

[7] HB is a widely used approach for predicting individual choices. Within the model, the recommendation (see Orme, 2016) was followed to include obvious constraints on orders of part-worth utilities within attributes to better predict individual choices (i.e., high is preferred to low, strong is preferred to weak, and provided is preferred to not (yet) provided (proof of concept attribute)).

[8] Note that this retest reliability test is highly dependent on the sample size, the number of randomly assigned tasks and fixed tasks, and the specific design of the fixed tasks.

professional background of the team had a significant effect on the decision of investors in cellular agriculture (at least $p < 0.05$).

Table 1. Main effects of the conjoint analysis based on a multi-level logit regression

Investment criteria	Hypotheses	Coef. (*SE*)	t-Ratio
(Founding) Team criteria Entrepreneurial spirit: high *(reference group: low)*	H1a	0.620 (0.074)	8.370***
Professional background: scientific/technical *(reference group: business)*	H1b	0.103 (0.067)	1.523
Track record: strong *(reference group: weak)*	H1c	0.268 (0.069)	3.894***
Product criteria Proof of concept: provided *(reference group: not (yet) provided)*	H2a	0.192 (0.067)	2.841**
Value-added of product & technology: high *(reference group: low)*	H2b	0.587 (0.075)	7.853***
Scalability: high *(reference group: low)*	H2c	0.790 (0.078)	10.085***
Market criteria Degree of competition: low *(reference group: high)*	H3	0.190 (0.069)	2.773**
N (decisions) *N* (decision-makers) *χ2* *Df*		1.144 44 277 7	

Notes: This table presents the results of a multinomial logit model to estimate effects (here: coefficients which are also called log odds or (part-worth) utilities) for attribute levels. Coefficients and standard errors (SEs) are displayed. The coefficient of each attribute level reflects the importance decision-makers attribute to each criterion. For instance, the attribute level of the criterion scalability has a particularly high effect size. The chi-square of the overall model was 276.77 (relative chi-square is 39.54) and thus was statistically significant with $p < 0.01$ (df =7). We denoted significance levels with asterisks. Significant codes: $p < 0.01$ ***; $p < 0.05$ **
Source: own study.

To compare screening criteria and their importance perceived by decision-makers, we estimated the relative importance of each attribute by computing the ranges of attribute part-worth utilities (*i.e.* the difference between best and worst part worths per attribute) and normalising them to a sum of 100% (Block *et al.*, 2021; Sawtooth Software, n.d.). The subsequent discussion details the relative significance of each screening criterion: As the value of an investment criterion increased, so did its influence on a cellular agriculture investor's decision. For instance, the top three screening criteria (*i.e.* scalability (28.72%), entrepreneurial spirit (22.55%), and value-added of product and technology (21.35%) explain almost three-quarters of the investors' decisions in cellular agriculture (72.62%). Consequently, the likelihood of a cellular agriculture venture successfully passing the investor's screening phase increases if the cellular agriculture venture scores high on these three decision criteria. The least important screening criteria to investors in cellular agriculture represent the track record of the team (9.75%), proof of concept (6.97%), degree of competition (6.92%), and the professional background of the team (3.74%).

In view of the team-related criteria, the results demonstrated that investors in cellular agriculture attached the highest relative importance to the team's entrepreneurial spirit which is the second most important criterion overall. This finding supports Hypothesis 1a and is in line with previous

research highlighting the team's personality-related, cognitive, and motivational characteristics as key determinants of investment decisions (Block *et al.*, 2021; Wessendorf *et al.*, 2019 with further references). In contrast, we found no support for Hypothesis 1b. Accordingly, the field of the educational and professional background of the team had no significant impact on the decision of investors in cellular agriculture, suggesting that they do not favour a business or scientific/technical background. This finding is particularly interesting since talents with a background in science and technology are strongly needed in the cellular agriculture industry, and as experts have indicated a preference for a team's scientific/technical background in the conducted interviews. In the later stages of presenting the results, we will revisit Hypothesis 1b, examining the outcomes in greater detail and considering the professional background of the investors to present intriguing findings. However, we will first proceed with the main hypotheses.

Apart from this, the results support Hypothesis 1c. The team's track record (*i.e.* their industry-related experience or entrepreneurial experience) represents a strong quality signal as it has a significant impact on investors' decision-making in cellular agriculture and ranks in the centre in terms of relative importance among all criteria, which is in line with previous studies (Moritz *et al.*, 2021; Block *et al.*, 2019; Wessendorf *et al.*, 2019).

Within the product criteria category, the criterion proof of concept is given the least relative importance (ranks fifth overall) but still matters for investors in cellular agriculture. Thus, support was provided for Hypothesis 2a. The rather low relative importance attached to this attribute may be due to the fact that the focus of the sample is on the pre-seed and seed investment stages (59.1% and 75.0%, respectively), where the proof of concept is normally still under development and investors do not have many options besides accepting this reality as an early-stage investor. This illustrates the willingness of participating VCs to provide early support to founders with great ideas who have made limited progress on their products to date. Next, the results provide support for Hypothesis 2b by showing that VCs attach significant importance to the value-added for the customer or industry through the product and technology. This attribute ranks third (this is in line with previous studies, such as Moritz *et al.*, 2021; Block *et al.*, 2019), close behind the team's entrepreneurial spirit criterion, and addresses major challenges in the industry, including high production costs, high energy consumption (based on LCA studies), and product quality (*e.g.* to produce highly structured products like steaks with a high nutritional value). For example, while the described value-added in terms of cost reduction strongly addresses the current high costs of producing cellular agriculture products, the stated value-added in terms of emissions reductions underscores the desire of impact investors to achieve social and/or environmental returns in addition to financial returns (GFI, 2021d; Cambridge Associates & The Global Impact Investing Network, 2015).

Finally, the scalability criterion was given the highest relative importance by cellular agriculture investors. This is a very striking result compared to previous studies, which indicate a much lower importance (Block *et al.*, 2021; Moritz *et al.*, 2021; Block *et al.*, 2019). Therefore, this finding confirmed Hypothesis 2c and addressed a similar rationale as the value-added criterion, namely, the biggest challenge in cellular agriculture, which is to scale up the technology while reducing costs to the point where cellular agriculture products can be produced in large quantities (on an industrial scale) and marketed at reasonable prices (GFI, 2022a; Stephens *et al.*, 2018). Furthermore, this finding may once again address the importance of scalability in the context of impact investing as products from cellular agriculture can have a more positive impact on humans, animals, and the planet when the products are available in large quantities. Indeed, the aspect of whether the technology of the new venture is scalable and can be valuable in terms of solving pressing problems is stressed by all experts interviewed without exception.

Finally, regarding the market dimension, the findings demonstrate that cellular agriculture ventures with a low degree of competition are significantly more likely to be chosen by VCs than cellular agriculture ventures with a high degree of competition, which supports Hypothesis 3. Despite the penultimate overall ranking, this indicates that investors in cellular agriculture consider a venture's competitive environment. Furthermore, the rather low importance found for this criterion contradicts the results of Jung *et al.* (2011) where investors in the biotech industry attach the second

highest importance to the degree of competition attribute. Reasons for the discrepancy may relate to the fact that the biotech investor sample focused largely on established pharmaceutical companies. This sector is characterised by hyper-competition as the first drug that passes the testing phase and gets approved is likely to win the entire market (Jung *et al.*, 2011, with further references). This type of competition is certainly not the case in cellular agriculture yet, although players in this field are vying to file patents (Oxford Economics, 2021). Therefore, competition in this regard is appreciated, but otherwise, cellular agriculture is still a nascent industry with plenty of room for additional players to resolve existing uncertainties with the technology and make cellular agriculture products available to the masses.

With respect to the relative importance of the main decision criteria categories, it appears that product-related criteria are rated as the most important category with 57.04% (M = 19.01%), followed by team-related criteria with 36.04% (M = 12.01%), and the market-related criterion degree of competition with 6.92%. Consequently, Hypothesis 4a is not supported. Instead, the analysis shows a contrary relationship, which means that product-related criteria are preferred over team-related criteria. This result is of particular interest in light of the ongoing debate as to whether the jockey (entrepreneur) or the horse (product) drives the decision of VCs (Moritz *et al.*, 2021; Block *et al.*, 2019; Kaplan *et al.*, 2009; Macmillan *et al.*, 1985). In recent years, research on VCs' decision criteria regarding early-stage ventures has tended to find a consensus on the higher importance of the entrepreneur/team (Wessendorf *et al.*, 2019). However, the results of this study suggest that the opposite is true – product criteria are preferred over team criteria – for the cellular agriculture industry. This could be due to the pressing challenges facing this emerging industry, such as scaling technology, reducing costs, and increasing overall production efficiency to reduce energy consumption (GFI, 2022a; Stephens *et al.*, 2018). However, we should interpret this should with caution as the selection of decision criteria for the CBC experiment has a large impact with regard to which criteria category is more relevant. Finally, support is provided for Hypothesis 4b, as investors in cellular agriculture perceive the product dimension of decision criteria as more important than the market dimension. However, this requires cautious interpretation as only one market criterion was used in this study and there was also a team criterion (professional background), which investors considered even less relevant.

As previously described, we initially found no confirmation for Hypothesis 1b and observed in the results that the team's technical background did not appear to be a significant selection criterion from the investors' perspective. At first glance, this could support the findings of Wessendorf *et al.* (2019), which suggest that VCs tend to favour heterogeneous skills, and therefore, querying homogeneous criteria shows no significance. In contrast, Franke *et al.* (2006) empirically found that investors tend to exhibit a similarity bias, often preferring skills in founding teams that they themselves possess. Since exactly half of the investors in the sample had a business background and the other half a scientific/technical one, we wanted to examine this question in greater detail. To explore this finding, we performed an additional multi-level logit regression for two separate groups: investors with a business background and investors with a scientific/technical background (Table 2). The analysis revealed that albeit investors with a background in business had no specific preference for the professional background of the team (p = 0.445), those with a scientific/technical background showed a significantly higher preference for a founding team with a scientific/technical background ($p < 0.05$), thus providing support for the similarity bias documented in Franke *et al.* (2006). Interestingly, it appears that the product criterion proof of concept (Hypothesis H2a) loses its significance after separately examining the two investor groups. Similarly, it shows that the market criterion degree of competition (Hypothesis H3) is evidently important only for investors with a scientific/technical background, and not for those with a business background. However, we should interpret this cautiously due to the now smaller group size.

Table 2. Results of the conjoint analysis with comparison across investors with business and scientific/technical backgrounds

Model **Sample** **Investment criteria**	**(1)** **Business** **Coef. (*SE*)**	**(2)** **Scientific/technical** **Coef. (*SE*)**
(Founding) Team criteria Entrepreneurial spirit: high *(reference group: low)*	0.457 (0.100) ***	0.785 (0.116) ***
Professional background: scientific/technical *(reference group: business)*	-0.076 (0.093)	0.275 (0.103) **
Track record: strong *(reference group: weak)*	0.232 (0.093) **	0.330 (0.107) **
Product criteria Proof of concept: provided *(reference group: not (yet) provided)*	0.179 (0.093)	0.239 (0.103)
Value-added of product & technology: high *(reference group: low)*	0.587 (0.075) ***	0.590 (0.111) ***
Scalability: high *(reference group: low)*	0.785 (0.109) ***	0.859 (0.121) ***
Market criteria Degree of competition: low *(reference group: high)*	0.144 (0.095)	0.249 (0.103) **
N (decisions)	572	572
N (decision-makers)	22	22
χ2	130	158
Df	7	7

Notes: This table presents the results of a multinomial logit model to estimate effects. Coefficients and standard errors (SEs) are displayed. The coefficient of each attribute level reflects the importance decision-makers attribute to each criterion. Model 1 consists of participants with a business background and model 2 represents participants without a business background. The chi-squares show that both models are statistically significant with $p < 0.01$ (df =7). Significant codes: $p < 0.01$ ***; $p < 0.05$ **
Source: own study.

CONCLUSIONS

Cellular agriculture investment is gaining strong momentum recently and is evolving from a niche market. This research is the first to explore cellular agriculture investors' investment criteria when screening early-stage ventures in the cellular agriculture domain. Drawing on a multi-method design based on previous research on VC decision-making, expert interviews, and a survey-based CBC experiment, we identified the relevant screening criteria of VCs in cellular agriculture and examined their relative importance. The experiment involved 44 individual investors, representing approximately 10% of the total population and thus being representative. Our findings differ from those previously identified for non-specific industries, but as this is one of the first studies on investment criteria in cellular agriculture, it provides an interesting starting point for future research.

The results show that cellular agriculture investors attach the highest relative importance by far to the product-related criterion of scalability (28.72%), the team-related criterion of the entrepreneurial spirit of the founding team (22.55%), and the product-related criterion value-added of the product and technology (21.35%). These results reflect the major challenges currently facing the cellular agriculture industry, namely increasing scalability, and reducing the cost of the technology. The remaining criteria of lower importance are the track record of the founding team (9.75%), the proof of concept (6.97%), the degree of competition (6.92%), and the professional background of the founding team (3.74%). These findings distinguish cellular agriculture from non-industry-specific

studies, particularly with respect to the relevance of the scalability criterion. Thus, while team-related criteria often outweigh product-related criteria in previous studies (*e.g.* Block *et al.*, 2021; Wessendorf *et al.*, 2019; Franke *et al.*, 2008; Shepherd *et al.*, 2000), product-related criteria are most preferred in this study, followed by team-related criteria and the market criterion. This outcome contributes to the ongoing jockey (entrepreneur) versus horse (product) debate (Moritz *et al.*, 2021; Block *et al.*, 2019; Kaplan *et al.*, 2009; Macmillan *et al.*, 1985) by demonstrating that some of the differences could be attributed to the specific industry under investigation.

This study specifically addresses the most challenging aspect of fundraising for new ventures in cellular agriculture, namely the difficulty of reaching target investors (GFI, 2021a). By shedding light on the most important venture attributes VCs seek in their preselection, new ventures in cellular agriculture can leverage the information about the most important attributes to tailor their investment proposal and increase their chances of passing the screening phase, which fails to about 80% (Petty & Gruber, 2011). Further implications for practice address investors in cellular agriculture and policymakers. Cellular agriculture investors can use the results to benchmark their internal organisational policies with those of other investors in the field. Finally, policymakers who aim to nurture the cellular agriculture ecosystem are suggested to fund open-access R&D and support the creation of critical infrastructure to advance the development of cellular agriculture for the benefit of humans, animals, and the planet.

Cellular agriculture is one of the most exciting developments in the startup and VC sectors due to its innovative nature and potential to feed an ever-growing global population. Nevertheless, this development is not without its drawbacks. From a consumer perspective, cellular agriculture is challenging because many consumers are unfamiliar with the term and require significant education from providers (The Environmental Law Institute and New Harvest, 2017). Furthermore, the societal roles of animal production beyond nutrition, including ecosystem services, co-product benefits, contributions to livelihoods, cultural significance, and traditional agricultural jobs, could be lost (Wood *et al.*, 2023).

This article acknowledges limitations related to the CBC experiment. While the conjoint method used addresses some research issues, it has its own challenges, including construct validity and preselection bias (Block *et al.*, 2021; Shepherd & Zacharakis, 1999). There's also a concern about external validity, as decision-makers face hypothetical ventures. Although efforts were made to ensure construct validity through expert interviews and validation by industry professionals, the hypothetical nature of the scenarios could limit external validity. Moreover, the sample size, although adequate for the purposes of this study, remains relatively small and specific to early-stage investors, which might not generalize across different stages of investment or types of investors. Furthermore, the study's focus on specific criteria may have excluded other potentially relevant factors, such as intellectual property or regulatory considerations, which could influence investment decisions. Another limitation is the potential pre-selection bias, as participants were already engaged in the cellular agriculture sector, possibly skewing the results towards industry-specific preferences. In the CBC experiment, decision-makers sometimes had to choose between equally appealing investments, though this method is comparable in effectiveness to other conjoint methods (Elrod *et al.*, 1992). Given this study's insights into decision criteria in cellular agriculture, further research is needed, exploring various aspects such as different investment stages, types of investors, and specific cellular agriculture categories. Longitudinal studies could provide deeper insights into how investment criteria evolve over time as ventures progress from early to later stages. Expanding the sample to include a more diverse group of investors, such as corporate VCs, family offices, and impact investors, could offer a more comprehensive understanding of the investment landscape in cellular agriculture. Investigating the role of other critical factors, such as intellectual property, regulatory environments, and market dynamics, would further enrich the understanding of VC decision-making criteria. Similarly, the character strengths of founders, which have been proven to influence business success, could also be considered (Zbierowski & Gojny-Zbierowska, 2022). Employing alternative research methodologies, such as analysing archival data from leading VC firms or conducting in-depth case studies, could complement the findings from conjoint analysis and enhance the result's robustness. Examining the impact of investor characteristics, such as their prior experience, risk tolerance, and strategic focus, on their decision-making processes could provide valuable insights. Finally, comparative studies between different emerging industries

could reveal whether the findings in cellular agriculture are unique or part of a broader trend in venture capital investment strategies.

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Green transformational leadership as a foundation for implementing green strategic orientations and the development of green innovation and green performance

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ABSTRACT

Objective: The objective of the article is to examine the influence of green transformational leadership on green entrepreneurial and green market orientations, which, in turn, affect green innovation. Moreover, the article analyses the relationship between green innovation and green performance.

Research Design & Methods: We used a quantitative research design. We applied a 37-item survey to a sample of 398 small, medium, and large companies in the industrial and service sectors of Mexico. We analysed the results using the partial least squares structural equation modelling approach.

Findings: Green transformational leadership has a strong influence on green entrepreneurial and green market orientation. Besides, only green entrepreneurial orientation positively influences green innovation. Finally, there is a relationship between green innovation and green performance.

Implications & Recommendations: Theoretical implications support most of the arguments put forth in various studies. However, the context can modify the behaviour of the studied relationships. The results provide arguments for adopting a sustainable view of activities within organisations, leading to improved performance and the achievement of competitive advantages.

Contribution & Value Added: The main contribution of this article is that it demonstrates the importance of green transformational leadership as an element that allows the development of green entrepreneurial orientation and green market orientation, which stimulate green innovation. Likewise, the context does influence the behaviour of the observed variables.

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INTRODUCTION

The current environmental concerns are bringing about significant changes in business models, which must incorporate sustainability as a fundamental pillar. Due to pressure from stakeholders, organisations are making substantial efforts to carefully listen to the new needs and concerns of customers, suppliers, employees, and the community (Tjahjadi *et al.,* 2020). Zhai *et al.* (2018) indicate that companies need to respond quickly to changes in customer preferences and maintain sustainable business development. Otherwise, they will be less competitive by not adapting to the new market conditions (Zameer *et al.,* 2020).

While organisations have managed to be competitive by implementing effective leadership, strategic orientations, and innovation, all of this changes when responding to the new needs of the environment (Cillo *et al.,* 2019). As mentioned earlier, sustainability is a determining factor for many organisations, prompting them to reconfigure to address this need. Thus, two sustainable strategic orientations are adopted: green entrepreneurial orientation (GEO) and green market orientation (GMO). Similarly, an organisation's culture must change, developing green transformational leadership (GTL); green innovations (GI) will replace traditional innovations, all resulting in green performance (GP).

In this context, the study of green behaviour in organisations becomes a research area with significant aspects to be addressed, as it is still unknown whether all the mentioned variables positively impact organisations. Moreover, the context plays an important role that must be considered when concluding. In this regard, the evidence generated so far, besides being limited, has been contextualized to specific sectors and economies. Therefore, it is not advisable to extrapolate the results to other contexts.

Consequently, the main objective of this study was to analyse how green transformational leadership influences green performance through green entrepreneurial orientation, green market orientation, and green innovation in the context of small, medium, and large companies in the industrial and service sectors of Mexico. For this purpose, we defined a sample of 398 companies to which we applied a seven-point Likert scale survey. We analysed the results using the partial least squares structural equation modelling (PLS-SEM) approach.

There is vast literature evidence of how innovation relates to higher firm performance. Even on a smaller scale, there is evidence of the influence of entrepreneurial and market orientation strategies on innovation. However, these have been studied individually or indirectly in their effect on innovation. On the other hand, leadership has been studied from a global perspective in the organisation, as a direct catalyst for innovation and performance. However, some gaps have not been strongly addressed, and this study seeks to analyse them.

This lead us to pose the following research questions: Is green transformational leadership suitable for efficiently developing strategic orientations? Does adopting strategic orientations to a sustainable vision significantly contribute to the development of innovation? Does green innovation truly generate better business performance focused on environmental issues? Finally, does the green context in a developing country allow for harvesting the same results as in a developed one?

This study is considered original because, unlike other studies, in which scholars analyse transformational leadership as a mediating variable or require the indirect effect of another variable, here GTL serves as the foundation for developing strategic orientations that lead to innovation and performance. This is regarded as original and will strengthen the state of the art. Furthermore, we developed the study within the green or sustainable context, for which there is still limited evidence, contributing to reducing the gap between theory and empirical evidence.

The article is structured as follows. The first part will discuss the literature review of each study variable and the relationships between them to formulate hypotheses. Subsequently, we will present the research methodology used, followed by the analysis of results and their discussion. Finally, we will present conclusions along with contributions, limitations, and future research directions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Green Entrepreneurial Orientation

When discussing GEO, it is crucial to understand what green entrepreneurship entails. In this context, Mahdi *et al.* (2021) assert that green entrepreneurship is a subcategory of entrepreneurship that focuses on creating environmentally sustainable products or services. Similarly, Jiang *et al.* (2018) state that green entrepreneurship involves the development of green activities that generate both economic and environmental benefits with due consideration for societal benefits as well (Alwakid *et al.,* 2020).

Specifically, Guo *et al.* (2020) define GEO as a strategic inclination at the company level to identify and seize ecological market opportunities based on a comprehensive consideration of risks and benefits. According to Peris *et al.* (2020), GEO arises from the need to study this strategy from an

ecological perspective, where companies strive to be proactive, innovative, and decision-makers in sustainable projects that result in improved corporate performance.

Moreover, GEO is primarily divided into three dimensions. The first refers to *proactiveness*, involving responding first to customer needs by introducing new eco-friendly products, services, or technologies (Jiang *et al.,* 2018). *Innovativeness* pertains to the implementation of products or services that differ from competitors, addressing previously undetected or unmet needs. Finally, *risk-taking* is the tendency to take an active stance by investing in ecological projects with high levels of uncertainty (Jiang *et al.,* 2018). Balancing these dimensions is essential to achieving economic, environmental, and social performance (Ye *et al.,* 2022).

Evidence indicates that GEO results in superior environmental performance (Guo *et al.,* 2020), particularly financial performance (Muangmee *et al.,* 2021). It also enables market share expansion (Yadegaridehkordi *et al.,* 2023) and accelerates the development of eco-friendly products and services, creating sustainable value (Jiang *et al.,* 2018).

A positive characteristic of GEO is its ability to foster green innovation (Shehzad *et al.,* 2023), utilising modern technology for the development of eco-friendly products and processes (Teece, 2016). Therefore, scholars consider GEO a high-level dynamic capability that is adaptive and innovative (Criado-Gomis *et al.,* 2017). Organisations with GEO can also be more efficient in transitioning from polluting to non-polluting processes (Jiang *et al.,* 2018). This prompts organisations to pay closer attention to environmental demands from stakeholders and incorporate them into their corporate strategy, moving beyond merely meeting basic regulations (Wang *et al.,* 2023). Furthermore, organisations with GEO are in a better position to satisfy customer and environmental needs compared to competitors. Their culture of innovation and proactivity promotes the acquisition of heterogeneous resources and knowledge that are difficult for competitors to imitate (Ye *et al.,* 2022).

Therefore, it is relevant to note that implementing GEO strategies is risky in volatile environments (Yadegaridehkordi *et al.,* 2023). Nevertheless, the potential for high benefits justifies the adoption of GEO.

Green Market Orientation

Market orientation (MO) is also a fundamental strategic orientation for development within organisations. In this case, MO aims to foster a culture and values within the organisation focused on the customer and their needs (Narver & Slater, 1990). Noteworthy, this strategy has been used for decades by organisations seeking to be more competitive. However, pressure from stakeholders has led many of them to also implement a green culture that promotes the creation of green products (Pomegbe *et al.,* 2022). For this reason, GMO emerges as a sustainability strategy. From the stakeholder theory perspective, shareholders, consumers, employees, and society as a whole have become aware of the adverse effects of business activities on the environment.

As stated by Papadas *et al.* (2017), GMO is the degree to which an organisation participates in strategic, tactical, and internal processes and activities that collectively seek to create, communicate, and provide products and/or services with a minimal environmental impact.

Scholars divide GMO into strategic, tactical, and internal GMO. Strategic GMO involves designing and implementing strategies aimed at achieving a positive long-term environmental impact by the company (Papadas *et al.,* 2017), through ecological marketing initiatives (Papadas *et al.,* 2019). Developing strategic GMO requires the inclusion of stakeholders and the natural environment. Otherwise, the strategies will not have the expected impact, as all environmental actions are market-oriented (Vilkaite-Vaitone & Skackauskiene, 2019).

Tactical GMO involves developing a mix of green marketing (Borah *et al.,* 2023), and incorporating environmental values into tactical marketing decisions within organisations (Papadas *et al.,* 2017). Internal GMO involves creating a culture oriented towards environmental sustainability. Internal GMO entails assimilating corporate environmental values by all members of the organisation who will implement GMO (Lin *et al.,* 2020). In this regard, internal GMO generate programs for reducing energy, waste, paper consumption, or inputs that affect the environment. It also promotes various sustainable practices within the organisation.

The importance of developing GMO in organisations is significant. GMO enables the implementation of innovative strategies and capabilities to meet customer needs regarding environmental care. Furthermore, it prioritises the use of green technologies for the development of eco-friendly products, resulting in greater customer value compared to the competition and higher profitability. In this sense, companies that promote MO strategies will be better aligned with their customers' requirements, increasing organisational performance. It also allows collaborative work among various departments, resulting in the creation of ecological solutions that meet customer needs.

Green Transformational Leadership

Leadership is a cornerstone of any organisation. Without it, there is no direction to achieve the mission, vision, and objectives. Moreover, the type of leadership developed in an organisation shapes its culture, values, and the way all members work. There are various types of leadership, each with certain characteristics, and their efficiency varies depending on the context (OC, 2018). Among them is transformational leadership. This type of leadership is based on trust between leaders and employees, with the latter being treated with special attention (Nurjanah *et al.,* 2020). With the development of a society more involved in sustainability issues and more demanding towards organisations to contribute to environmental improvement, transformational leadership becomes oriented towards a sustainable green vision.

Chen and Chang (2013) describe GTL as leadership that motivates all personnel to achieve environmental objectives. It promotes organisational learning (Le & Lei, 2019) and enables superior performance (Li *et al.,* 2020). To achieve this, the promotion of values such as respect, collective responsibility, and organisational belonging is used (Mittal & Dhar, 2016). Likewise, GTL fosters a culture of creativity, empathy, knowledge development, ethics, and green innovation in an organisation (Aftab *et al.,* 2022), which, when combined with all strategic resources, leads to the creation of new eco-friendly products and services (Begum *et al.,* 2022).

A characteristic of GTL is that it allows employees to challenge themselves, be able to face challenges, think differently, and develop new perspectives and ideas (Al Nuaimi *et al.,* 2021), leading to the implementation of ecological sustainability initiatives (Begum *et al.,* 2022). By contrast, GTL motivates personnel to prioritise their personal goals over those of the organisation (Mittal & Dhar, 2016). Above all, GTL should inspire, encourage thinking outside the box, innovate in green products (Obeidat *et al.,* 2018), and foster a green organisational culture that, in turn, focuses on meeting customer needs from a sustainability perspective; consequently, GLT influences EO and MO (Menguc *et al.,* 2007).

Green Innovation

We can describe GI as a series of systematic actions and modifications aimed at addressing environmental concerns (Mahdi *et al.,* 2021). According to Peng and Liu (2016), it is the development of products, processes, systems, and methodologies that meet people's needs while simultaneously minimising the consumption of natural resources. In this sense, various authors emphasise the crucial role of modern technology, internal research, and external knowledge in significantly reducing waste, pollution, water, and energy use (Aftab *et al.,* 2022), and addressing issues related to the health and safety of individuals (Jiang *et al.,* 2018).

One of the attributed advantages of GI is the improvement of environmental performance (Roy & Khastagir, 2016). It also enables cost and production time reduction (Begum *et al.,* 2022), enhances the organisation's market position, attracts customers, and generates a competitive advantage (Hur *et al.,* 2013).

Moreover, a significant feature of GI involves the creation of ecologically friendly production strategies, processes, and procedures within the company, requiring a different vision among organisation members (Yadegaridehkordi *et al.,* 2023). This implies developing a culture based on environmental sustainability and commitment to stakeholders. Another characteristic of GI is that developing new products or services considered eco-friendly, conveys an affirmative message indicating that the company is mindful of environmental considerations (Chahal *et al.,* 2014).

However, it is essential to consider that there may be innovation practices focused solely on complying with legal requirements without a real interest in reducing waste or pollution (Leal-Rodríguez *et al.,* 2018). In such cases, long-term simulation may not reflect better customer loyalty or performance.

Green Performance

Unlike business performance, where various indicators measure financial results, and in some cases, market results, GP focuses on understanding how actions and strategies leading to sustainable goods and services positively impact the environment. In this regard, it agrees with Zhan *et al.* (2018) that while financial performance is crucial, environmental performance must also be seriously considered to meet stakeholder demands.

Green performance links the organisation's objectives with its environmental responsibilities (Wang, 2020). That is, there must be consistency between the green culture developed in the organisation and the actions taken in this regard. These actions should impact, for example, reduced pollution, waste, energy and water consumption, and paper use (Asadi *et al.,* 2020). However, they should also impact environmental reputation.

Organisations considering themselves green do so within the framework of the Triple Bottom Line, composed of economic, social, and environmental performance (Sung & Park, 2018). Therefore, when measuring performance, it is necessary to consider indicators that impact all three mentioned performances.

However, although sustainable performance addresses environmental issues, not all factors increase financial, social, and environmental performance (Wang, 2020). Sometimes, the increase only occurs in financial performance (Muangmee *et al.,* 2021), or in social and environmental performance (Yadegaridehkordi *et al.,* 2023).

Part of the explanation for why the implementation of sustainable measures and products does not impact performance is that organisations implement sustainable measures due to social pressure, and not genuine interest in contributing to environmental improvement.

Green Transformational Leadership and Green Entrepreneurial Orientation

As mentioned earlier, transformational leadership is of utmost importance in enriching the organisational culture and empowering employees to fulfil the organisation's vision, mission, and objectives. This type of leadership encourages an attitude of innovation, entrepreneurship, and risk-taking to enhance performance and gain competitive advantages. Therefore, we can state that transformational leadership has a significant influence on entrepreneurial orientation (Leite & Rua, 2022). There is evidence supporting this relationship (Engelen *et al.,* 2015; Obeidat *et al.,* 2018; Yamin, 2020); implementing this type of leadership in the organisation strengthens entrepreneurial orientation, leading to improved innovation. Therefore, it is important to know if this behaviour also occurs in a green environment. Thus, we formulated the hypothesis:

H1: Green transformational leadership has a positive influence on green entrepreneurial orientation.

Green Transformational Leadership and Green Market Orientation

Similarly to the previous relationship, it is recognised that leadership is necessary to implement market orientation (Harris & Ogbonna, 2001). In particular, transformational leadership creates a positive environment that influences building a future vision, motivates employees, and creates a customer-centric culture, thereby reinforcing market orientation (Menguc & Auh, 2008).

While studies support the association between transformational leadership and traditional market orientation, including green orientation (Dhaouadi, 2021; Menguc *et al.,* 2007), it is necessary to examine if sustainability-oriented transformational leadership influences GMO in the same way, a relationship scarcely studied in the literature. Therefore, we formulated the following hypothesis:

H2: Green transformational leadership has a positive influence on green market orientation.

Green Entrepreneurial Orientation and Green Innovation

The literature suggests that adopting GEO within organizations fosters a culture of innovation, resulting in the creation of sustainable and innovative products, services, and processes. There is significant evidence supporting this relationship (Guo *et al.*, 2020; Makhloufi *et al.,* 2022; Shehzad *et al.,* 2023). Moreover, GEO functions as a distinct system that mirrors strategic efforts made by companies to expedite green innovation and improve sustainable business outcomes (Muangmee *et al.,* 2021). Green entrepreneurial orientation modifies internal processes within the organisation to stimulate GI. Therefore, GEO plays a relevant role in the proper development of green innovation, laying the foundation for the commercialisation of innovative products and services, resulting in better performance and simultaneously satisfying consumers. Given the lack of significant evidence linking these two variables in a sustainability context, especially in the specific context of Mexico, this presents an opportunity to explore whether this behaviour is similar in this context. Consequently, we proposed the following hypothesis:

H3: There is a relationship between green entrepreneurial orientation and green innovation.

Green Market Orientation and Green Innovation

Wang (2020) notes that society is currently concerned about the negative impact of many products on the environment. Green market orientation contributes to environmental sustainability by understanding customer needs, translating into the innovation of ecological products. Empirical evidence supports the relationship between MO and GI (Muangmee *et al.,* 2021; Nuryakin & Maryati, 2022; Wang *et al.,* 2023), in which the use of innovations is driven by a broad understanding of customers' environmental needs, desires, and concerns. In this context, GMO is the antecedent to innovation. However, the specific impact of GMO on GI has not been extensively studied. This creates an opportunity to enrich existing literature, leading to the following hypothesis:

H4: There is a relationship between green market orientation and green innovation.

Green Innovation and Green Performance

Green innovations positively impact business performance, especially in environmental aspects (Hanif *et al.,* 2023; Ho *et al.,* 2021; Muangmee *et al.,* 2021; Singh *et al.,* 2020). Green innovation enhances the response to external environmental pressure from customers, improving green performance by offering eco-friendly products. The impact of GI on various types of performance is multifaceted. Green innovation benefits economic performance by reducing energy and water consumption costs, resulting in higher profits. It also improves environmental performance by reducing waste, increasing recycling, and optimising resources consumption. Furthermore, GI enhances social performance by supporting sustainable development in the community and benefiting employees, customers, and suppliers. Wang (2020) shares this idea and also indicates that the relationship between GI and GP is based, on the one hand, on the fact that organisations are aware that implementing GI involves using fewer resources, which leads to greater savings. On the other hand, there is a greater demand from consumers to acquire environmentally friendly products.

While the literature generally supports the positive relationship between GI and various types of GP, there are cases when the impact is partial. Therefore, it is crucial to understand if, in the context of this research, GI behaves similarly concerning GP. Consequently, we formulated the following hypothesis:

H5: Green innovation has a positive influence on green performance.

RESEARCH METHODOLOGY

Population and Sample

To analyse the behaviour of the variables described in the national productive sector, we decided to select the two most important sectors of the economy, *i.e.* industry (20.4% of GDP) and services (58.2% of GDP) (National Institute of Statistics, Geography, and Informatics, 2023a). Within these

sectors, we selected economic activities that develop more GI and implement GEO and GMO. The selected activities were manufacturing, hospitals, clinics, and laboratories, waste management, treatment, and final disposal of waste, as well as the hotel industry.

Based on this selection, we identified a total of 51.086 small, medium, and large enterprises according to the National Statistical Directory of Economic Units (National Institute of Statistics, Geography and Informatics, 2023b). Of these, 12.271 correspond to manufacturing and 38.815 to the described services.

We administered a survey to general managers, owners, or authorised executives of the companies, resulting in 420 completed surveys by the end of the application period. However, after the data cleaning process, we validated 398 surveys meeting the minimum sample margin established for a confidence level of 95% and a margin of error of 5%. The survey application period was from April to September 2023, with a pilot test conducted in February of the same year.

Measures

We based the survey design on the review of the analysed literature. We structured the survey into six sections. The first section collected company data such as name, economic activity, type of capital, age of company, and company size. The remaining sections asked about each of the study variables. For the latter, 37 items were developed on a 7-point Likert scale, where 1= totally disagree and 7= totally agree.

The variable *Green Transformational Leadership* consisted of five items originally developed by Dechant and Altman (1994) and adapted by Wang *et al.* (2023). *Green Entrepreneurial Orientation* included eight items adapted from the studies of Galia *et al.* (2020), Hernández-Perlines and Rung-Hoch (2017) and Li *et al.* (2010). *Green Market Orientation* had nine items adapted from Pomegbe *et al.* (2022). *Green Innovation* comprised six items adapted from Guo *et al.* (2020) and Muangmee *et al.* (2021). *Green Performance* had nine items derived from the study of Jiang *et al.* (2018).

We designed all variables as unidimensional. Control variables included the type of capital (national or foreign), age company (below 5 years, 5-10 years, above 10 years), company size (11-50 employees, 51-250 employees, and employees above 250), and the sector (industry or services) to observe if these factors influence the behaviour of the variables.

Common Method Variance

To ensure that the results obtained did not present internal validity problems due to inflated correlations resulting from inadequate survey responses, we used Harman's one-factor test (Podsakoff *et al.,* 2003). According to Cernas *et al.* (2017), this procedure is conducted through an exploratory factor analysis using an unrotated factor matrix. If a single factor emerges or if one factor represents the majority of the explained variance, it is concluded that the variables are contaminated by common method variance.

After performing the mentioned procedure, the result of Harman's one-factor test showed that the first factor explained only 32.55% of the extracted variance. Consequently, we ruled out the existence of common method variance.

Data Analysis

Table 1 displays the characteristics of the surveyed companies, showing the predominance of national companies, with a seniority of over 10 years and mainly small and medium-sized, which is consistent with official data.

We used the partial least squares structural equation modelling (PLS-SEM) statistical technique for data analysis through the Adanco 2.1.1 software (Dijkstra & Henseler, 2015). This software allows the analysis of non-normal data and has a high degree of certainty when performing factor analysis before using multiple regressions (Hair *et al.,* 2014). Noteworthy, the analysis variables are reflective, second-order, and of type B.

Table 1. Firm characteristics

Firm characteristics	Frequency	Percentages
Sector		
Manufacturer	118	30
Services	280	70
Origin		
National	341	85.7
Foreign	57	14.3
Size		
11-50 employees	192	48.2
51-250 employees	155	38.9
Employees above 250	51	12.8
Age		
Below 5 years	46	11.6
5-10 years	78	19.6
Above 10 years	274	68.8

Source: own study.

RESULTS AND DISCUSSION

The use of PLS-SEM in its first phase – the measurement model – allowed us to analyse the reliability and internal consistency of all variables with their respective items. Consequently, we discarded items that did not surpass the thresholds established by the theory. Thus, the analysis of the model, which originally consisted of 37 items, was reduced to 24. GEO, GMO, GI, and GP lost three items each, while GL lost only one.

The initial indicators of internal consistency – reliability and convergent validity – included Dijkstra-Henseler's rho, Jöreskog's rho, Cronbach's alpha (α), and average variance extracted (AVE). Results for the first three indicators exceeded the minimum threshold of 0.800 (Nunnally & Bernstein, 1995). Moreover, all AVE indicator data were above the minimum of 0.500 suggested by Fornell and Larcker (1981) (Table 2).

Table 2. Construct reliability and convergent validity

Construct	Dijkstra-Henseler's rho (ρA)	Jöreskog's rho (ρc)	Cronbach's alpha(α)	AVE
GEO	0.9208	0.9175	0.9176	0.6908
GMO	0.9146	0.9125	0.9133	0.6356
GI	0.8478	0.8446	0.8454	0.6449
GP	0.9239	0.9213	0.9226	0.6620
GTL	0.8954	0.8950	0.8950	0.6808

Source: own study.

However, in line with theory (Carmines & Zeller, 1979), the results of the factor loadings analysis were also positive as all of them were above 0.707. In general, the items belonging to the GTL and GEO constructs had the highest loadings, being above 0.800 (Table 3). Likewise, it is possible to observe the type of items that were used in the survey, which allowed an understanding of the behaviour regarding the green ecosystem developed by Mexican companies.

Furthermore, we analysed the heterotrait-monotrait ratio of the correlations indicator. This indicator measures discriminant validity between indicators of the same construct and between indicators of different constructs. In this indicator, values should be below 0.85 (Henseler *et al.,* 2015). The results consistently showed values below this threshold (Table 4). Furthermore, Table 5 presents the results of the Fornell-Larcker criterion, which aims to demonstrate how a construct is distinct from the other constructs analysed. In all cases, we observed appropriate differences as indicated by Hair *et al.* (2014).

Table 3. Factor loadings

Item	Factor Loadings				
GTL1	0.803	**GMO1**	0.886	**GP1**	0.767
GTL2	0.850	**GMO2**	0.744	**GP2**	0.853
GTL3	0.825	**GMO3**	0.772	**GP3**	0.815
GTL4	0.822	**GMO4**	0.776	**GP4**	0.767
GEO1	0.840	**GMO5**	0.810	**GP5**	0.768
GEO2	0.835	**GMO6**	0.788	**GP6**	0.902
GEO3	0.874	**GI1**	0.755	–	
GEO4	0.877	**GI2**	0.791		
GEO5	0.720	**GI3**	0.860		

Source: own study.

Table 4. Discriminant validity (HTMT)

Construct	GEO	GMO	GI	GP	GL
GEO	–	–	–	–	–
GMO	0.6392	–	–	–	–
GI	0.3041	0.2701	–	–	–
GP	0.0717	0.0870	0.4966	–	–
GTL	0.7547	0.7803	0.2690	0.0843	–

Source: own study.

Table 5. Discriminant validity: Fornell-Larcker Criterion

Construct	GEO	GMO	GI	GP	GL
GEO	**0.6908**	–	–	–	–
GMO	0.4150	**0.6356**	–	–	–
GI	0.0924	0.0725	**0.6449**	–	–
GP	0.0051	0.0077	0.2518	**0.6620**	–
GTL	0.5719	0.6123	0.0725	0.0073	**0.6808**

Source: own study.

After defining each construct and its final items according to all parameters analysed in the measurement model, we evaluated the structural model to test the research hypotheses (Table 6). To achieve this, we applied the bootstrapping procedure with a subsample of 4.999.

We confirmed a positive and highly significant relationship between GTL and the two analysed strategic orientations with very similar values for GTL → GEO (β= 0.756, t=22.561, p= 0.000), as well as GTL → GMO (β= 0.783, t=22.440, p=0.000), with the latter relationship being slightly stronger than the former. Consequently, we confirmed both hypotheses. On the other hand, we found that GEO had a positive impact on GI (β= 0.223, t=3.091, p= 0.001), slightly surpassing the minimum threshold of 0.200 indicated by Chin (1998). However, we found no relationship between GMO and GI (β= 0.126, t=1.533, p=0.063). Therefore, we confirmed H3 but rejected H4. Finally, we confirmed that there was an association between GI and GP (β= 0.502, t=10.790, p=0.000), so we accepted H5.

Table 6. Hypothesis testing

Effect	Original coefficient	Standard bootstrap results			
		Mean value	Standard error	t-value	p-value
GTL -> GEO	0.756	0.7578	0.0335	22.5613	0.000
GTL -> GMO	0.782	0.7825	0.0349	22.4400	0.000
GEO -> GI	0.223	0.2226	0.0721	3.0918	0.001
GMO -> GI	0.126	0.1252	0.0820	1.5330	0.063
GI -> GP	0.502	0.5046	0.0465	10.7904	0.000

Note: P= 0.001

Source: own study.

On the other hand, we estimated the effect size f2 of Cohen for each of the proposed relationships, and the results were as follows: GTL → GEO = 1.336, GTL → GMO = 1.579, GEO → GI = 0.032, GMO → GI = 0.010, and GI → GP = 0.336. According to Cohen's parameters (1988), 0.02 is a small effect, 0.15 is a medium effect, and 0.35 is a large effect. The relationships of GEO and GMO with GI presented a small effect, while the relationship between GI and GP was considered medium. A different case is the relationship between GTL with GEO and GMO, where the effect sizes were very high. This indicates that GTL as an exogenous variable has a strong influence on the analysed strategic orientations – endogenous variables.

We determined R2 of the entire model. The coefficients were: GEO = 0.572, GMO = 0.612, GI = 0.102, and GP = 0.252. According to the parameters of Hair *et al.* (2011), the constructs GEO and GMO showed a predictive level from moderate to high, while for GI and GP, it was weak.

Finally, we analysed control variables, such as the type of capital, company age, size, and sector. However, none of them was relevant to their behaviour.

The obtained results allow for the following discussion. Regarding the first hypothesis, the result showed that organisations with GTL have a strong influence on the implementation of GEO, which is in line with various studies (Menguc *et al.,* 2007; Obeidat *et al.,* 2018). This indicates that organisations that develop transformational leadership oriented towards the green or sustainable theme modify their culture so that all employees integrate the values, mission, and vision generated, serving as a catalyst for GEO to foster the creation of a green entrepreneurial culture. The impact of this relationship was strong, indicating the high importance of good leadership to successfully develop a strategic orientation such as GEO. In the same vein, we also accepted the second hypothesis; GTL had a strong influence on GMO and it strengthens the implementation of a green culture based on the customer; organisations seek to understand the needs of their customers and stakeholders in general. Previous literature (Dhaouadi, 2021; Widiana, 2017) has focused on analysing this relationship but without a sustainable approach. In this case, the results show that organisations have matured and transformed to include environmental issues in their culture. On the other hand, the results showed that there is a positive relationship between GEO and GI (H3). These results align with those obtained by Muangmee *et al.* (2021) and Wang *et al.* (2023), confirming the stance that a culture based on green entrepreneurship facilitates the innovation processes, generating environmentally friendly products and services, and that, in turn, GEO is preceded by GTL. On the other hand, unlike what the literature indicates (Lin *et al.,* 2014; Tjahjadi *et al.,* 2020), GMO did not influence GI (H4). An explanation for this result has to do with the fact that this strategic orientation, although focused on the customer and their needs, and implementing sustainable practices internally, has not managed to turn them into specific innovations. That is, GMO has mainly focused on working within organisations by generating sustainable practices, as well as promoting the green actions they conduct. Meanwhile, GEO is the strategy responsible for influencing GI. In this sense, sustainable entrepreneurship is responsible for solving sustainability problems through commercial activities (Sung & Park, 2018). The evidence showed that there was a relationship between GI and GP (H5), which is in line with previous studies (Tian *et al.,* 2023; Wang, 2020). In this regard, we confirmed that green innovations improve the environmental performance of companies; consumers are willing to acquire goods and services from organisations committed to the environment.

Finally, if we did not consider the effect of GTL on GEO and GMO and only analysed. the direct relationship between GTL and GP, the result would still be positive but not significant (β = 0.1340; similar results to Chen *et al.,* 2014). This result indicates that GTL does influence GP, but it does so indirectly by exerting influence on the strategies of GEO and GMO. Thus, we confirmed the main research objective stating that green transformational leadership influences green performance through green entrepreneurial orientation, green market orientation, and green innovation.

CONCLUSIONS

In an era when concern for environmental issues is paramount, organisations have developed the ability to listen to the demands and needs of all stakeholders. This has allowed for the development of GI

that meets the expectations of all stakeholders, ultimately impacting organisations' environmental performance. Green innovation is the result of the correct implementation of GEO and GMO. However, they do not always have a simultaneous impact, as was the case in this study. While this aligns with the empirical evidence developed so far, it should be emphasised that the implementation of two strategic orientations is not easy to control, causing only one of them to influence innovation, in this case, GEO. Moreover, GTL is the factor behind both strategies and we can consider it the foundation for the optimal development of the entire green innovation ecosystem. The context in which the research was conducted is also relevant because the lack of a relationship between GMO and GI suggests that simply knowing the customer is not sufficient to develop green innovations.

The main contribution of this article is that it analyses the influence of GTL as the essential element that allows for the development of the two strategic orientations used. Firstly, it is necessary to forge GTL for it to act and maximise GEO and GMO. Secondly, we conducted the entire analysis in a sustainability environment and in organisations that, due to their characteristics, must be more open to the development of green innovations, and therefore, the generation of GEO, GMO, and GP.

Theoretical implications support most of the arguments put forth in various studies. However, the context can modify the behaviour of the studied relationships.

As practical implications for organisations, the results provide arguments for adopting a sustainable view of activities within organisations, leading to improved performance and the achievement of competitive advantages.

From a social perspective, awareness of the positive impact of environmental issues will mobilise more resources from organisations to address this issue within society, benefiting both the community and organisations and improving their image in society.

The main limitation of conducting the research was the access to information, as many companies chose not to participate. However, we expanded both the number of surveys sent and the time devoted to obtaining a sufficient number of responses necessary to complete the established sample.

As the research develops, we consider it relevant to analyse the behaviour of the variables GEO, GMO, GI, and GP, but by type of leadership. It is worth investigating whether different types of leadership influence a greater or lesser implementation of sustainable measures. Moreover, it is important to identify specifically the types or measures of sustainable practices that organisations implement and how they influence both market strategy design and performance. This way, a model of adopting sustainable best practices can be proposed to improve the innovation, image, and performance of organisations.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Market choice and technology intensity of exports in international business networks: Firm-level evidence from Poland

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ABSTRACT

Objective: The objective of the article is to study links between market choice and technology intensity of exports in international business networks for firms located in Poland during the 2016-2020 period.

Research Design & Methods: We analysed the decisions of firms to sell in one or more geographical markets (national, European, non-European) using the Community Innovation Survey of Polish manufacturing and services firms. We singled out firms that are subsidiaries of multinational enterprises originating from large developed economies including the US, Germany, UK, and France, and compared their market choices to those of indigenous firms.

Findings: The results show that membership in international business networks increases the probability of exporting. However, the effects differ by the parent company's country of origin. The increase in the probability of EEA+ market presence is especially high in the case of German and British business groups and less pronounced in the case of American and French groups. On the other hand, membership in the American, French, and other business groups increases the probability of selling to non-EEA+ markets. The role of foreign business groups depends on the technology intensity of the industry in which they operate. German subsidiaries are the most likely to export if they are active in the high-tech, medium-low-tech, and low-tech manufacturing sectors. For French subsidiaries, it is in the medium-high-tech and high-tech manufacturing sectors. High-tech services are likely to be exported by members of foreign business groups regardless of the origin of the parent company.

Implications & Recommendations: Our study showed the essential role of European integration for exports of firms based in Poland. It also showed that the risk of technologically stagnant 'East' – 'West' networks, similar to Mexican *maquilladora,* based mainly on the low cost of labour, did not materialize.

Contribution & Value Added: The work is original as it uses a unique Polish CIS firm-level dataset that allows for distinguishing between market choices of foreign-owned and indigenous firms located in Poland.

Article type: research article

Keywords: exporting; international business networks; market choice; technology intensity; Poland

JEL codes: F12, F14, F23, L25, O31

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INTRODUCTION

During the last three decades a global tendency for international business networks (IBNs) to dominate the reinforcement of corporate growth strategy has been observed. Mirroring this development, multinational enterprises (MNEs) decentralized their internal structures in the 1990s to become networked firms (Buckley & Casson, 1998). Extensive literature has emerged on the formation of IBNs that seeks to explain the determinants and motives of firms to engage in such networks.

IBNs, which are usually organized by Western MNEs lead to a division of labour within the value chain of an industry and may stretch across many countries.

Participation in IBNs has been of particular importance for developing and transitioning economies through the expansion of global value chains (GVCs). The inability of actors in production networks to self-organize due to institutional uncertainty or coordination failures can affect the prospects for reconfiguring their economies and integration with the world economy. This process may lead to the emergence or non-emergence of network organizers that act as promoters of innovation, production, and trade linkages. Therefore, understanding the transformation of business networks and their realignment with global networks requires a better understanding of network organizers. This issue is especially relevant in the context of Central and East European countries (CEECs) where during the communist period enterprises acted as production units only, while technology development was delegated to isolated academic organizations and innovation processes were governed through government and party hierarchies. After the collapse of communism and successful economic transition MNEs became the most active network organizers in CEECs.

International trade patterns of CEECs cannot be fully understood without considering the strategies of MNEs that have been shaping foreign direct investment (FDI) and outward processing traffic (OPT) in the region (Radosevic & Hotopp, 1999). In particular, the international fragmentation and globalization of production within MNEs imply that their subsidiaries might be export-oriented due to the strategic decisions of parent companies. Consequently, the participation of foreign-owned firms in host country exports can be higher compared to that of indigenous firms. The influence of IBNs on CEECs is supposed to improve their competitive positions in foreign markets. However, studies on the integration of indigenous firms into such networks in CEECs and their performance are still rather limited.

The discussion and research on IBNs in CEECs started already in the late 1990s. For example, Ellingstadt (1997) predicted the emergence of 'East' – 'West' IBNs that would resemble *maquilladora* types of relationships in Mexico. According to his view, CEECs could operate only as a low-cost labour base with restricted innovation opportunities. In the alternative vision, CEECs would operate as complements of West European economies (Zysman & Schwartz, 2008). Kurz and Wittke (1998) used the example of German firms to show that they do not exploit cheap labour but rather develop complementary specialization that results in a strategic rearrangement of tasks and functions within value chains. In this way, CEECs capacities could be integrated into GVCs organized by Western MNEs.

However, the formal validation of these competing views requires extensive empirical research based on individual firm-level datasets. Therefore, the main objective of this article is to study links between market choice and technology intensity of exports in IBNs for firms located in Poland during the 2016-2020 period using the Community Innovation Survey (CIS) of Polish manufacturing and services firms. The case of Poland is particularly illustrative and worth investigating. Poland is the biggest of the new EU member states and one of the most successful transition economies in terms of attracting FDI. According to Statistics Poland (2024), in 2022, the country hosted 22204 foreign affiliates which accounted for over 14% of total employment and 55% of all exports.

In our study, we focused on the decisions of firms to sell in one or more geographical markets (national, European, non-European) and see how these decisions differ with firms' participation in various IBNs and domestic firms. In particular, we singled out firms that are subsidiaries of multinational enterprises originating from large developed economies such as the US, Germany, the UK, and France, and compared their market choices with those of Polish standalone firms and members of Polish business groups. Furthermore, we extended our analysis by studying interactions between foreign business group membership and the technological intensity of exports.

We performed estimations for two overlapping periods with different dependent variables. Firstly, we estimated the Tobit model for shares of sales to three markets (national, European, and non-European) for the period 2018-2020. Secondly, we ran the probit model by estimating the dummy variable describing firms' presence in one of the three markets for the 2010-2020 period.

Our study shows that membership in IBNs increases the probability of exporting compared to domestic companies. However, the effects differ by the parent company's country of origin. The increase in the probability of EEA+ market presence is especially high in the case of German and British business

groups and less visible in the case of the American and French groups. On the other hand, membership in the American, French, and other business groups increased the probability of selling to non-EEA+ markets. Moreover, membership in a foreign business group increases the probability of exporting to the EEA+ market in the majority of sectors. This pattern is especially visible in the case of German and French subsidiaries. The highest values of estimates in the case of German groups are visible in the case of low-tech, medium-low tech and high-tech sectors. In the case of French subsidiaries, the highest probability is observed in high-tech sectors. It is also high in the case of medium high-tech and high-tech services. The pattern of EEA export orientation of British and American groups is also quite noticeable but diversified. Noteworthy, membership in all foreign business groups increases the chances of exporting high-tech services and rarely in low-tech services.

The structure of this article is as follows. In the next section, we will provide the literature review. Then, we will describe the analytical framework and the dataset. Subsequently, we will report and discuss our empirical results. The last section will provide a summary and conclusions.

LITERATURE REVIEW

The literature defines networks as groups of firms that can take various forms. Typically they include market-based or hierarchical ties. However, they can also consist of firms engaged in horizontal trust-based cooperation. In particular, networks involve relationships that depend on the use of various resource-sharing and monitoring mechanisms to overcome problems resulting from contract incompleteness. By pooling their resources, the members of a business network can increase their flexibility through better specialization and risk- and knowledge-sharing. Rugman (1997, p. 182) noted that the lead company at the centre of a network, 'provides … strategic and organizational leadership ... beyond the resources that, from an accounting perspective, lie directly under … [its] … management control.' According to Ernst (1999, pp. 15-16), 'the lead company derives its strength from its control over critical resources and capabilities and from its capacity to coordinate transactions between different network nodes. Both are the sources of its superior capacity for generating economic rents. The lead firm heavily determines the growth and direction of suppliers.'

The business networks have a spatial dimension. They can be local, regional, national, or international. In the international business literature, the last dimension receives the most emphasis due to MNEs' activities in host countries. In principle, network organizers can be any actors with the necessary capability and resources. However, given management, finance, and technology gaps in CEECs, MNEs are regarded as the most important network organizers. Moreover, MNEs may affect innovation dynamics, productivity, and export performance in host countries (Pereira *et al*., 2020; Wang & Wang, 2021; Liu & Li, 2022). In the literature on FDI spillovers, foreign subsidiaries are considered conduits of their parent companies' knowledge, technology, and expertise which may spill over onto local firms (Marin & Bell, 2006; Duan *et al*., 2020; Almodóvar & Nguyen, 2022).

The magnitude and quality of interactions of foreign-owned firms with indigenous firms is dependent on their resources and capabilities. In particular, the literature on the effects of FDI on host country economies has emphasized the importance of indigenous firms possessing absorptive capacity, not only to allow them to interact with foreign subsidiaries but also to get the most out of such interactions (Cohen & Levinthal, 1990; Marin & Bell, 2006; Kolasa, 2008; Yokota & Tomohara, 2010; Cieślik & Hagemejer, 2014; Villar *et al*., 2020).

Anecdotal evidence shows that MNEs are important network organizers in CEECs. The car manufacturing industry example underlines the role of individual firms in shaping patterns of networks (Pavlinek, 2002; 2006). Foreign car manufacturers transferred their networks to the CEE region creating supply networks and systems of innovation (Tulder, 2004). Industry studies document that they range from low-cost base operations to those where they operate as a complementary production base. Tulder and Ruigrok (1998, p. 223) concluded that four types of IBNs in the European car industry have different strategic goals for the region: 'Followers and lock-out networks largely see the region as a still limited market. Peripheral firms primarily use the region as an entry into the West European car market. Front-runner firms have adopted the most sophisticated (and also the most difficult to

manage) strategy: they see the region as a production site for cheap reimports back into the home base; they see it as a source for lower-end world cars and components; and they see the region as a market.' Jürgens and Krzywdzinski (2009) examined the evolution of work models in the car industry to argue that work models in CEECs did not follow the low-road trajectory.

Furthermore, MNEs directly affect the export performance of host countries as they often play a leading role in organizing and shaping GVC activities (Ryan *et al*., 2020). Global value chains reinforce globalization, reshape the structure of international trade, increase direct collaborations between indigenous firms, and affect their performance. In recent years, Poland has emerged as one of the champions in GVCs and firms in Poland are actively engaged in European value chains. In particular, Germany is an important source of the 'imported' value added in other European countries' exports and has a large share of foreign VA in gross exports. Domestic value added in gross exports of Poland to the EU countries increased in the majority of sectors, including modern technology sectors (such as electrical and optical instruments) over the period of 1995-2011 (Taglioni & Winkler, 2016). Cieślik *et al.* (2021) investigated the relationship between foreign ownership of firms and innovation activities in a wide group of CEECs. In particular, they studied the effects of FDI and firms' participation in hierarchic GVCs on product, process, marketing, and organizational innovations. Their results show that participation within MNE GVC networks makes firms less likely to introduce innovations, especially product and marketing innovations and that this effect is particularly strong in CEECs.

However, no attempt so far has been made to study the link between business group memberships, technology intensity of exports and the probability of entering various types of markets for a new EU member state like Poland. This is surprising given the fact that Poland is the biggest country among the new member states that joined the EU in the first wave of the Eastern enlargement in 2004 and has strong business links to Germany (Taglioni & Winkler, 2016; Becker & Cieślik, 2020). Therefore, this article attempts to fill an existing gap in the literature. In particular, we hypothesized that companies that are members of international business groups, and hence enjoy better access to external resources, are more often integrated in GVCs, and are more likely to export than domestic firms. We can also expect that export performance depends on the country of origin of the lead company and the sector's technological advancement. In particular, we believe that members of international business groups organized by the EEA-based firms are more likely to export to European markets compared to the Polish firms and the members of the non-EEA-based firms. Moreover, in line with case study evidence, we hypothesized that membership in IBNs increases the probability of exporting in all sectors, including more technologically intensive goods and services. Our findings should contribute to a better understanding of firm-level determinants of the export performance of firms in Poland.

RESEARCH METHODOLOGY

Our dataset consisted of five runs of the Polish edition of the Community Innovation Survey. The survey included all of the manufacturing firms employing more than 49 people, as well as a sample of firms employing 10-49 people. The questionnaire did not cover micro firms employing fewer than 10 workers. For services, we surveyed a sample of firms from selected industries. In total, we have 74 218 observations from the 2012, 2014, 2016, 2018, and 2020 waves of CIS. The survey embraced a total of 34 521 unique firms (the panel was not balanced). Table 1 shows the breakdown of firms by the number of times they appear in the CIS.

Table 1. The number of firms surveyed in Poland's CIS database

Times in CIS	1	2	3	4	5
Number of firms	17 438	6 491	3 392	2 378	4 822

Source: CIS survey.

The CIS questionnaire was significantly modified in 2018 when scholars introduced the question of the estimated share of sales to three types of markets. Consequently, for the 2018 and 2020 editions of the CIS, we had the data on the estimated shares of sales to the domestic market (we call this variable

share_ntl) in 2018 and 2020 respectively. The firms also answered questions about their estimated shares of sales to the EU or associated countries (*share_EEA+*) and to other countries (*share_oth*). Our baseline analysis consisted of the estimation of double-censored Tobit models of these shares.

On the other hand, for earlier editions of the CIS (2012, 2014, and 2016) we only had dummy variables indicating whether a firm did or did not sell to a given market. We call these variables *market_ntl, market_EAA+,* and *market_oth,* respectively. These variables refer to the respective three-year periods, *e.g.* 2010-2012 for CIS 2012. Since these questions were not included in CIS in 2018 and 2020, we imputed the data based on the estimated shares, *e.g., market_ntl=1* if and only if *share_ntl>0.* We then validated the results from our Tobit regressions by estimating probit models that covered all five editions of the CIS.

As for the independent variables, we were particularly interested in the effects of participation in IBNs and the technology intensity of exports. We singled out domestic firms (standalone and those that belonged to Polish business groups) or those that belonged to IBNs. In the case of IBNs, we included dummies for the subsidiaries of multinational enterprises that were the largest foreign investors in Poland. In particular, we singled out four major countries of investors that included: Germany, France, the UK, and the US, which had the largest number of foreign subsidiaries in our sample.

Our control variables included the percentage of workers with higher education (our measure of human capital), dummies for the members of domestic groups of firms, variables related to the innovation performance of firms, and OECD technological categories (based on NACE-Rev-2 classification). We also controlled for firm size, because larger firms can exploit scale economies more easily. We controlled for the innovation performance of firms, because it can be correlated with a variety of firm capabilities that are important for exporting. However, we did not believe we could identify any causal relationship between innovation and exporting in our simple framework. Therefore, we did not interpret (or even report) the estimated coefficients. Due to the confidentiality conditions imposed by Statistics Poland, data on revenue and the exact number of employees were unavailable. Instead, we only had information on the firm size category (*i.e.,* small which is the reference, medium, and large).

In our baseline analysis, we started by estimating key dependent variables, *i.e. share_ntl, share_EEA+* and *share_oth.* Since these dependent variables are, obviously, from the [0-100] interval, for each variable, we applied a separate double-censored Tobit model. Specifically, we assumed that:

$$y_i = \begin{cases} 0 & \text{if} \quad y_i^* \leq 0 \\ y_i^* & \text{if} \quad 0 < y_i^* < 100 \\ 100 & \text{if} \quad y_i^* \geq 100 \end{cases} \tag{1a}$$

and

$$y_i^* = \mathbf{x_i}\boldsymbol{\beta} + \varepsilon_i \tag{1b}$$

in which y was one of our dependent variables (*e.g. share_ntl*), y^* was the respective latent variable, $\mathbf{x_i}$ was the vector of independent variables (see Table 1), $\boldsymbol{\beta}$ was the vector of parameters to be estimated, and we assumed that $\varepsilon_i \sim N(0, \sigma^2)$. In the context of these estimations, we also reported the marginal effects for both extensive and extensive margins.

In the next part of our analysis, we estimated separate probit models for *market_ntl, market_EAA+,* and *market_oth*. This is a series of probit models on a pooled dataset in which we lumped together observations from all five waves of the CIS (2012-2020). By analogy to (1a)-(1b), we considered the following specification:

$$z_i = \begin{cases} 0 & \text{if} \quad z_i^* \leq 0 \\ 1 & \text{if} \quad z_i^* > 0 \end{cases} \tag{2a}$$

and

$$z_i^* = \mathbf{x_i}\boldsymbol{\gamma} + \epsilon_i \tag{2b}$$

in which z was one of the binary dependent variables (*e.g. market_ntl*), the vector of explanatory variables $\mathbf{x_i}$ was the same as in the model (1a)-(1b), $\boldsymbol{\gamma}$ was the vector of parameters to be estimated and we assumed that $\varepsilon_i \sim N(0, \rho^2)$.

Finally, we extended our empirical analysis by including interactions between foreign business group

membership and the technological intensity of exports. In this way, we verified our hypotheses concerning the technological intensity of firms operating in Poland and exporting goods to various markets.

Table 2. Definitions of variables

No.	Variable	Description	Type of variable
Independent variables			
1.	*share_ ntl*	The share of firm's sales on the domestic market	continuous [0-100]
2.	*share_EEA+*	The share of firm's sales on the EEA+ market (EU, UK, NO, CH, IS and LI)	continuous [0-100]
3.	*share_oth*	The share of firm's sales on other foreign markets	continuous [0-100]
4.	*market_ ntl*	The firm sells to the Polish market	dummy
5.	*market_EEA+*	The firm sells to the EEA+ market	dummy
6.	*market_oth*	The firm sells to other foreign markets	dummy
Key explanatory variables			
7.	*group_DE*	Member of a group of firms and the parent company is located in Germany	dummy
8.	*group_US*	Member of a group of firms and the parent company is located in US	dummy
9.	*group_FR*	Member of a group of firms and the parent company is located in France	dummy
10.	*group_GB*	Member of a group of firms and the parent company is located in United Kingdom	dummy
11.	*group_foreign_oth*	Member of a group of firms and the parent company is located in other foreign country	dummy
12.	*Domestic*	Standalone firm or member of a group of firms and the parent company is located in Poland	dummy
Control variables (estimates not reported)			
13.	*Medium*	The firm has between 51 and 250 workers	dummy
14..	*Large*	The firm has more than 250 workers	dummy
15.	*high_ed*	Percentage of workers with higher education	continuous [0-100]
16.	*prod_inn*	The firm introduced product innovations in the last three years	dummy
17.	*proc_mnf_inn*	The firm introduced process innovations in the last three years	dummy
18.	*org_inn*	The firm introduced organizational innovations in the last three years	dummy
19.	*markt_inn*	The firm introduced marketing innovations in the last three years	dummy
20.	*Industry*	2-digit NACE-Rev 2 industry	categorical
21.	*Year*	year of the CIS	discrete
Technology interaction variables			
22.	*HT*	High-technology manufacturing	dummy
23.	*HTS*	High-tech services	dummy
24.	*MLT*	Medium-low-technology manufacturing	dummy
25.	*LTS*	Low-technology services	dummy
26.	*MHT*	Medium-high-technology manufacturing	dummy
27.	*LT*	Low-technology manufacturing	dummy
28.	*LTS*	Low-technology services	dummy

Note: EEA+ market includes EU, UK, Norway, Switzerland, Iceland and Liechtenstein.
Source: CIS survey.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 3 reports the descriptive statistics of our sample covering the period 2016-2020. We had 14 711 observations from the 2018 wave of CIS (2016-2018) and 14 010 from the 2020 wave (2018-2020). There were 8 597 firms covered by both runs of the survey.

The data summarized in Table 3 reveals that small firms were underrepresented in our sample. The share of medium firms was close to 47% and that of large firms – to 16% in 2020. Noteworthy, we surveyed all manufacturing firms employing more than 49 people and only a sample of firms employed 10-49 people. Moreover, for services firms, we looked at a sample of even larger companies. According

to Statistics Poland, a few years earlier in 2016, the composition of firms with at least 10 workers was as follows: small firms 64%, medium 20%, and large firms 7%. About 6% of firms belonged to foreign-owned companies; the largest shares of firms belonged to German (3.3%), American (0.9%), and French (0.8%) business groups. On the other hand, the overwhelming majority in the sample were Polish standalone firms or belonging to Polish business groups. They constituted our reference group. We noted that 70% of firms delivered their goods to the national market (PIE, 2019). Thus, the Polish market remains the most important market for most firms.

Table 3. Summary statistics for CIS 2020: Key variables

variable	share_ntl	share_EEA	share_oth	group_DE	group_US	group_FR	group_GB	group_oth	group_dom	medium	Large	high_ed
mean 2020	69.378	25.042	5.544	0.033	0.009	0.008	0.004	0.063	0.112	0.467	0.164	32.971

Source: own elaboration based on CIS data.

In the extension of our study, we analysed the exports of foreign-owned firms defined by technological categories. These subgroups are defined by the classification of Eurostat NACE technological categories of industries (see Table A1 in the Appendix for details).

Econometric Analysis: Baseline Results

Table 4 shows our baseline estimation results. We obtained them from the Tobit model, a model of the shares of revenue from sales to the national market, European market, and other markets, for the 2018-2020 period. In Table 4 and in all other estimations in this text, we included control variables for firm size, the level of human capital, innovation performance, and year and industry variables, as defined in Table 2.

Table 4. Tobit estimations based on CIS 2018 and CIS 2020

VARIABLES	(1)	(2)	(3)
	share_ntl	***share_EEA+***	***share_oth***
group_DE	-34.90***	35.92***	-1.695
	(1.529)	(1.479)	(1.208)
group_US	-45.68***	21.32***	28.86***
	(2.595)	(2.334)	(2.379)
group_FR	-32.46***	32.26***	3.090
	(2.594)	(2.473)	(1.988)
group_GB	-44.06***	38.63***	11.18***
	(3.477)	(3.273)	(2.715)
group_foreign_oth	-31.62***	28.57***	7.354***
	(1.073)	(1.031)	(0.852)
Constant	119.9***	-20.90***	-41.17***
	(1.300)	(1.230)	(1.272)
Observations	28 721	28 721	28 721
Uncensored	18078	17571	9122
Left-censored	1315	10333	19351
Right-censored	9328	817	248
F-test	150.9	125.7	40.82
Prob > F	0	0	0
Pseudo-R2	***0.0457***	***0.0425***	***0.0380***

Note: *** p<0.01, ** p<0.05, * p<0.1. Industry, firm size, level of human capital, innovation performance, industry and time controls included (not reported); robust standard errors in parentheses.
Source: own study.

In Table 4, almost all variables were significant at the 1% level and displayed expected signs. The reference group was a standalone Polish firm or a member of a group of firms when the parent company was located in Poland. Column (1) reports the estimation results associated with a relative share of sales to the national market. Implicitly, being a Polish firm is positively related to a higher share of sales in the national market, while memberships in IBNs significantly reduces this share. It means that international business groups have a much larger scale of operation in comparison to national market. The firms from the American and the British IBNs are the most outward-oriented (least oriented towards the Polish market), while the firms belonging to the European IBNs (Germany and France) are slightly less so.

Column (2) reports the estimation results for the EEA+ market. Being a Polish firm (a reference group) reduced the share of sales to EEA+. On the other hand, being a member of a foreign IBN significantly increased the share of sales on the EEA+. The increase in the share of sales to an EU market presence was especially high in the case of members of British, German and French IBN; the estimated parameter values for American and other countries' business groups were also positive but of a lower magnitude. Thus, pro-EEA+ market orientation was the strongest among European IBN, and (probably) reflects the trade and financial liberalization within the Single European Market (SEM). In the case of membership of French business groups, the estimate for EEA+ was higher in comparison to the non-EEA+ market.

Finally, column (3) reports the estimation results for the share of sales to non-EEA+ markets. The major non-EEA+ export markets for Poland in 2019 were Russia (3.0% of exports), the US (2.8%), Ukraine (2.0%), China (1.0%), Turkey (0.78%), and Belarus (0.69%) (see: https://oec.world/en/profile/country/pol). The role of IBN for exports to non-EEA+ countries was somewhat different in comparison to European markets. Membership in a US business group had the strongest positive effect on exports to other markets. The membership in the UK and other business groups had also a positive effect on these exports. These results probably reflect the global scope of operation, including the GVCs, of American, British, or other business groups. Meanwhile, the membership in German and French IBN had no significant effect on the share of sales to non-European markets in comparison to Polish firms. This result probably reflects a large share of Russian, Ukrainian, and Belarusian markets in Poland's exports, where EU firms were probably less active compared to Polish ones. This might be also explained by the fact that German firms organize their GVCs mostly among European firms (Taglioni & Winkler, 2016).

To complete the picture we report in Table 5 the marginal effects of the IBN variables of our baseline Tobit model. For this type of model, we had two types of marginal effects. Noteworthy, the intensive margin was from 0 to 100, while the extensive margin – from 0 to 1.

Table 5. Marginal effects of IBN membership (cf. Table 4)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	intensive share_ntl	**intensive share_EEA+**	**intensive share_oth**	**extensive market_ntl**	**extensive market_EEA+**	**extensive market_oth**
group_DE	-34.90***	35.92***	-1.695	-0.921***	0.819***	-0.0375
	(1.529)	(1.479)	(1.208)	(0.0605)	(0.0622)	(0.0473)
group_US	-45.68***	21.32***	28.86***	-1.220***	0.361***	0.654***
	(2.595)	(2.334)	(2.379)	(0.0813)	(0.0809)	(0.0711)
group_FR	-32.46***	32.26***	3.090	-0.750***	0.739***	0.162**
	(2.594)	(2.473)	(1.988)	(0.114)	(0.0991)	(0.0825)
group_GB	-44.06***	38.63***	11.18***	-1.126***	0.742***	0.347***
	(3.477)	(3.273)	(2.715)	(0.102)	(0.107)	(0.0961)
group_foreign_oth	-31.62***	28.57***	7.354***	-0.812***	0.521***	0.262***
	(1.073)	(1.031)	(0.852)	(0.0438)	(0.0358)	(0.0308)
Constant	119.9***	-20.90***	-41.17***	2.487***	-0.674***	-1.369***
	(1.300)	(1.230)	(1.272)	(0.0899)	(0.0348)	(0.0372)
Observations	28 721	28 721	28 721	28 155	28 721	28 721

Note: Industry, firm size, level of human capital, innovation performance, industry and time controls included (not reported); robust standard errors in parentheses.
Source: own study.

Firstly, we reported the intensive margin, *i.e.* the average increase in the variable *assuming* that it is inside the interval (columns (1)-(3) in Table 5. For instance, conditional on the firm having *some* exports, a firm belonging to German IBN has a share of EEA+ exports that was 35.9 percentage points higher than an average firm in the sample.

Columns (4)-(6) of Table 5 report the intensive margin, *i.e.* the average increases in the probability of selling to a specific market. Apparently, the probability that a German-owned firm sells to the EEA market was 0.819 higher than the probability of an average firm selling to this market. This effect was a bit stronger than for French and British IBNs and substantially higher than for US-owned IBNs. Hence, these results show a higher probability of starting and expanding exports to the EEA+ market of firms that belong to German, French, and British IBNs.

The baseline Tobit estimations reported in Tables 4 and 5 were based on the 2018 and 2020 editions of CIS. To validate them, we additionally performed a series of probit models on a pooled dataset, in which we merged observations from all five waves of the CIS, covering the period 2010-2020. In this case, the dependent variable was also a dummy indicating if the firm was selling to a given market or not. Table 6 shows the results of these estimations.

Table 6. Baseline probit estimations for the period 2010-2020

VARIABLES	(1)	(2)	(3)
	market_ntl	***market_EEA+***	***market_other***
group_DE	-0.672***	0.848***	0.0460
	(0.0477)	(0.0489)	(0.0384)
group_US	-0.995***	0.411***	0.607***
	(0.0651)	(0.0661)	(0.0578)
group_FR	-0.494***	0.671***	0.251***
	(0.0886)	(0.0770)	(0.0634)
group_GB	-0.736***	0.755***	0.239***
	(0.0861)	(0.0883)	(0.0795)
group_foreign_oth	-0.403***	0.193***	0.0612***
	(0.0220)	(0.0173)	(0.0171)
Constant	0.755***	-0.930***	-1.377***
	(0.0359)	(0.0330)	(0.0338)
Observations	74,216	74,216	74,216

Notes: Robust standard errors in parentheses. Industry, firm size, level of human capital, innovation performance, industry, and time controls included (not reported); robust standard errors in parentheses.
Source: own study.

The results in Table 6 support conclusions regarding the market choices of firms in Poland. Those belonging to foreign IBNs had a lower probability of entering the national market than Polish reference firms and were much more export-oriented. Firms from European IBNs (German, British, and French) had a higher probability of entering the EEA+ market, while firms belonging to the US IBNs were more outward-oriented, towards other markets.

Extended Analysis: The Interaction Between Capital Groups and the Technological Intensity of Exports

To enrich our analysis, we analysed the structure of the technological intensity of exports of foreign IBNs. Table 7 reports the results of the extended study that includes interactions between foreign IBN membership and the technological intensity of exports as defined by the OECD categories. This allowed us to verify our hypotheses concerning the technological intensity of firms operating in Poland. Therefore, we made estimations for various subgroups of foreign-owned firms. The extended analysis focused on the main foreign business groups and we skipped the estimations for Polish firms and other countries IBNs.

Table 7. Extended estimations with interactions between foreign business group membership and technological intensity

VARIABLES	-1	-2	-3	VARIABLES	-1	-2	-3
	share_ntl	share_EEA	share_oth		share_ntl	share_EEA	share_oth
DE_HT	-40.00***	46.64***	-11.58*	FR_HT	-22.58*	33.23***	-20.86
	-8.405	-8.359	-6.225		-11.64	-10.71	-14
DE_HTS	-29.38***	36.29***	-6.123	FR_HTS	-21.47***	26.73***	-3.056
	-5.91	-5.516	-4.458		-6.219	-5.917	-4.536
DE_LT	-36.82***	37.50***	-1.284	FR_LT	-26.21***	25.40***	6.356
	-3.015	-2.927	-2.632		-6.492	-5.955	-5.207
DE_LTS	-6.887	8.483*	-5.62	FR_LTS	-12.52	4.468	-7.466
	-4.773	-4.55	-3.752		-11.56	-10.76	-9.386
DE_MHT	-30.36***	30.68***	-6.758***	FR_MHT	-36.65***	38.51***	-4.92
	-3.241	-3.238	-2.557		-5.512	-5.658	-4.223
DE_MLT	-25.63***	26.51***	-0.958	FR_MLT	-18.30***	16.17***	4.094
	-2.764	-2.605	-2.132		-5.334	-5.212	-3.8
US_HT	-44.26***	15.09**	30.19***	GB_HT	-47.51***	61.05***	-0.943
	-10.89	-6.939	-10.97		-4.26	-4.104	-3.163
US_HTS	-44.26***	13.76***	34.48***	GB_HTS	-51.23***	47.89***	7.987
	-5.688	-4.916	-5.217		-7.176	-7.354	-5.679
US_LT	-43.93***	30.38***	21.12***	GB_LT	-23.05***	28.66***	-5.832
	-6.375	-6.133	-5.811		-8.834	-8.197	-5.889
US_LTS	-12.17	-3.671	13.59	GB_LTS	-18.30*	16.34	4.461
	-10.84	-9.839	-10.07		-10.34	-9.983	-7.934
US_MHT	-31.91***	11.10**	18.67***	GB_MHT	-43.30***	33.52***	7.772
	-4.866	-5.446	-4.272		-8.671	-8.848	-6.932
US_MLT	-36.44***	24.82***	18.01***	GB_MLT	-31.67***	23.08***	18.29***
	-5.16	-5.03	-4.307		-7.855	-7.012	-5.639
Constant					123.0***	-23.70***	-42.24***
					-1.35	-1.276	-1.293
Observations					28 721	28 721	28 721
Uncensored					18 078	17 571	9 122
Left-censored					1 315	10 333	19 351
Right-censored					9 328	817	248
F-test					489.4	657.3	38.39
Prob > F					0	0	0
Pseudo-R2					***0.0393***	***0.0368***	***0.0362***

Notes: Abbreviations for analyzed sectors: HT: High-technology manufacturing; HTS: High-tech services; MLT: Medium-low-technology manufacturing. LTS: Low-technology services; MHT: Medium-high-technology manufacturing; LT: Low-technology manufacturing. The detailed list of OECD categories is listed in the Appendix. Control variables included (not reported); robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: own study.

The results for the EEA+ market, reported in columns (2), show that IBN memberships increased the estimated shares of sales to the EEA market for most sectors. This pattern was especially visible in the case of German and British subsidiaries. The EEA+ market orientation was pronounced in all six subsectors of German and French IBNs, and in five subsectors in the case of the American and British firms. German IBNs were especially active in high-tech manufacturing and services and in low-tech sectors. We observed a similar pattern towards high-tech sectors in the case of British and French IBNs, while the American IBNs were more oriented towards low-tech sectors.

Column (3) reports the results obtained for exports to non-European markets. They show that membership in the American IBNs matters for almost all sectors. The highest values were reported for high-tech manufacturing and services sectors, and they were not significant for low-tech services.

There was no clear pro-export orientation towards non-European markets in the case of members of German and British IBNs; which was in line with expectations.

CONCLUSIONS

In this article, we explored the relationships between market choice, business group memberships, and technological intensity of Polish manufacturing and services firms in 2010-2020. We based our firm-level analysis on five runs of the Polish edition of the Community Innovation Survey. Specifically, we analyzed the decision of the firms to sell in one or more geographical markets, namely national, European (EEA+), and non-EEA+, and evaluated how firms differ in terms of firm business group membership and technology characteristics. In line with our literature-based predictions, being a member of IBNs increased the probability of exporting. However, the effects differed by the lead company's country of origin. The increase in the probability of EEA+ market presence was especially high in the case of German, British, and French business groups and less visible in the case of the American business groups. On the other hand, membership in the American, and British business groups increased the probability of selling to non-EEA+ markets.

We extended the baseline analysis by looking at the interaction between international business group membership and technological intensity of exports. The membership in IBNs increased the probability of exporting to the EEA+ market in the majority of sectors. This pattern was especially visible in the case of German and French subsidiaries. The highest values of estimates in the case of German business groups were visible in the case of high-tech sectors (manufacturing and services) and in low-tech, medium-high-tech sectors. In the case of French subsidiaries, we observed the highest probability in high-tech sectors. It was also high in the case of medium high-tech and high-tech services. The pattern of EEA+ export orientation of British and American business groups was also quite noticeable but more diversified. Noteworthy, membership in all foreign business groups increased the likelihood of exporting high-tech services but rarely in low-tech services.

Thus, the firms located in Poland that are members of IBNs enjoy better access to external resources, are more often integrated into GVCs, and are more likely to export than domestic firms. The members of IBNs organized by European-based firms were more likely to export to the EEA+ markets compared to the domestic firms and the members of the non-EEA-based firms. Our study showed the essential role of European integration for exports of firms based in Poland. In particular, the importance of proximity to large European markets is essential for managers of all firms that operate in Poland, especially those that are members of IBNs. It also showed that the risk of technologically stagnant 'East' – 'West' networks, similar to Mexican *maquilladora,* based mainly on the low cost of labour, did not materialize. Polish firms, members of IBNs, are active in both high-tech manufacturing and services and not only in low-tech or medium-low sectors. The main limitation of our study was its focus on a single country. Therefore, in future studies, researchers need to extend the analysis of IBNs to include other CEECs**.**

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Appendix A: Classification of manufacturing industries in the sample by technology intensity

High-technology manufacturing	NACE-Rev-2 code
Manufacture of basic pharmaceutical products and pharmaceutical preparations	21
Manufacture of computer, electronic and optical products	26
Medium-high-technology manufacturing	
Manufacture of chemicals and chemical products	20
Manufacture of electrical equipment	27
Manufacture of machinery and equipment n.e.c.	28
Manufacture of motor vehicles, trailers and semi-trailers	29
Manufacture of other transport equipment	30
Medium-low-technology manufacturing	
Manufacture of coke and refined petroleum products	19
Manufacture of rubber and plastic products	22
Manufacture of other non-metallic mineral products	23
Manufacture of basic metals	24
Manufacture of fabricated metal products, except machinery and equipment	25
Low-technology manufacturing	
Manufacture of food products	10
Manufacture of beverages	11
Manufacture of tobacco products	12
Manufacture of textiles	13
Manufacture of wearing apparel	14
Manufacture of leather and related products	15
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	16
Manufacture of paper and paper products	17
Printing and reproduction of recorded media	18
Manufacture of furniture	31
Other manufacturing	32
High-tech services	
Air transport	51
Publishing activities	58
Motion picture, video and television programme production, sound recording and music publishing activities	59
Programming and broadcasting activities	60
Telecommunications	61
Computer programming, consultancy and related activities	62
Information service activities	63
Financial service activities, except insurance and pension funding	64
Insurance, reinsurance and pension funding, except compulsory social security	65
Activities auxiliary to financial services and insurance activities	66
Low-tech services	
Wholesale trade, except for motor vehicles and motorcycles	46
Land transport and transport via pipelines	49
Warehousing and support activities for transportation	52
Postal and courier activities	53

Source: Eurostat (2021).

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The contribution share of authors was equal and amounted to ⅓ for each of them.
AC – conceptualisation, literature writing, JM – methodology, KS – calculations, discussion.

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Conflict of Interest

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Access to sources of stable, sustainable, and modern energy as a goal of sustainable development in the European Union: Are the Scandinavian countries leading the energy transition?

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ABSTRACT

Objective: The objective of the article is to classify European Union (EU) member states according to similarity in the area of sustainable development goal 7 (SDG7) of the United Nations (UN) Agenda 2030 on affordable and clean energy.

Research Design & Methods: We conducted a hierarchy of EU countries using the linear ordering method due to the level of achievement of sustainable development goal 7 based on indexes available in the Eurostat database for the years 2015 and 2021. We preceded the selection of the method for ordering objects by applying several procedures (Hellwig method (HELLWIG); Technique for order of preference by similarity to ideal solution (TOPSIS); standardized value Sums method (SSW); zeroed unitarization method (IUCN) proposed in the literature. Next, we used a procedure to support the selection of the method based on the measure of inter-ranking comparisons. Moreover, we singled out high-performing countries and countries that require increased attention and support to facilitate the transition to a greener energy economy.

Findings: The article presents the ranking of countries by level of achievement of SDG 7 in 2021 and 2015 using the IUCN method. The hypotheses that proclaim the Scandinavian countries (Sweden and Denmark) as leaders in the implementation of SDG7 in the European Union and forming the cluster with the highest degree of SDG7 implementation were verified positively. The results obtained for each group of countries indicate strong development disparities among member countries in the area of clean and accessible energy in its various aspects.

Implications & Recommendations: The econometric optics proposed in the study and its results can help classify EU member states in terms of achieving SDG7 for researchers and policymakers. Scholars may supplement the proposed research approach with further measures of clean and accessible energy beyond the SDG7 monitoring indexes. Such indexes could include energy prices, which affect the scale of energy poverty, or the level of greenhouse gas emissions on which environmental well-being depends, among others.

Contribution & Value Added: The study narrowed the knowledge gap on the choice of the linear ordering method for objects, often used in socio-economic research. The use of an original research approach different from previous work for the new timeframe supports filling the research gap in empirical studies concerning the classification of European Union member states in terms of SDG7 implementation.

Article type:	research article
Keywords:	sustainable development; clean energy; accessible energy; SDG 7; EU countries; classification; typology; sustainable development goal; sustainable energy management
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INTRODUCTION

The concept of sustainable development is a response to the destructive impact of human economic activity on environmental well-being. This concept has evolved over the years. Initially, it assumed the need to eliminate the negative impact of economic development on the environment. Today, scholars view it through the prism of a balance between respect for environmental well-being, social development, and economic growth. Graczyk (2017) indicates that in the context of sustainable development, sustainable energy development is of particular importance. It is the process of sustainable, safe, and efficient provision of energy for sustainable development. Patterson (2009) defines sustainable energy as energy consumption and production that meet the needs of parents without depriving children of the opportunity to meet their needs in the future. Lorek (2007) notes that the implementation of measures to support sustainable energy requires the implementation of sustainable energy policies, which we should aim at maintaining a balance between meeting social needs, energy security, economic competitiveness, and environmental protection.

The realisation of the concept of sustainable development in terms of economic practice is the document Agenda 2030 (*Transforming our world: The 2030 Agenda for Sustainable Development, 2015)* by the United Nations (UN). The document includes 17 major sustainable development goals, under which the UN identified a total of 169 tasks. It is a follow-up document (*Agenda 21*, 1992) covering the 21 millennium development goals presented by the UN at a conference in 1992 and enshrined in the UN Millennium Declaration in 2000 (Millennium Development Goals and Beyond, 2015). Scholars see sustainable development goals as an opportunity for global society due to the shift in focus in global politics and the possibility of putting the world on a sustainable growth path.

Among all the 17 sustainable development goals identified in the 2030 Agenda, the one that directly addresses the issue of energy management is Goal 7 aimed at ensuring access to affordable, reliable, sustainable and modern energy for all (*Transforming our world: the 2030 Agenda for Sustainable Development, 2015)*. Energy is a sector that can play an important role in mitigating climate change because of its potential to transform into clean energy (Muntean *et al.*, 2021). The first task identified under this goal is to increase the availability of clean and affordable energy (7.1). Energy availability is an important determinant of economic development (Marcillo-Delgado *et al.*, 2019), supports poverty alleviation and sustainable industrialisation and urbanisation (Chirambo, 2018), determines the satisfaction of human needs, and is essential in many areas, such as transportation, heating and cooling, electricity for equipment and production processes, for example (Chovancová & Vavrek, 2022). The second task is to increase the share of renewable energy sources in the global energy mix (7.2), whose role is particularly important in terms of creating sustainable development, reducing negative climate change by reducing carbon emissions, and strengthening energy security (Swain & Karimu, 2020). The third task assumes a doubling of the growth rate of global energy efficiency (7.3). Energy efficiency and renewable energy sources complement a sustainable energy economy (Salvarli & Salvarli, 2020). Increasing energy efficiency translates into lower energy requirements for renewable energy development and availability, reducing the burden of obtaining each (McCollum, 2017) and reducing the negative impact of energy on environmental well-being.

Another task (7.A.) includes the need to increase international cooperation for research on clean energy technologies, more advanced, and less environmentally damaging fossil fuel technologies, energy efficiency, and promoting the undertaking of investments in energy infrastructure and environmentally friendly energy technologies (*Transforming our world: the 2030 Agenda for Sustainable Development, 2015)*. Conducting research and development activities is important in terms of creating innovation in the energy sector (Bointner, 2014). Energy innovation is particularly important in the context of combating climate change and reducing greenhouse gas emissions (Mallett, 2015). The final task is to expand infrastructure and modernise technologies that enable access to modern and sustainable energy services (7.B.) (*Transforming our world: the 2030 Agenda for Sustainable Development, 2015)*. The premise of developing infrastructure and sustainable energy services in all countries is the result of the close connection between SDG7 and the Fourth Industrial Revolution (Muntean *et al.*, 2021).

The energy transition of European Union member states based on the concept of sustainable energy corresponds to the goals set under SDG7. Continuing to make progress in the area of clean and accessible energy, supporting decarbonisation and, thus, environmental well-being, will require the pursuit of a well-considered energy policy. Meeting the challenges facing the European Union in pursuing energy policy and building a sustainable energy economy requires simultaneous consideration of many areas, such as energy security, meeting social needs, the competitiveness of the economy, and concern for environmental well-being.

The European Union's energy policy is grappling with several energy challenges, including reducing dependence on fossil fuel imports, increasing energy efficiency, developing renewable energy sources, and decarbonising or integrating energy markets. Measures aimed at creating an integrated energy market and ensuring energy security and stability in the energy sector are at the core of the European Union's energy policy. As agreed in 2014 (with a review conducted in 2018), the energy goals for 2030 are to increase the percentage of renewable energy in total energy consumption to 32%, increase energy efficiency by 32.5%, and realise interconnections covering no less than 15% of the EU's electricity systems (Energy policy: General principles 2023). Noteworthy, the REPowerEU Plan (2022) indicates a desire to increase the share of renewables in global energy consumption to 45% in 2030. The energy package Fit for 55: Delivering the EU's 2030 Climate Target on the way to climate neutrality (2021) indicates the need to reduce net emissions by no less than 55% by 2030, compared to 1990 levels, and to make Europe the first climate-neutral continent by 2050. These targets are in the nature of commitments set out in the first European climate law, as well as providing opportunities in the areas of innovation, investment and jobs. The intensification of actions taken within the European Union's energy policy framework supports the implementation of the tasks set under SDG7.

Previous research on the progress of clean and accessible energy in the European Union in light of SDG7 is limited to one selected ordering method. The research problem is the question of which ordering method is optimal for classifying EU member states in terms of achieving SDG7. We made a hierarchy of EU countries using the linear ordering method due to the level of achievement of SDG Goal 7 based on indexes available in the Eurostat database for 2015 and 2021. The choice of the method of ordering objects was preceded by the application of several procedures (HELLWIG, TOPSSIS, SWW, IUCN) proposed in the literature, and then we used a procedure to assist in the choice of the method based on the measure of inter-ranking comparisons. Moreover, we singled out high-performing countries along with countries that require increased attention and support to facilitate the transition to a greener energy economy. The use of an original research approach different from previous work for the new timeframe supports filling the knowledge gap in the selection of a linear ordering method for objects, often used in socio-economic research. We aimed to classify the European Union member states according to their similarity in the area of sustainable development goal 7 of the UN 2030 Agenda on affordable and clean energy. The empirical data included in the study comes from the Eurostat database (2023) and covers the years 2015-2021. We chose this period because of the data availability for the SDG 7 implementation period to date.

The article is organised into several chapters. The next section will include a literature review and hypotheses development, which presents the state of knowledge to date on assessing the progress of SDG7 implementation in European Union member states. The next section will include research methodology, which will present the indexes and linear ordering methods used to assess the progress of SDG7 in European Union member countries. The next section will present results and discussion, including the rankings of European Union countries in terms of SDG7 implementation in 2015 and 2021, rankings of countries according to the value of selected indexes in 2021, and groups of similar countries in terms of SDG7 implementation levels. The last part of the work will present conclusions, the implications for economic practice, limitations, and potential future research directions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The development of affordable and clean energy is particularly important, because it also determines the achievement of selected goals in areas of the economy other than energy. The interactions between

SDG7 and the other sustainable development goals have been the subject of many studies, the results of which can be a valuable resource for researchers and those responsible for implementing these goals. Maduarai Elavarasan *et al.* (2021) postulate the view that one of the foundations for the implementation of the other SDGs is to shape sustainable development based on SDG7. Nillson *et al.* (2016) point to examples of how SDG7 interacts with selected SDGs. For example, increasing coal burning to improve energy access (SDG7), would have devastating impacts on environmental well-being by accelerating climate change and ocean acidification (SDG13, SDG14), as well as worsening community health (SDG3). In contrast, engaging agricultural land for bioenergy production (SDG7) could negatively impact food security (SDG2) and the end of poverty (SDG1), albeit reversible. In contrast, the supply of energy to homes positively affects education, but improving education does not directly determine energy, so it is a one-way interaction. Le Blanc (2015) indicates interactions between SDG7 and poverty (SDG1), inequality (SDG10) and responsible consumption and production (SDG12). He also notes the lack of consideration of the link between energy and economic infrastructure in the sustainable development goals.

The literature covers the classifications of European Union member states in the area of affordable and clean energy. The completed studies resulted in a division of EU economies into clusters or a classification according to the degree of implementation of SDG7. These studies were characterised by variation, for example, in terms of the econometric methods used, the selection of variables or the period considered. The results obtained in studies that have divided member countries into clusters vary in terms of the number of clusters, from dividing them into 4 clusters (Firoiu *et al.*, 2021), to distinguishing five clusters (Włodarczyk *et al.,* 2021), to distinguishing 11 clusters (Rybak *et al.,* 2021). Chovancová and Wawrek (2022) presented different research optics, where determining the best and worst countries allowed for comparison with other countries (Table 1).

Firoiu *et al.* (2021) analysed the dynamics of the implementation of the goals of the seventh sustainable development goal in the European Union member countries in 2015 and 2019. The empirical study resulted in five clusters covering the European Union countries in 2019. Within the first cluster (A_2019), they identified 10 countries. Among others, they were characterized by the highest average value of energy productivity in the EU and an average value of dependence on energy imports higher than the EU average. The second cluster (B_2019) included five countries. Among others, it was characterised by the lowest average value of energy productivity in the European Union and slightly higher than the EU average values of the share of renewable energy in total energy consumption and dependence on energy imports. In cluster three (C_2019), Firoiu *et al.* identified eight countries identified. This cluster was characterised, among others, by the lowest average value of dependence on energy imports and the highest average value of renewable energy in total energy consumption among the European Union countries. In contrast, the fourth cluster (D_2019) brought together 4 countries and was characterised, among others, by the highest average value of dependence on energy imports and the lowest share of renewable energy in total energy consumption. The study indicated an increase in the commitment of EU member countries to the seventh sustainable development goal and observed an increase in the number of top-performing countries from 4 in 2015 to eight in 2019.

Rybak *et al.* (2021) conducted a study on the progress in the integration of energy markets in the European Union member states. The analysis resulted in a division into 10 clusters in 2019. Bulgaria was classified in cluster 0, which had the lowest energy productivity level and the highest population unable to heat their homes due to poverty levels among EU member states. On the other hand, Cyprus and Estonia were assigned to separate clusters due to their exceptionally high levels of dependence on energy imports among EU countries. Ireland was placed in a separate cluster due to its highest level of energy productivity. Cluster eight included two of the 4 Visegrad Group countries, Poland and the Czech Republic, plus Slovenia and Romania. Characteristics of this cluster included similar levels of energy productivity and dependence on energy imports. On the other hand, Cluster 9 included countries with similar levels of dependence on energy imports. Cluster 10 brought together EU leaders in terms of, among others, the share of renewable energy in total energy consumption. In conclusion, the formation of the mentioned clusters was mainly due to the different energy mix of EU member states, energy productivity, dependence on energy imports, and the population being unable to heat their homes due to poverty levels. Rybak *et al.* (2021) observed the main differences between the countries of the 'old' and 'new' European Union.

Table 1. The overview of selected studies on the implementation of SDG7 in European Union member states

Firoiu *et al.* (2021)	
Research period	2015, 2019
Variables	primary energy consumption, final energy consumption, energy productivity, share of renewable energy in gross final energy consumption, energy import dependency, population unable to keep the home adequately warm by poverty status
Selected results	the year 2019: *Cluster A*: BE, DE, GR, HU, IE, IT, NL, PT, SK, ES; *Cluster B*: AT, HR, LV, PL, SI; *Cluster C*: BG, CZ, DK, EE, FI, FR, RO, SE; *Cluster D*: CY, LT, LU, MT
Research method	Hierarchical cluster analysis
Rybak *et al.* (2021)	
Research period	2000, 2019
Variables	primary energy consumption, primary energy consumption per capita, final energy consumption, final energy consumption per capita, final energy consumption in households per capita, energy productivity, share of renewable energy % 2005, energy import dependency, energy import dependency oil and petroleum, energy import dependency solid fossil fuels, energy import dependency natural gas, population unable to keep the home adequately warm by poverty status % 2005, greenhouse gas emissions intensity of energy consumption
Selected results	year 2019: *Cluster 0*: BG; Cluster *1:* CY; Cluster *2:* DK; Cluster *3:* EE; Cluster *4:* DE, FR; *Cluster 5*: IE; Cluster *6:* LU; Cluster *7:* MT, GR; Cluster *8:* PL, CZ, SI, RO; Cluster *9:* LT, LV, PT, ES, IT, BE, NL, HR, HU, AT, SK; Cluster *10*: SE, FI
Research method	Surface trend analysis, hierarchical cluster analysis
Włodarczyk *et al.* (2021)	
Research period	2019
Variables	energy productivity, the share of renewable energy in transportation, the share of renewable energy in electricity, the share of renewable energy in heating and cooling, energy import dependency, greenhouse gas emissions intensity of energy consumption
Selected results	year 2019: *Cluster A*: AT, DE, GR, IE, IT, PT, ES; *Cluster B*: BE, CY, LT, LU, MT; *Cluster C*: BG, HR, EE, RO, SI; Cluster *D*: CZ, FR, HU, NL, PL, SK; Cluster *E*: DK, FI, LV, SE.
Research method	Hierarchical cluster analysis
Chovancová and Wawrek (2022)	
Research period	2010-2017
Variables	primary energy consumption per capita, final energy consumption per capita, energy productivity, production of renewable energy, energy import dependency by products, population unable to keep the home adequately warm by poverty status, total greenhouse gas emissions including land-use change and forestry
Selected results	Classification: SE, AT, DK, FI, LV, HR, SI, EE, FR, RO, ES, CZ, DE, SK, PL, UK, HU, IE, IT, NL, PT, GR, LT, BE, MT, BG, CY, LU
Research method	The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)

Note: AT: Austria, BE: Belgium, BG: Bulgaria, CY: Cyprus, CZ: Czechia, DE: Germany, DK: Denmark, EE: Estonia, ES: Spain, FI: Finland, FR: France, GR: Greece, HR: Croatia, HU: Hungary, IE: Ireland, IT: Italy, LT: Lithuania, LU: Luxembourg, LV: Latvia, MT: Malta, NL: Netherlands, PL: Poland, PT: Portugal, RO: Romania, SE: Sweden, SI: Slovenia, SK: Slovakia
Source: own study based on Firoiu *et al.*, 2021; Rybak *et al*., 2021; Włodarczyk *et al*., 2021; Chovancova & Wawrek, 2022.

In their study, Włodarczyk *et al.* (2021) investigated the relationship between sustainability and renewable energy sources in European Union member states. Based on the empirical analysis, they identified five clusters in 2019. Cluster 1 (A_2019) included 7 countries. The characteristic feature of this cluster was the highest average energy productivity relative to the other clusters, as well as above EU average results regarding, among others, average values of dependence on energy imports or the share of renewable energy in energy consumption. Another cluster (B_2019) included 5 countries, and the distinguishing feature of this cluster was the highest average value of dependence on energy imports. In contrast, the distinguishing feature of yet another cluster (C_2019) was, among others, the lowest average value of energy productivity compared to the other clusters. On the other hand, Cluster D_2019 included six countries and was the cluster with the lowest average share of renewable energy in heating and cooling relative to the other clusters. The last cluster E_2019, included 4 countries and

its average value of renewable energy share in energy consumption in all areas (electricity, transportation, heating and cooling) was the highest relative to the other clusters.

The article by Chovancová and Wawrek (2022) assessed the progress of the seventh sustainable development goal in the European Union from 2010 to 2017. Based on a multi-criteria assessment, the highest-ranked European Union member country was Sweden, which was due to its results in the area of renewable energy production. Nevertheless, the results in terms of energy productivity were far from ideal, which indicated that even the top-ranked country in 2017 has some room for improvement. On the other hand, the lowest-ranked country was Luxembourg, which was due to, among others, a high percentage of energy consumption per capita or household, high dependence on energy imports, and total greenhouse gas emissions. Despite its last place, the country scored positively in terms of the percentage of the population that is unable to adequately heat their homes due to their poverty status. Concluding, none of the EU economies have fully succeeded in considering the indexes and the reasons for this are the variation in geographical or cultural conditions and the policy priorities of individual countries.

The compilation of the studies included in Table 1, shows variation in terms of the final set of criteria for classifying EU Member States in terms of the degree of SDG7 implementation. Nevertheless, some repetition is apparent in the selected SDG7 areas. All studies used indicators on energy productivity, renewable energy, and energy import dependency. However, Firoiu *et al.* (2021), Rybak *et al.* (2021), Włodarczyk *et al.* (2021), included the indicator population unable to keep home adequately warm by poverty status as a measure of energy poverty. The aforementioned indicators are characterised not only by their interaction but also by their complementarity in the ongoing energy transition.

Interpretations of energy productivity include the amount of economic product produced per unit of energy consumed. Improved energy productivity implies a reduction in energy consumption and is synonymous with reduced carbon dioxide production (Zhou *et al.*, 2024) which positively impacts environmental well-being (Aydin & Erdem, 2024). Improved energy productivity through reduced energy consumption implies relatively high economic output (Ding *et al.*, 2021). From an economic point of view, energy productivity is also equated with a measure of the savings that can be made through non-conventional energy sources (Huaman & Xiu Jun, 2014). Renewable energy sources are a remedy for depleting fossil fuel resources, which currently have a leading position in the global energy market (Østergaard *et al.*, 2022). Unfortunately, fossil fuels have a negative impact on the well-being of the environment, making it necessary to replace them with another energy source. In this situation, the most cost-effective alternative is the development of renewable energy sources (Olabi & Abdelkareem, 2022). Renewable energy sources play a special role in developing a sustainable energy economy by improving access to energy for society, reducing pollution, and supporting poverty reduction, and local socio-economic development activities (Algarni *et al.*, 2023). By reducing production costs, renewable energy sources can determine production growth and job creation and support improved energy security (Carfora *et al.*, 2022). Energy security is inextricably linked to the level of dependence on fossil fuel imports. In the context of the war in Ukraine, the independence of EU member states from imports of conventional energy sources from Russia is an absolute priority (Firlej & Stanuch, 2023). A solution to support the security of supply and meet energy demand can be the development of renewable energy sources (Firlej *et al.*, 2024). In the context of the implementation of SDG7, in addition to energy productivity, renewables, and dependence on fossil fuel imports, the issue of energy poverty, among others, is relevant. One indicator of fuel poverty is the population being unable to keep home adequately warm by poverty status. Improvements in this area can be reflected in a reduction in citizens' medical costs, a higher quality of life and an increased interest in becoming economically active among the population (Biernat-Jarka *et al.*, 2021). A search of the literature suggests a particularly high level of clean and accessible energy development in the Scandinavian countries that are members of the European Union. Sweden and Denmark were ranked first and third among European Union countries in the work of Chovancová and Wawrek (2022). In contrast, in two separate studies (Firoiu *et al.*, 2021; Włodarczyk *et al.*, 2021), Sweden and Denmark were in the same clusters, both of which had, among others, the highest average share of renewable energy sources in total energy consumption and the lowest average greenhouse gas emissions. In contrast, in the study by Rybak *et al.* (2021), Sweden formed a cluster alongside Finland within which SDG7 was considered achieved.

Moreover, global studies also confirm the high level of development of a sustainable energy economy in Sweden and Denmark. In the Energy Transition Index classification presented in the Fostering Effective Energy Transition (2023) report, Sweden and Denmark were ranked first and second, respectively. The compilation covered 120 countries worldwide. The final score consisted of results obtained in the areas of system performance (equitable, secure, sustainable) and transition readiness (regulatory framework and investment, enabling factors). Sweden and Denmark were also ranked in the top two positions also in the Energy Trilemma Index presented in the World Energy Trilemma Index (2022) report. The classification included 127 countries of the world and was based on performance in categories such as energy security, energy equity, and environmental sustainability. In the area of energy security, the highest ranking among EU countries went to Finland (the third place) and Sweden and Denmark were ranked fourth and 14th, respectively. On the other hand, within the energy equity category, Luxembourg was the winner and Denmark and Sweden were ranked 11th and 19th, respectively. In the area of environmental sustainability, Sweden, Denmark and Finland were the best, ranking first, second, and third respectively.

The research results on the development of a sustainable energy economy in Sweden and Denmark was characterised by a high level of similarity while indicating the leading positions of both countries both within the European Union and globally. These prior empirical results led us to hypothesise:

H1: The Scandinavian countries are among the clusters with the highest degree of SDG7 implementation in the European Union.

H2: The Scandinavian countries are leading the way in the implementation of SDG7 in the European Union.

RESEARCH METHODOLOGY

We aimed to classify European Union member countries according to their similarity in the area of sustainable development goal 7 of the UN 2030 Agenda on clean and affordable energy. We based the classification of European Union member countries in terms of achieving SDG7 on selected official indicators of this goal (Figure 1). We based the analysis of the progress of European Union member countries in terms of achieving Sustainable Development Goal 7 on affordable and clean energy on selected indicators (Figure 1). We obtained the statistical material used in the study from the Eurostat database (Eurostat, 2022). The time scope of the study covered the years 2015 and 2021. The statistical material used in the study came from the Eurostat database (Eurostat, 2022) and covered all 27 European Union member states. The time scope of the study covered the years 2015 and 2021. The study period coincided with the first (2015) year of Agenda 2030 and (2021) the year for which the latest data were available at the time of the econometric study. In the course of the analysis, we aimed to answer the question of which ordering method is optimal for classifying EU member states in terms of achieving SDG7.

The selection of diagnostic features was guided by statistical analysis in addition to content analysis, considering the appropriate level of feature variability (coefficient of variation of at least 0.10; quotient of extreme values of at least 2) (Figure 2). We also identified the features' nature. Thus, we included the following variables in the set of stimulants (*S*): X_1, X_2, X_3, X_4, X_5, we included the remaining variables in the set of destimulants (*D*). We assumed that each variable contributes the same portion of information to the evaluation of the studied objects. The weights of all variables were the same and equal to one. Changes in the adopted indexes from 2015 to 2021 were generally insignificant (Figure 2). During the analysed period, all indexes that were stimulants increased and all indexes that were destimulants (except X_9) decreased.

An important issue in the construction of a ranking due to the level of a complex phenomenon, which is what we are dealing with, is the choice of an ordering method. In particular, in ordering methods based on a synthetic variable, an important step is the normalisation of diagnostic characteristics and the method of construction of the synthetic variable. The study used a procedure to help choose one of several methods recommended in the literature, presented in Kukuła and Luty (2015). In the

literature, we can find many proposals for these methods and discussions on the criteria for their selection. This issue was described by, among others Hellwig (1968), Hwang and Yoon (1981), Kukuła (2000), Ishizaka and Nemery (2013), Walesiak (2014), Izonin *et al.* (2022).

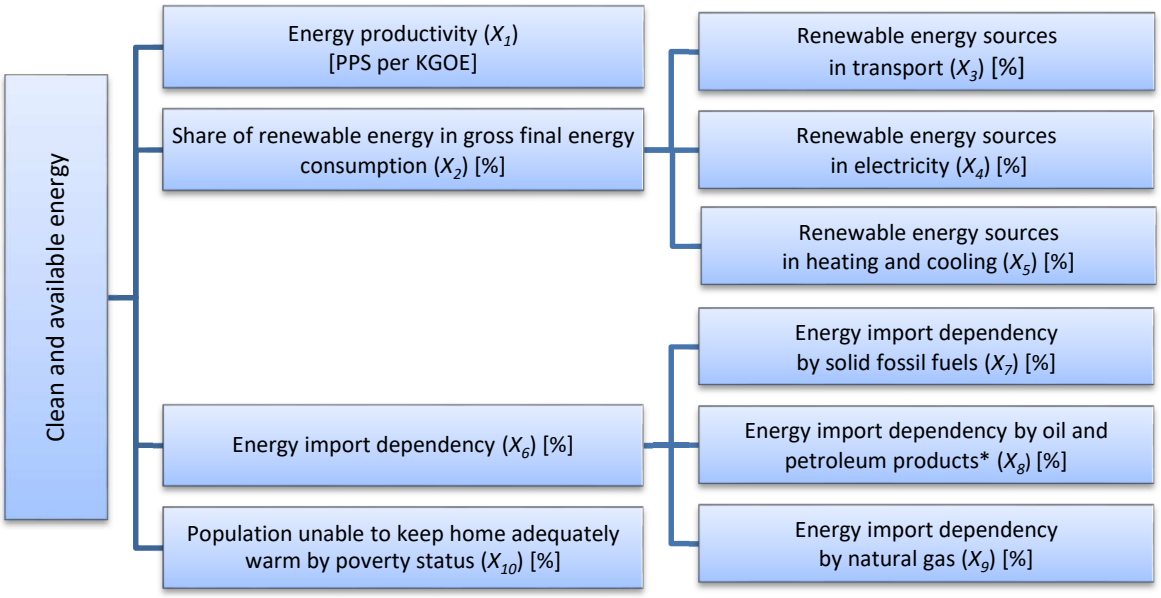
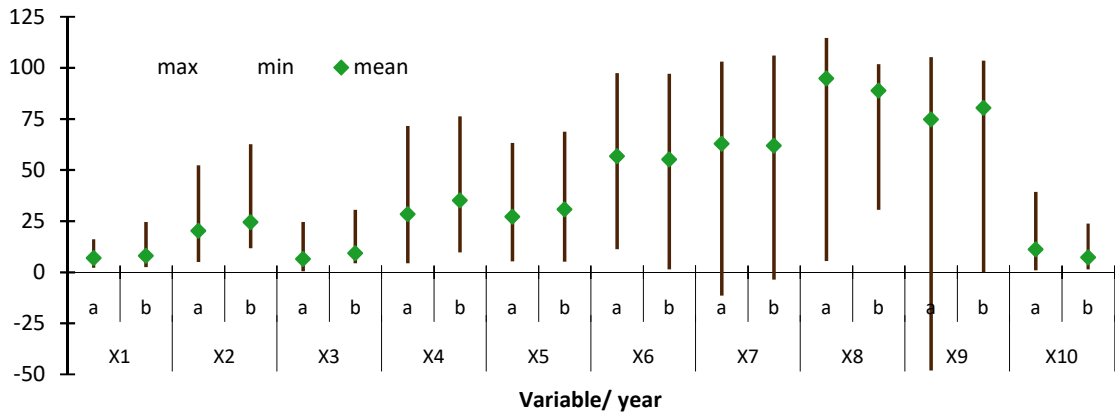


Figure 1. Selected indicators for the classification of European Union member states in terms of the achievement of SDG7

Note: KGOE – kilograms of oil equivalent; PPS: purchasing power standard; *: excluding biofuel.
Source: own elaboration.



Specification		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
a	**SD**	3.17	11.58	5.29	18.22	15.88	24.88	41.75	20.46	43.56	10.25
	CV	0.46	0.57	0.8	0.64	0.59	0.44	0.66	0.22	0.58	0.91
b	**SD**	4.4	12.03	5.08	18.33	16.53	22.07	40.48	15.83	28.33	6.72
	CV	0.55	0.49	0.54	0.52	0.54	0.40	0.65	0.18	0.35	0.91

Figure 2. Descriptive statistics for the variables in the years 2015 (a) and 2021 (b)

Note: Designations as in Table 1. SD: standard deviation, CV: coefficient of variation.
Source: own elaboration based on the results.

In the first stage of the study, we selected four linear ordering procedures (Table 3).

Table 3. Chosen linear ordering methods

Method	Synthetic variable	Normalisation	
		Stimulant	***Destimulant***
HELLWIG	$Q_i = 1 - \frac{d_i^+}{d_0}$	$z_{ij} = \frac{x_{ij} - \bar{x}_j}{S_j}$	$z_{ij} = \frac{x_{ij} - \bar{x}_j}{S_j}$
TOPSIS	$Q_i = \frac{d_i^-}{d_i^- + d_i^+}$	$z_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^n x_{ij}^2}}$	$z_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^n x_{ij}^2}}$
SSW	$Q_i = \frac{1}{m}\sum_{j=1}^m z_{ij}$	$z_{ij} = \frac{x_{ij} - \bar{x}_j}{S_j}$	$z_{ij} = \frac{\bar{x}_j - x_{ij}}{S_j}$
IUCN	$Q_i = \frac{1}{m}\sum_{j=1}^m z_{ij}$	$z_{ij} = \frac{x_{ij} - \min\limits_i x_{ij}}{\max\limits_i x_{ij} - \min\limits_i x_{ij}}$	$z_{ij} = \frac{\max\limits_i x_{ij} - x_{ij}}{\max\limits_i x_{ij} - \min\limits_i x_{ij}}$

Note: Q_i- the value of the synthetic measure for the object i $(i = 1,..,n)$; x_{ij}, x_{ij}, z_{ij} – actual and normalised values of the trait j (j=1,..,m) for the object i; $\bar{x}_j, \bar{x}_j, S_j$ - arithmetic mean,, standard deviation of the trait j; $\bar{d}, S_d$ – arithmetic mean, standard deviation d_i^+: $d_0 = \bar{d} + 2S_d$; $d_i^+ = \sqrt{\sum_{j=1}^m (z_{ij} - z_j^+)^2}$; $d_i^- = \sqrt{\sum_{j=1}^m (z_{ij} - z_j^-)^2}$; $z_j^+ = \begin{cases} \max\limits_i z_{ij}, X_j \in S \\ \min\limits_i z_{ij}, X_j \in D \end{cases}$; $z_j^- = \begin{cases} \min\limits_i z_{ij}, X_j \in S \\ \max\limits_i z_{ij}, X_j \in D \end{cases}$

TOPSIS: Technique for Order of Preference by Similarity to Ideal Solution; SSW: Standardized Value Sums Method; IUCN: Zeroed Unitarization Method.

Source: own study.

In the second stage of the analysis, among the rankings made (thus the methods used), we used the one that was most similar to the others selected, *i.e.* the one for which $\bar{u}_p$ was the largest when:

$$\bar{u}_p = \frac{1}{v-1}\sum_{\substack{q=1 \\ p \neq q}}^{v} m_{pq}\,,\ p,q = 1,2,\ldots,v \tag{1}$$

in which v – number of rankings; $m_{pq} m_{pq} = 1 - \frac{2\sum_{i=1}^n |c_{ip} - c_{iq}|}{n^2 - z}$ such that: c_{ip}, c_{iq}, – i object's position in the rankings of p and q respectively; $z = \begin{cases} 0, & n \in P \\ 1, & n \notin P \end{cases}$; P – the set of even natural numbers; $m_{pq,}\, m_{pq} \in [0,1]$.

The chosen method was the basis for the preparation and interpretation of the ranking of EU countries by the phenomenon under study in 2021 and 2015.

RESULTS AND DISCUSSION

Based on selected SDG 7 indexes (Figure 1), we prioritized. EU countries according to the value of synthetic measures using the four ordering procedures described in Table 3. The resulting ordering arrangements differ (Figure 3).

For each pair of the presented order systems, we estimated the values of the measure m_{pq} and $\bar{u}_p$ (Table 2).

In the problem under consideration, the ranking of countries obtained from the synthetic trait determined by the IUCN method was closest to all other determined rankings ($\bar{u}_p$ = 0.846) (Table 4).

Figure 4 shows the ranking of countries by level of achievement of SDG 7 in 2021 and 2015 using the IUCN method. The Spearman determined rank correlation coefficient was 0.941, indicating a strong positive correlation of ordinal systems. In 2015, Denmark, Sweden, and Romania were ranked highest and Belgium, Cyprus and Malta – lowest. In 2021, Denmark, Estonia, and Sweden had the highest ranks and Lithuania, Luxembourg, and Belgium – the lowest. In 2021, relative to 2015, 10 countries

improved their position. These were Sweden, Slovenia, Latvia, Portugal, Ireland, Greece, Slovakia, Cyprus, Malta and Belgium. In contrast, the position of nine countries deteriorated over the same period. These were Romania, Croatia, Poland, the Czech Republic, Italy, Bulgaria, Spain, Luxembourg and Lithuania. In 2021, in relation to 2015, the position of eight countries has not changed. These were Denmark, Sweden, Austria, Finland, Germany, the Netherlands, Hungary, and France.

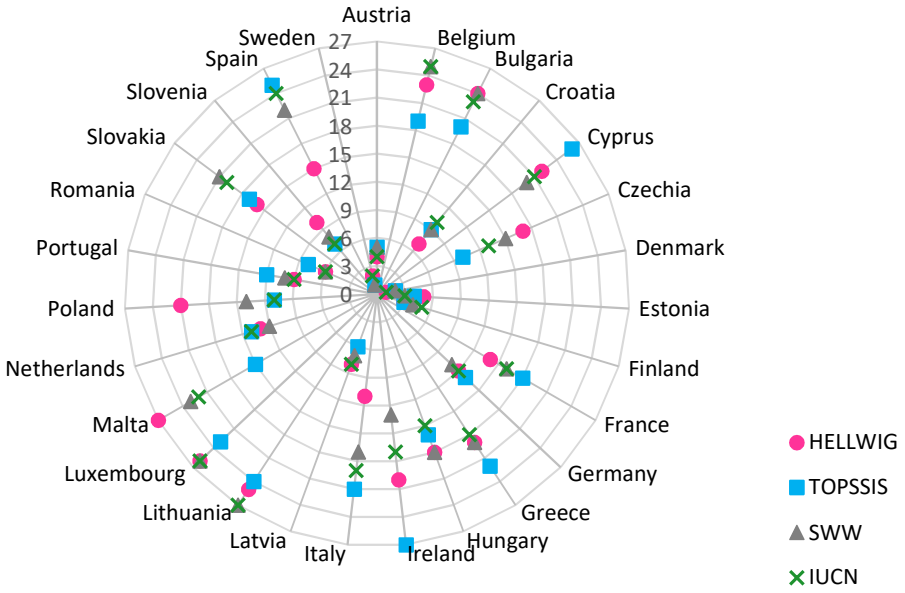


Figure 3. Ranks of European Union countries in terms of their level of SDG 7 achievement in 2021 according to the ordering methods shown in Table 2

Source: own elaboration based on results.

Table 4. Measure values $\mathbf{m_{pq}}$ and $\bar{\mathbf{u}}_\mathbf{p}$ determined according to formula (1)

Method	HELLWIG	TOPSSIS	SWW	IUCN	$\bar{u}_p$
HELLWIG	1.000	0.725	0.835	0.813	0.791
TOPSSIS	–	1.000	0.775	0.813	0.771
SWW	–	–	1.000	0.912	0.841
IUCN	–	–	–	1.000	0.846

Note: Designations as in Table 2

Source: own study based on the results.

In 2021, Ireland (24.45), Denmark (16.89) and Luxembourg (12.82) were the best performers on Index X_1 – energy productivity (PPS per KGOE) (Table 5). In contrast, Bulgaria (2.47), Malta (4.31) and Estonia (4.47) were the worst performers in the same year. In 2021, the average value of this index in the EU-27 was 8.01 (Figure 2). In 2021 relative to 2015, the value of index X_1 increased in 26 countries and decreased in one.

In 2021, under Index X_2 – the share of renewable energy in gross final energy consumption (%), the highest values belonged to Sweden (62.6%), Finland (43.1%), and Latvia (42.1%). In contrast, the lowest values occurred in countries such as Luxembourg (11.74%), Malta (12.15%), and the Netherlands (12.28%). In 2021, the average value of this index in the EU-27 countries was 24.49%. In 2021, relative to 2015, the value of index X_2 increased in 21 countries and decreased in six. In 2021, index X_3 – renewable energy sources in transport (%) had the highest value in Sweden (30.43%), Finland (20.51%), and Estonia (11.24%) and the lowest in Ireland (4.30%), Greece (4.31%), and Poland (5.67%). In 2021, the average value of this index in the EU-27 countries was 9.39%. In 2021, relative to 2015, the value of index X_3 increased in 23 countries and decreased in four. The analysis of the value of index X_4 – renewable energy sources in electricity (%) in 2021 in the EU-27 countries allowed us to identify the EU leaders in this area: Austria (76.19%), Sweden (75.70%), and Denmark (62.65%), as well as the last-

ranked countries: Malta (9.66%), Hungary (13.66%) and Luxembourg (14.22%). In 2021, the average value of this index in the EU-27 countries was 35.19%. In 2021, relative to 2015, the value of index X_4 increased in 20 countries and decreased in seven. The analysis of the value of index X_5 – renewable energy sources in heating and cooling (%) in 2021 in the EU-27 countries makes it possible to identify the highest ranked: Sweden (68.64%), Estonia (61.32%), Latvia (57.38%) and those countries with the lowest values, *i.e.* Ireland (5.17%), the Netherlands (7.72%), Belgium (9.24%). In 2021, the average value of this index in the EU-27 countries was 30.74%. In 2021, relative to 2015, the value of index X_5 increased in 18 countries and decreased in nine.

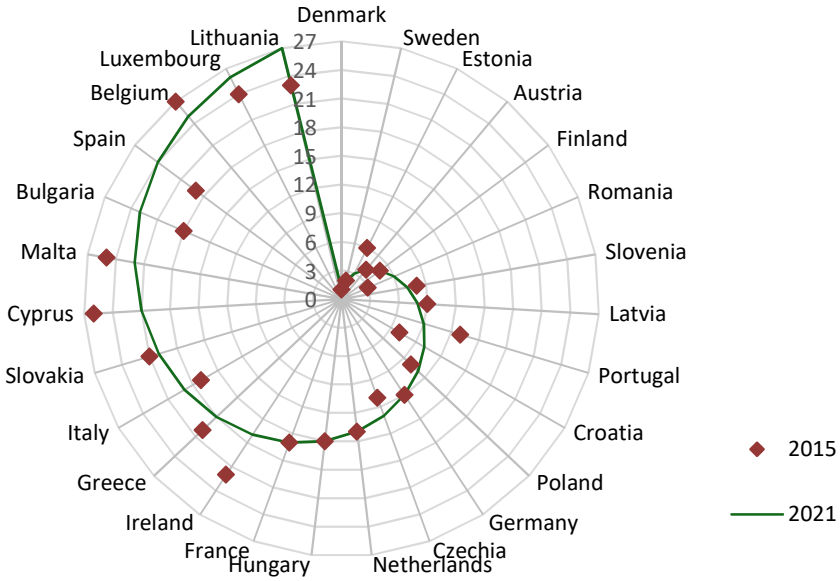


Figure 4. Rankings of European Union countries in terms of the level of achievement of SDG 7 in 2021 and 2015 by IUCN methods

Source: own elaboration based on the results. Method designations as of Table 3.

Table 5. Country rankings by value of selected indexes in 2021

Variable	Ranking*
X_1	IE, DK, LU, IT, DE, AT, SE, FR, ES, CY, NL, PT, GR, SI, BE, HR, FI, RO, LT, LV, SK, HU, PL, CZ, EE, MT, BG
X_2	SE, FI, LV, EE, AT, DK, PT, HR, LT, SI, RO, GR, ES, FR, DE, IT, CY, CZ, SK, BG, PL, HU, BE, IE, NL, MT, LU
X_3	SE, FI, EE, SI, MT, DK, BE, IT, AT, ES, NL, SK, PT, FR, DE, LU, RO, BG, CZ, CY, HR, LT, LV, HU, PL, GR, IE
X_4	AT, SE, DK, PT, HR, LV, ES, DE, RO, FI, IE, IT, GR, SI, NL, EE, BE, FR, SK, LT, BG, PL, CY, CZ, LU, HU, MT
X_5	SE, EE, LE, FI, LT, PT, DK, CY, HR, AT, SI, MT, GR, BG, RO, FR, CZ, PL, IT, SK, HU, ES, DE, LU, BE, NL, IE
X_6	MT, LU, CY, IE, GR, IT, LT, BE, ES, PT, DE, NL, HR, HU, SK, AT, SI, FR, PL, CZ, LV, FI, BG, DK, RO, SE, EE
X_7	IE, ES, HR, AT, NL, CY, LU, IT, EE, SE, LV, BE, LT, SK, FR, FI, DE, HU, RO, CZ, DK, SI, BG, GR, PT, MT, PL
X_8	LT, LU, SI, CY, SK, IE, PT, MT, DE, FR, BG, CZ, PL, BE, ES, FI, LV, GR, AT, HU, NL, IT, HR, SE, RO, EE, DK
X_9	MT, LT, ES, PT, EE, LU, SE, LV, BE, FI, SI, GR, BG, FR, IT, CZ, DE, PL, HR, IE, SK, HU, AT, NL, DK, RO, CY
X_{10}	BG, LT, CY, GR, PT, ES, RO, IT, MT, FR, SK, HR, HU, LV, BE, DE, IE, PL, DK, LU, NL, CZ, EE, AT, SI, SE, FI

Note: Designations as in Table 1. *: by value in descending order. AT: Austria, BE: Belgium, BG: Bulgaria, CY: Cyprus, CZ: Czechia, DE: Germany, DK: Denmark, EE: Estonia, ES: Spain, FI: Finland, FR: France, GR: Greece, HR: Croatia, HU: Hungary, IE: Ireland, IT: Italy, LT: Lithuania, LU: Luxembourg, LV: Latvia, MT: Malta, NL: Netherlands, PL: Poland, PT: Portugal, RO: Romania, SE: Sweden, SI: Slovenia, SK: Slovakia.

Source: own study based on the results.

In 2021, index X_6 – energy import dependency (%) obtained the highest values in countries such as Malta (97.06%), Luxembourg (92.47%), Cyprus (89.52%) and the lowest values belonged to Estonia

(1.41%), Sweden (21.22%), Romania (31.65%). In 2021, the average value of this index in the EU-27 countries was 55.24%. In 2021, relative to 2015, the value of index X_6 increased in nine countries and decreased in 18. In 2021, index X_7 – energy import dependency by solid fossil fuels (%) obtained the highest values in countries such as Ireland (105.92%), Spain (105.66%), Croatia (100.71%) and Austria (100.19%). In contrast, we observed the lowest values in Poland (-3.61%), Portugal (4.54%), and Greece (9.6%). In 2021, the average value of this index in the EU-27 countries was 61.96%. In 2021, relative to 2015 overall (excluding Malta – no data available), the value of the X_7 index increased in 14 countries and decreased in 12. In 2021, index X_8 – energy import dependency by oil and petroleum products (excluding biofuel) (%) obtained the highest values in such countries as Lithuania (101.70%), Luxembourg (99.85%), Slovenia (99.55%). In contrast, we observed the lowest values in Denmark (30.56%), Estonia (54.91%), and Romania (68.18%). In 2021, the average value of this index in the EU-27 countries was 88.92%. In 2021, relative to 2015 overall, the value of the X_8 index increased in five countries and decreased in 22. In 2021, index X_9 – energy import dependency by natural gas (%) obtained the highest values in such countries as Malta (103.48%), Lithuania (100.82%), Spain (100.07%). In contrast, we observed the lowest values in Romania (22.80%), Denmark (27.76%) and the Netherlands (33.62%). In 2021, the average value of this index in the EU-27 countries was 80.42%. In 2021, relative to 2015 overall, the value of index X_9 increased in 12 countries, decreased in 11 and remained unchanged in four.

In 2021, index X_{10} – population unable to keep the home adequately warm by poverty status (%) obtained the highest values in countries such as Bulgaria (23.7%), Lithuania (22.5%), and Cyprus (19.4%). In contrast, we observed the lowest values in Finland (1.3%), Sweden (1.7%), and Slovenia (1.7%). In 2021, the average value of this index in the EU-27 countries was 7.37% (Table 2). In 2021 relative to 2015 overall, the value of the X_{10} index increased in 4 countries, decreased in 21, and remained unchanged in two.

Furthermore, countries were divided by their level of achievement of SDG 7 (Table 6) according to the synthetic measure determined using the IUCN method in 2021 into four groups with levels:

– very high (group I): $Q_i \in \left(\max_i Q_i - 0{,}25R\,;\, \max_i Q_i\right]$;
– high (group II): $Q_i \in \left(\max_i Q_i - 0{,}5R\,;\, \max_i Q_i - 0{,}25R\right]$;
– medium (group III): $Q_i \in \left(\max_i Q_i - 0{,}75R\,;\, \max_i Q_i - 0{,}5R\right]$;
– low (group IV): $Q_i \in \left[\min_i Q_i\,;\, \max_i Q_i - 0{,}75R\right]$;

in which $R = \max_i Q_i - \min_i Q_i$.

Table 6. Groups of countries similar in terms of the level of implementation of SDG 7 in 2021

Group	Country
Group I	Denmark, Sweden
Group II	Estonia, Austria, Finland, Romania
Group III	Slovenia, Latvia, Portugal, Croatia, Poland, Germany, Czechia, Netherlands
Group IV	Hungary, France, Ireland, Greece, Italy, Slovakia, Cyprus, Malta, Bulgaria, Spain, Belgium, Luxembourg, Lithuania

Source: own study based on the results.

We determined basic numerical characteristics for diagnostic variables in groups of countries similar in terms of SDG 7, as shown in Table 7.

The first group (Table 6) consisted of only two countries. In 2021, the average value of the energy productivity index (PPS per KGOE) significantly exceeded the EU-27 average and more than doubled the average result of countries in the second group. The percentage of renewable energy in gross final energy consumption significantly exceeded the EU average. It was almost double the results obtained by countries classified in the third group, and almost three times for the results of countries assigned to the fourth group. Considering the structure of renewable energy source distribution, we draw special attention to the high average levels of renewable energy sources in electricity (%) and renewable

energy sources in heating and cooling (%). On the other hand, the average values of the energy import dependency index (%) were more than twice as good as the EU average, which was mainly due to very good results in the energy import dependency by oil and petroleum products (excluding biofuel) indexes (%) and energy import dependency by natural gas (%). In the case of the energy import dependency by solid fossil fuels index (%), good results were also obtained, which, however, were not at such a good level as those of the EU leaders in this area (from the third group of countries). The largest disparity among the analysed groups was in the percentage of the population unable to adequately heat their homes due to poverty. The average value of this index in the first group of countries was three times lower than the EU-27 average, twice as low as the average for the third group of countries, and as much as four times lower than the average for the fourth group of countries (Table 7).

Table 7. Selected characteristics of indexes in groups in 2021

Specification	Statistics	Group I	Group II	Group III	Group IV
X_1	min	9.32	4.47	4.51	2.47
	max	16.89	9.69	9.99	24.45
	mean	13.11	6.40	6.78	8.47
X_2	min	34.72	23.60	12.28	11.74
	max	62.57	43.10	42.11	28.23
	mean	48.65	35.29	24.64	17.36
X_3	min	10.55	7.67	5.67	4.30
	max	30.43	20.51	10.64	10.58
	mean	20.49	12.19	7.85	7.77
X_4	min	62.65	29.34	14.54	9.66
	max	75.70	76.19	58.43	45.96
	mean	69.18	46.89	38.01	24.63
X_5	min	41.53	24.48	7.72	5.17
	max	68.64	61.32	57.38	48.63
	mean	55.09	43.47	30.21	23.40
X_6	min	21.22	1.41	38.33	36.14
	max	32.56	51.96	66.93	97.06
	mean	26.89	30.76	51.39	69.50
X_7	min	12.69	23.21	-3.61	0.00
	max	94.20	100.19	100.71	105.92
	mean	53.45	72.74	45.97	69.78
X_8	min	30.56	54.91	78.39	84.33
	max	71.57	95.50	99.55	101.70
	mean	51.06	77.14	93.22	95.72
X_9	min	27.76	22.80	33.62	0.00
	max	100.00	100.00	100.05	103.48
	mean	63.88	68.36	84.11	84.40
X_{10}	min	1.70	1.30	1.70	2.50
	max	2.80	10.10	16.40	23.70
	mean	2.25	3.78	4.98	10.74

Note: Designations as in Table 1 and Table 4.
Source: own study based on the results.

The second group included 4 countries. In 2021, the average value of the energy productivity index (PPS per KGOE) was significantly behind the average of the EU-27 countries and the lowest in relation to all other groups. In 2021, the average of the following indexes: share of renewable energy in gross final energy consumption (%); renewable energy sources in transport (%); renewable energy sources in electricity (%) and renewable energy sources in heating and cooling (%) in each case achieved the second best results in relation to the other groups. Thus, we may call this group a runner-up in the area of renewable energy consumption. In 2021, despite the weakest average performance of the index energy import dependency by solid fossil fuels, the countries of the second group achieved the second-best po-

sition among all groups in terms of average energy import dependency (%), to which the good performance of the indexes energy import dependency by oil and petroleum products (excluding biofuel) (%) and energy import dependency by natural gas (%) contributed significantly. In 2021, the average value of the index population unable to keep the home adequately warm by poverty status (%) indicated the good position of the analysed group in this area. This result was almost twice as good as the EU-27 average and nearly three times as good as the average of the fourth group countries.

The third group included eight countries. In 2021, the average value of the energy productivity index (PPS per KGOE) for this group was not much behind the average value of countries classified in the second group. In comparison with Groups 1 and 2, we recorded significantly weaker results for the average value of the following indexes: share of renewable energy in gross final energy consumption (%); renewable energy sources in transportation (%); renewable energy sources in electricity (%); energy import dependency (%). Moreover, in the case of the renewable energy sources in the transport index (%), the result was slightly better than that of the fourth group, which is the weakest in this area. An interesting situation occurred in the case of the energy import dependency index (%), the average value of which is the closest to the EU-27 average considering all the separate groups. Attention is drawn to the average value of the energy import dependency by solid fossil fuels index (%), which is the best when compared with the other groups. The situation is different in the case of the average value of the energy import dependency by natural gas index (%), which indicates a similarly weak position of the analysed group as is the case with the fourth group. On the other hand, the average value of the population unable to keep the home adequately warm by poverty status index (%) indicates a relatively not too bad position of the analysed group of countries. This result was significantly better than the EU-27 average and more than twice as good as the result obtained by the fourth group of countries.

The fourth group, comprising 13 countries, was the largest in terms of size. In 2021, the average value of the energy productivity index (PPS per KGOE) was close to the EU-27 average and was second only to the result obtained by the first group of countries. When compared with the other groups, the average values of the following indexes: share of renewable energy in gross final energy consumption (%); renewable energy sources in transport (%); renewable energy sources in electricity (%); energy import dependency (%) indicate the weakest position of the analysed group in these areas. Among the aforementioned indexes, only the renewable energy sources in the eating and cooling index (%) was higher than the EU-27 average. In the area of energy import dependency, the weakest results compared to other groups were achieved in the average value of indexes: energy import dependency (%); energy import dependency by oil and petroleum products (excluding biofuel) (%); energy import dependency by natural gas (%). The situation was not much better in the case of the index energy import dependency by solid fossil fuels, where the result obtained was better than in the case of the second group. Moreover, the average values of all indexes of energy import dependency fared worse than the results of the EU-27 average. The average value of the population unable to keep the home adequately warm by poverty status index (%) positions the analysed group in last place among all analysed groups. The result obtained was as much as four times weaker than the result of the first group and significantly weaker than the average of the EU-27 countries.

In our 2021 study, Denmark and Sweden comprised the group with the highest level of SDG 7 achievement. Our work confirmed their similarity in terms of the characteristics of the studied indicators (Firoiu *et al.,* 2021), in which both in 2015 and 2019, these countries were assigned to the same group, which was characterised in comparison with others by, among others, the highest average value of the share of energy from renewable sources, the lowest average value of energy import dependency (%). The group was also characterised by the lowest average level of greenhouse gas intensity, which we can associate with a broad focus on a clean energy economy. The same group also included Bulgaria, the Czech Republic, Estonia, Finland, France, and Romania, among others, which were assigned to separate country groups in our work. In a similar study, Włodarczyk *et al.* (2021) also assigned Denmark and Sweden in 2019 to the same group (which also included Finland and Latvia), indicating the highest average value of indexes in this group (relative to the other groups) for renewable energy sources in transportation (%); renewable energy sources in electricity (%) and renewable energy sources in heating and cooling (%), and the lowest average level of greenhouse gas intensity. On the other hand, in their

study, Rybak *et al.* (2021) classified Denmark in 2019 as a separate site, arguing for the considerable variation in the countries studied in terms of the level of SDG7 achievement. They indicated the characteristics of the Danish economy's import dependency – low for oil, high for coal and below 0 for natural gas. In the same study, Sweden and Finland were placed in the same group. In another study (Chovancová & Wawrek, 2021), Sweden and Denmark ranked first and third, respectively, in a classification covering the average position of the EU-27 countries from 2010 to 2017 in terms of the level of multicriteria assessment covering a range of indexes for clean and accessible energy.

Despite the limited possibility of comparing the results of our study with those of other works due to differences in the choice of indexes, the period of the study or the econometric method, we may note numerous similarities. Denmark and Sweden were among the countries with a high average value of many indexes describing the development of clean and accessible energy. The results obtained in our study allowed for a positive verification of the research hypotheses proclaiming that the Scandinavian countries (Sweden and Denmark) were leaders in the area of progress towards clean and accessible energy in the European Union, as well as formed a cluster with the highest degree of implementation of the SDG7.

Denmark is an example of a country that has successfully implemented an energy transition toward clean and accessible energy for several decades. Changes in Denmark's implemented energy policy were largely determined by the oil crisis outbreak in the 1970s. In connection with the energy-inefficient and environmentally destructive structure of the energy sources, corrective measures were taken to reduce primary energy consumption, diversify the structure of its sources, and increase the efficiency of the energy sector. Denmark had already become energy-independent by the end of the twentieth century as a result of the exploitation of deposits of fossil fuel resources. Beginning in the last decade of the twentieth century, the development of renewable energy sources strongly supports Denmark's energy security. The country's energy policy transformation based on clean energy technologies allowed for the implementation of the concept of sustainable and balanced development (Frączek, 2015).

In Denmark, in 2021, the share of renewables in total energy consumption was 34.7% (compared to 30.5% in 2015), which was much better than the EU-27 average of 24.5%. In the same year, high participation of renewable energy in total energy consumption was recorded in the electricity (62.7%) and heating and heat (41.5%) sectors, while the transport sector was 10.5%. A comparison of the results with the EU-27 average, which was 35.2%; 30.7%, and 9.39%, respectively, within the indicated sectors (Table 1), shows significantly better results for Denmark (Eurostat, 2023). The high and, at the same time, one of the largest shares of renewable energy sources in total electricity consumption in the world was due, among others, to public support for the use of such sources. An important part of Denmark's energy policy was not only an emphasis on the development of renewable energy sources, but also high efficiency in the consumption of energy carriers (Frączek, 2015). The concern for energy efficiency is reflected in Denmark's National Energy and Climate Plan 2021-2030, which includes a number of measures aimed at supporting it both in private homes and businesses, as well as in public buildings. For example, Danish citizens can get funding to renovate their homes and switch to green heating. Meanwhile, business owners can count on support for measures aimed at energy savings. Municipalities and regions can take advantage of subsidies to improve energy efficiency and digitisation in buildings (European Commission, 2023).

Renewable energy development in Denmark is largely based on wind energy, which accounts for 26.2% of energy consumed in the total economy (Energy Institute Statistical Review of World Energy, 2023). The ability to develop wind energy at this scale is due to Denmark's geographic location with access to the North Sea, which is characterised by large shallow areas, high wind speeds, and low wind variability. These factors significantly support the development of wind energy, whose offshore capacity is one of the highest in the world (Energy Market Information Centre, 2023). The future of Danish wind energy is based on a political agreement on offshore wind farms, with a planned capacity of 9 GW with the possibility of reaching as much as 14 GW if offshore wind farmers decide to exercise the option in the agreement to build as much capacity as possible on land. Another major project is the planned construction of an energy island in the North Sea, with a minimum capacity of 3 GW in 2023 and 10 GW in 2040 (Directorate-General for Energy, 2023).

As a result of the energy crisis of the 1970s, Sweden has taken steps to move away from traditional fossil fuels and increase energy efficiency and energy independence. The potential for energy savings became a particularly important aspect of national policy (Legnér *et al.*, 2020). The implementation of clean energy technology solutions supported the Swedish public's understanding of the need to reduce the exploitation of natural resources in favour of more sustainable and harmonious development while maintaining the existing standard of living. The public sector supported this idea as exemplified by the preparation by municipalities of a sustainable economic system that was understandable to residents and had to be reflected in provincial and state-wide plans (Neterowicz, 2020). Sweden's energy transition is an excellent example of the focus of energy policy on sustainable, low-carbon energy systems, both at the national level through the construction of large-scale wind farms, hydropower and biomass, and at the community and household level through district heating plants and smart grids (Ring *et al.*, 2022). The implementation of smart grids was a milestone for building a clean energy economy, as it enabled Swedish households to take on the role of prosumers (Huang *et al.*, 2019).

In Sweden, in 2021, the participation of renewable energy sources in total energy consumption accounted for 62.57% (compared to 52.2% in 2015), consolidating its leadership in the European Union in this area with a significant advantage over second-ranked Finland (43.1%) and third-ranked Latvia (42.1%), as well as being more than double the EU-27 average. In the same year, Sweden's consumption of renewable energy sources was very high regardless of the area of consumption, with 75.7% in the electricity sector, 68.6% in heating and heating, and 30.4% in transportation. In each of the indicated sectors, Sweden achieved the best results in the European Union, which were much higher than the EU-27 average, which within the mentioned areas was respectively: 37.5%; 22.9%, and 9.1% (Eurostat, 2023). Sweden aims to increase the share of renewable energy sources in total consumption to 75% in 2030. The largest share of renewable energy consumption in Sweden is biofuels (53%), which are mainly used in industry and heating, although the highest growth rate in recent years has been observed in transportation (Draft updated NECP for Sweden, 2023). The structure of energy supply sources in Sweden supports a high level of energy productivity, as well as one of the lowest EU-27 energy import dependency by oil and petroleum products (excluding biofuel) and the lowest percentage of population unable to keep the home adequately warm by poverty status among EU economies.

On the one hand, Sweden's economic policy significantly supports the development of wind and biomass energy with subsidies, and on the other hand, imposes high taxes on nuclear and fossil fuels (Coal industry across Europe, 2017). The development of biomass energy would not have been possible without large-scale research and development projects, the creation of markets due to taxing fossil fuels, and the creation of district heating systems with wide coverage (Ydersbond, 2014). Sweden has the world's most developed energy mix and is the only country that has developed nuclear and renewable energy in parallel while reducing the share of fossil energy. Energy clusters formed by local communities play an important role in the Swedish energy system. Electricity generated in the clusters provides a source of supply for priority energy supply points (*e.g.* hospitals) when this energy is unavailable for some reason. Energy clusters generate not only electricity, but also heat and cooling, (Neterowicz, 2020). Another important link supporting the popularisation of renewable energy in Sweden is the natural conditions, which support, among others, the development of hydropower due to the presence of a large number of rapid rivers (Latoszek & Wojtowicz, 2020).

CONCLUSIONS

This article classifies the European Union member states in the area of achieving SDG7. The research focused on selected monitoring indicators for this objective, which included energy productivity, share of renewable energy in gross final energy consumption, energy import dependency, and population unable to keep the home adequately warm because of poverty status. We placed particular emphasis on measuring the area of share of renewable energy in gross final energy consumption, within which the structure of consumption in transportation, electricity, heating, and cooling was isolated. We placed more focus on measuring the area of energy import dependency, considering its structure, including solid fossil fuels, oil and petroleum products, and natural gas. Using an econometric apparatus including

selected linear ordering methods, we ranked the European Union member countries in terms of the level of achievement of SDG7 in 2021, followed by a division into groups of similar countries in terms of the level of achievement of this goal. The classification of EU Member States in this area varies and we can notice large differences between the established groups. In comparison with the existing literature, our study displays originality in several respects. Firstly, in tabular form, we presented a detailed search of the existing literature on the classification of EU member states in terms of the implementation of SDG7. Secondly, we analysed in theoretical terms the interdependencies between SDG7 achievement indicators, pointing out, among others, their complementary nature. Thirdly, we identified the IUCN method as optimal in the context of ranking the European Union Member States in terms of the achievement of SDG7, which significantly supports filling the research gap in this area. We positively verified the hypotheses that proclaim the Scandinavian countries (Sweden and Denmark) as leaders in the implementation of SDG7 in the European Union and forming the cluster with the highest degree of SDG7 implementation. These results correspond with the work of Chovancová and Wawrek, (2021), Firoiu *et al.* (2021), and Włodarczyk *et al.* (2021), which showed a high level of similarity in the development of a sustainable energy economy between Sweden and Denmark. Sweden and Denmark's energy transformation was initiated due to the outbreak of the oil crisis in the 1970s. At that time, the focus was on shifting away from fossil fuels to clean energy sources, increasing energy efficiency, and striving for energy independence. Today, both countries' energy policies strongly focus on developing the production and consumption of renewable energy sources and increasing energy efficiency, which translates into energy security. The national energy and climate plans for 2021-2030 include numerous measures to support renewable energy development, which focus on wind energy.

The results obtained for each group of countries indicate strong development disparities among member countries in the area of clean and accessible energy in its various aspects. The econometric optics proposed in the study and its results can help classify EU member states in terms of achieving SDG7 for researchers and policymakers The proposed research approach could be supplemented with further measures of clean and accessible energy beyond the SDG7 monitoring indexes. Such indexes could include energy prices, which affect the scale of energy poverty, or the level of greenhouse gas emissions on which environmental well-being depends, among others. The results of our research indicate the countries that are best at building a sustainable energy economy, which could serve as a model in the area of energy policy actions for policymakers in countries catching up with development in this area. However, the implementation of solutions that have proven effective in countries with the highest level of development of a sustainable energy economy is not always possible for other countries to imitate. This has to do, for example, with local geographic conditions predisposing to a greater or lesser extent to the development of renewable energy sources and the attitude of society to changes resulting from the energy transition. This requires policymakers to take a pragmatic and holistic approach, which will consider several factors that determine the development of the energy sector in the actions taken for clean and accessible energy. The recognition of these factors can support the pursuit of a long-term energy policy for an effective energy transition. Depending on the established conditions for the development of the national economy, these measures can take different forms. On the one hand, these actions can be based on providing financial incentives and tax breaks for those interested in investing in renewable energy sources and improving energy efficiency. On the other hand, there can be measures that discourage the use of fossil fuel-generated energy, such as environmental levies and taxes. The energy transition can be achieved through a modern infrastructure that is open to innovative and advanced solutions such as smart grids and energy storage. Clean energy technologies can be of interest to energy R&D actors. Supporting this type of activity is important from the point of view of building a sustainable energy economy, as it not only supports the creation of solutions reducing greenhouse gas emissions, but also determines the reduction of energy costs by increasing its availability to the general public.

The limitations of the conducted research results from statistical data availability. As a result of the outbreak of war in Ukraine in 2022, the European Union has taken a number of measures to strengthen energy security and independence from fossil fuel imports from the Russian Federation, which should be reflected in the improvement of a number of indexes monitoring the implementation of SGD7. At

the same time, the existing limitation provides an interesting prospect for further research, which may address the impact of measures taken under the energy security policy on building a sustainable energy economy for the European Union under the conditions of the war conflict in Ukraine.

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Export market experience, relational capital, and export performance in the context of different levels of psychic distance

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ABSTRACT

Objective: The objective of the article is to identify differences in the explanatory value of export market experience and relational capital as variables impacting export performance on markets characterised by high and low levels of psychic distance. We aimed to explore which of these resources turn out to be more useful in dealing with high and low levels of psychic distance between the exporter's home country and export markets.

Research Design & Methods: The research is quantitative and based on primary data collected from exporting firms representing different manufacturing sectors, which have a track record of export market relationships using computer-assisted telephone interviews (CATI) in 2020. We ran ordinary least squares regression (OLS) analyses with IBM SPSS 23 software.

Findings: The exporters' market-specific relational capital positively affects export performance, whereby this relationship is stronger for more distant markets. The impact of experience understood as tenure in the export market turned out to be insignificant for export performance.

Implications & Recommendations: Exporters can leverage their relational capital to enhance export market performance instead of acquiring market-specific knowledge on their own. Since an overreliance on a foreign partner's resources may prevent the development of own capabilities, an approach relying on joint experiential learning seems more advisable. Our findings also suggest that tenure in an export market in itself does not guarantee superior performance, as the learning exposure in the foreign markets has to be given.

Contribution & Value Added: We explore the relationships between a set of variables proposed by different theoretical views explaining export performance. The originality of our approach lies in the strategic optics we shed on firms' behaviour in high and low psychic distance markets. Depending on the contextual differences stemming from the level of psychic distance of markets firms strategise their presence in foreign markets deliberately relying on either their experience or market-specific relational capital.

Article type: research article

Keywords: export market performance; export experience; relational capital; relationship quality; psychic distance

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INTRODUCTION

Research on export performance seeks combinations of factors impeding or enhancing success in exporting (Trąpczyński *et al*., 2021). While some studies have investigated the impacts of export market experience (Dikova, 2009) and relational capital (Nguyen & Nguyen, 2014) separately, there is a significant gap in understanding how these factors interact under varying levels of psychic distance. Addressing this gap is crucial as firms increasingly operate in diverse international markets where both relational resources and market-specific experiences play pivotal roles. Recent studies have underscored the need

for more integrated approaches in international business research. For example, Martínez Villar (2021) and Santangelo and Meyer (2017) have called for deeper explorations into how firms navigate complex international environments using both relational and experiential resources. Our research answers this call by analysing the relationships between a firm's export market experience (EE) and relational capital (RC) as jointly affecting export performance (EP), under conditions of different levels of psychic distance (PD) in export markets. Specifically, our objective is thus to identify differences in the explanatory value of EE and RC as variables impacting EP in markets characterised by either low or high PD. In doing so, we highlight the strategic importance of building and leveraging high-quality relationships in foreign markets, which can be especially critical in high psychic distance contexts where local knowledge and trust mitigate the liabilities of foreignness and outsidership. Moreover, our study nuances the role of export experience by showing that its impact on performance is contingent on the PD of the target market, thus offering a more refined understanding of experiential learning in international contexts. Not least, by analysing markets with varying levels of PD, we demonstrate how firms can adjust their approach to building up local knowledge based on perceived market differences, providing actionable insights for international business managers as to the reliance on foreign market partners.

In the following parts of the article, we will develop a theoretical framework based on the process models of internationalisation, the evolutionary theory, the resource-based view (RBV), and the relational view. Firstly, we will explain the relevance of EE and RC as variables determining a firm's EP and provide a number of fundamental assumptions for the ensuing analyses. Secondly, we will explain the duality of PD as a contextual factor for export activities and discuss the strategic behaviour patterns of companies coping with the negative effects of the liabilities of foreignness and outsidership in markets characterised by low and high levels of psychic distance to formulate our research hypotheses. The remainder of the article will include a presentation of variables and research method, results of analyses, findings and conclusions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Export Experience and Export Performance

The relevance of export experience for the effectiveness of firm's international activities is especially noted in the process models of internationalisation and the evolutionary view, which rely on the phenomenon of experiential learning that may result in knowledge incubation along with the ongoing presence in foreign markets.

Explaining EE determinants, the traditional Uppsala model (Vahlne & Johanson, 2017) assumes that along with growing experience in foreign markets, firms accumulate relevant knowledge, which develops firms' capacity to reduce the liability of foreignness. Export market experience brings the chance for experiential learning and development of host-market specific knowledge, which increases the quality of firm's response to market-specific risk (Martín Martín *et al.*, 2022) and is essential for understanding market opportunities and dealing with uncertainty, especially valuable in distant markets (Martinez Villar, 2021).

According to the evolutionary and organisational learning approach (Zollo & Winter, 2002) and the knowledge-based view (KBV) (Johnson & Sohi, 2003; Chen *et al.* 2014), the experience shall be internalised and transformed into organizational knowledge. Path-dependent experiential learning is the mechanism of organisational capabilities development that enables firms to effectively adapt to a changing environment (Zollo & Winter, 2002). Appropriate quality of the learning process results in a resource-based rent. This explains why EE is seen as an important asset for exporters adapting to foreign markets' requirements. Export market experience is a driver of knowledge incubation and decision-making processes, leading to opportunity recognition and minimisation of the costs of foreign market misfits (Ahi *et al.*, 2017; Santangelo & Meyer, 2017). Foreign experience also brings easiness of gathering information concerning foreign markets and facilitates the development of business networks (Chen *et al*., 2020).

However, firms commit resources and learn about foreign markets under conditions of risk, uncertainty, and past feedback from their own structures and the environment, which may be affected by

limited rationality depending on the type of experience and market-specificity (Santangelo & Meyer, 2017). The evolutionists also point to a negative phenomenon – the 'shadow of the past' of experience and the ineffective learning process. Firms relying on experience tend to continue current activities and use only single-loop learning without the amendments necessary to adhere to different market conditions. Since only double-loop learning leads to competencies and actions resulting in growing effectiveness, firms stuck in the trap of past experiences do not develop in the market (Sampson, 2005).

Later versions of the Uppsala model incorporated these observations and particularly highlighted the role of experience which enhances the development of capabilities that are important for the firm's operations and its ability to learn the right things, which leads to the right choices and effective strategies (Vahlne & Johanson, 2017).

Relational Capital and Export Performance

Developments of the Uppsala model (Vahlne & Johanson, 2017) also led to the incorporation of ideas of the network and relational views, and the assumption that inter-organisational relationships and a company's position in networks in home and host markets may be critical resources for successful internationalisation. The relational view and RBV indicate that relational rents stem from inter- and intra-organisational structures, routines, and sequential learning processes creating path dependency advantage of resources embedded in relations supported by capital of social networks (Dyer *et al*., 2018). According to the revisited Uppsala model, the uncertainty that underpins a firm's internationalisation comes from both the liability of foreignness related to the psychic distance of the market, and the liability of outsidership interpreted directly as 'lack of bridging and bonding social capital' (Tian *et al.*, 2018). The possibility to minimise those two sources of uncertainties in foreign markets, and consequently also the firm's international performance, depends on insidership in foreign networks. Scholars regard the liability of outsidership as a more important barrier to internationalisation than foreignness *per se.* Thus, the key determinants of international strategic advantage come from resources building firm's relational capital abroad (Johanson & Vahlne, 2011; Vahlne & Johanson, 2017), which enhances the advantages stemming from partners' resources, structural embeddedness in local networks and market contacts. It is thus crucial to be an insider of the right network.

Collective international experience may lead to stronger commitments in foreign markets due to more effective opportunity recognition and exploitation of new strategic options (Johanson & Vahlne, 2011; Santangelo & Meyer, 2017). Foreign RC is particularly important for firms lacking experience and their own network position abroad, and struggling from underdeveloped firm-specific advantages fitting to host markets (Ratajczak-Mrozek, 2017). Foreign RC holds host market-specific value coming from potentially separate knowledge to be accessed: market knowledge, culture-specific features of relationship management, and sources of relational rent that bring a stronger capacity to deal with the liabilities of foreignness (Ferreras-Mendez *et al*., 2019).

Building appropriate relational ties and trust-based interaction leads to a higher quality of relationships, which is both an input and an output of the process of cooperation. High-quality inter-organizational relationships facilitate the flow of information, influence decision-making, promote legitimacy in the environment, affecting the credibility of the parties, and support the effective use of strategic opportunities in foreign markets (Ratajczak-Mrozek, 2017; Dyer *et al*., 2018; Bai *et al.*, 2021; Sharma *et al*., 2021). The value of exporters' RC comes also from the relational competencies of parties (Vahlne & Bhatti, 2019), which stem from and lead to the ability to build high-quality long-term relationships, with knowledge sharing as a critical mutual process leading to performance advantages in export markets (Cuypers *et al.*, 2020). Knowledge processes in relationships reinforced by trust, social bonds, and cognitive processes (Urzelai & Puig, 2019) bring partners' adaptability and flexibility, ability to diagnose and solve problems, readiness for information sharing and committing valuable resources. Combining partners' strengths leads to the development of new knowledge, such as market-fitting products and innovations (Martín Martín *et al*., 2022; Pigola & Costa, 2023). Moreover, RC is also an important facilitator of development of other critical success factors of exporting firms, e.g. export market intelligence and marketing capabilities (Pham *et al*., 2017), competitive strategy in export markets (Franca & Rua, 2018), innovativeness and bricolage capability,

especially valuable when facing resource limitations (Chang & Huang, 2022), absorptive capabilities (Rua *et al*., 2019), and human capital in general (Radulovich *et al*., 2017).

Similarly to EE, firm's RC may also show its dark side (Sulimowska-Formowicz, 2018). Overembeddedness and too strong ties may limit the strategic view, resulting in ineffective learning processes, learning the wrong things and getting stuck in once-effective patterns. Studies show a paradox of combined positive and negative effects of repeating business relationships (Dyer *et al*., 2018) and a curvilinear relationship with a positive effect of relational capital diminishing after obtaining a certain optimum (Oliveira & Lumineau, 2019). Firms tend to replace the process of creating the organization's own knowledge with the knowledge of the partner and its relational capital.

Concluding the above considerations, we can assume that:

- EE and RC are both firm-specific resources that positively affect the EP, although with different strengths of this influence due to different mechanisms of advantage creation associated with each of them;
- EE and RC specific to a given export market correlate positively with each other;
- The positive effect of EE and RC combined impact on the EP should be stronger than the sum of their separate effects, as together they form a stronger mechanism of organizational learning than separately, by fostering synergy effects in market-specific knowledge creation based on own and partner's experience and knowledge.

Psychic Distance Context for Export Performance

Psychic distance is a phenomenon of a dual nature and is defined as such. From a behavioural perspective, PD is a subjective state of mind of a decision maker concerning perceived differences between home and host countries of activities (Demirağ & Kayabaşı, 2024). The bigger the perceived differences, the stronger the feeling of anxiety and uncertainty towards the host country, which affects the quality of decisions and accuracy of actions on foreign markets. The perception of PD is not identical to a factual geographic, cultural or institutional distance. A more objective definition of PD points to sources of differences and states that psychic distance is a set of factors preventing or disturbing the flow of information between parties located in different countries, thus hindering their processes of learning and understanding the foreign market, which influences internationalisation decisions (Verbeke *et al.,* 2018; Martínez Villar, 2021). These factors are associated with country-based diversities and dissimilarities of language and communication style, cultural factors, economic situation, and institutional environment.

Moreover, PD may be directly influencing company effectiveness although there is a paradox visible in companies' behaviour, which may be related to prior foreign experience. Assumptions on a cultural similarity of markets may disturb the accuracy of learning about critical differences between these markets and result in lower effectiveness. At the same time, firms operating under high levels of PD may be more effective as they take the risks and adapt to the situation while underestimating the differences (Evans & Mavondo, 2002) or tend to be over-prepared to the conditions that may be faced in markets which they perceive as distant, thus problematic (Sousa & Lengler, 2009). Firms may also regard a high PD context as a driver of learning processes (Nordin & Lindbergh, 2019).

Patterns of Dealing With PD in Search for Export Performance

Exporting companies tend to develop different patterns of dealing with PD, some of which are more experience-based, while others rely more on relationships. We argue that PD constitutes a context for the deployment of these facilitators of export performance, whereby we can expect the level of PD to alter the relative relevance of export market experience and relational capital.

First of all, the aforementioned theoretical underpinnings alongside the available empirical evidence suggest that EE should generally be conducive to EP regardless of the PD level in that market. Within the internationalisation process, learning is based on past experience and occurs under conditions of risk, uncertainty, and partial ignorance in all network units, both internal and external (Clarke & Liesch, 2017; Santangelo & Meyer, 2017). The uncertainty comes from objective risk factors, re-

flected by PD indicators, which create a context for the effectiveness of all learning processes, *i.e.* experiential learning, self-development, and network-based learning.

In markets perceived as not particularly distant, exporters can easily leverage their understanding of similar business practices, cultural norms, and regulatory environments (Šeinauskienė *et al.*, 2022). Experience can help firms reduce the uncertainty associated with operating in a foreign market, especially in contexts in which the firm's existing knowledge and experience are more directly applicable (Chen & Kim, 2021). Operating experience in a specific market allows firms to better allocate resources and make ongoing decisions, likely leading to higher efficiency (Sousa & Lengler 2009).

In the contexts of higher PD, foreign market experience can help firms to overcome the greater challenges due to the aforementioned differences in culture, language, business practices, and regulations (Trąpczyński & Banalieva, 2016). Operating in high PD markets often requires firms to adapt their products, services, and strategies to local conditions. Firms with more experience in a market are likely to be better at this adaptation process (Ciszewska-Mlinarič & Trąpczyński, 2019; Martínez Villar, 2021; Demirağ & Kayabaşı, 2023). Therefore, we posit the following:

H1: Export market experience positively influences export performance in both high and low psychic distance markets.

Another strategy of coping with distance-based uncertainties relies on the use of support from knowledgeable local partners in host markets, which requires RC (Vahlne & Bhatti, 2019; Wójcik & Ciszewska-Mlinaric, 2021). Ties with partners in key host markets are assets critical to decisions regarding the geography of a company's international growth (Cuypers *et al*., 2020), including decisions to build export markets portfolio out of more or less distant countries. Furthermore, RC which involves trust and durable cooperation, can lead to more efficient and effective business operations. This is particularly true in low PD markets with potential ease of sharing norms and values that can facilitate trust-building (Arnone & Deprince, 2016). However, in the context of high PD between markets, as *e.g.* in the case of cooperation of firms from emerging and developed markets, the success in internationalisation requires adopting strategies that minimize the effects of liabilities of outsidership. Developing relationships with local entities helps to gather market knowledge and relationship-specific knowledge about business partners (Ferreras-Mendez *et al.*, 2019; Li & Fleury, 2020). Strong relationships can help to mitigate the operational risks including political or regulatory risks (Dinner *et al*., 2019) and enable the overcoming of cultural barriers thus leading to effective business practices and improved EP (Matos *et al*., 2022).

In conclusion, regardless of the PD level, RC can lead to improved EP by enhancing communication, building trust, providing access to local networks, overcoming cultural barriers, increasing local market knowledge, mitigating risk and exploitation of partners' resources. Thus, we posit the following:

H2: Relational capital positively influences export performance in both high and low psychic distance markets.

However, the mechanisms through which EE and RC lead to improved performance may vary depending on the perception of the market's PD by the export manager. For low PD markets, EE can be argued to have a stronger performance effect due to higher familiarity and ease of doing business in a more similar environment (Demirağ & Kayabaşı, 2023). In low PD markets, the firm's existing knowledge and experience are more directly applicable (Chen & Kim, 2021). In high PD markets, exporters face greater challenges due to differences in culture, language, business practices, and regulations (Bodlaj & Vida, 2018). While experience can help firms learn to overcome these barriers, the learning curve may be steeper and the positive effects of experience may take longer to materialise, leading to a weaker relationship between experience and performance (Šeinauskienė *et al*., 2022). Moreover, while firms with more EE are likely to be better at this adaptation process, the challenges associated with adaptation in high PD markets may weaken the positive relationship between experience and performance (Virvilaitė & Šeinauskienė, 2015). High PD markets are often associated with greater risk and uncertainty. While experience can help mitigate some of these risks (Martinez Villar, 2021), the inherent challenges and uncertainties of high PD markets may weaken the positive relationship between experience and performance (Chen & Kim, 2021). Therefore, we hypothesised:

H3: The positive relationship between export experience and export performance is weaker for markets of higher psychic distance.

In low PD markets, the ease of communication due to shared language and cultural norms can enhance the quality of relationships with partners, leading to improved EP (De Netto *et al*., 2021). In such markets, RC can be built up more easily, while the shared understanding and common practices facilitate communication and cooperation between the exporter and its foreign partners (Mansion & Bausch, 2020). The strong RC leads to high-quality relationships which in turn mitigate risks of foreign operations connected with power exerting behaviours of business partners (Siemieniako *et al.,* 2023). However, in high PD markets, the role of RC becomes even more crucial. While building RC in such markets can be challenging due to differences in communication styles, negotiation tactics, and business ethics, these challenges make RC a key determinant of export success (Qiao & Wang, 2021). Overcoming these obstacles to develop trust and commitment can lead to a stronger and more resilient RC. Therefore, in high PD markets, the positive relationship between RC and EP can be expected to be stronger, as the value of RC is amplified. Hence, we hypothesised:

H4: The positive relationship between relational capital and export performance is stronger for markets of higher psychic distance.

Finally, we expect that the relative relevance of EE and RC will vary between the context of low and high PD. In markets with low PD, not only do the home country and the export market share similar business practices, cultural norms, and legal systems, but the business environment tends to be more stable, making the company's accumulated experience over time more applicable and valuable (Johanson & Vahlne, 2011). The familiarity of these markets facilitates the learning process, allowing companies to quickly adapt and respond to market changes based on their own experience. Moreover, in markets with low PD, companies can build legitimacy over time more easily through their consistent presence and a proven performance reputation (Prashantham *et al*., 2019). In contrast, in markets with high PD, RC can play a more crucial role than own experience for a number of reasons. Firstly, high PD markets often tend to be less stable (Håkanson & Ambos, 2010), so the applicability of a firm's experience may be limited. Firms relying on their own experience may either simplify assumptions concerning distance and take risks even if not ready (Evans & Mavondo, 2002) or gather knowledge and get over-prepared to distant markets due to cautiousness (Sousa & Lengler, 2009). Accordingly, more extensive relationships with local partners can help navigate these uncertainties (Dinner *et al*., 2019). As the unfamiliarity of markets can impede the learning process, it becomes faster and more effective to rely on relations with local partners to obtain up-to-date knowledge and overcome uncertainty (Wójcik & Ciszewska- Mlinarič, 2021). In high PD markets, building legitimacy towards local stakeholders is also crucial for efficiency (Smith *et al.*, 2011).

To sum up, while EE plays a significant role in low PD markets, the importance of RC increases in high PD markets. This 'substitution effect' suggests that as PD increases, relationships with foreign partners start to matter more for performance than the company's own experience measured in years of exporting to that market. Therefore, we hypothesised:

H5: In markets with higher psychic distance, the role of relational capital in explaining export performance is stronger than the role of export experience.

RESEARCH METHODOLOGY

Data Collection and Variables Operationalisation

The study was based on primary data obtained from Polish manufacturing firms, with at least 10 employees, exporting to at least two countries and showing at least 10% of foreign sales to total sales (FSTS).

We collected the data using CATI with export executives of 500 firms, in 2020. Further analyses focused on the sample of 278 exporters which indicated cooperation with foreign partners to develop business operations in the main export market and established export market-based relational capital.

As widely practised when respondents are reluctant to provide objective data, we opted for a subjective approach to measuring our dependent variable of export performance in line with previous research (e.g. Sousa *et al*., 2009). Among the independent variables, we measured export market experience (EE) with the number of years since the entry into the major foreign market (*e.g.* Alcantara & Hoshino, 2012). We proxied relational capital (RC) by relationship quality measure adapted from Lages *et al*. (2005). The contextual value of psychic distance (PD) relied on the assessment of the level of several types of differences between Poland and the indicated foreign market in line with Puthussery *et al*. (2014).

Among the firm-level control variables, we included firm age (*e.g.* Sousa & Tan, 2015) and firm size in 2019, by employment (*e.g.* Hollender *et al*., 2017). We captured export share with FSTS in 2019 (*e.g.* Trąpczyński & Halaszovich, 2022). Although not central in our conceptual framework, export share can co-determine foreign market performance with other firm-level variables (Barłożewski & Trąpczyński, 2021), so it was controlled for, and the technological intensity of the sector as well. Table 1 summarises the variables measured on existing scales.

We verified the distributions of individual quantitative variables included in the models. To explore the effects of PD, we divided the data based on the median (Me = 3.93), creating groups with low PD (n=152, 30.4%) and high PD (n=126, 45.3%). We transformed the variables involved in the statistical analyses based on the decimal logarithm (firm age, firm size, export share), as well as inversion (relational capital). As for EE and RC, we removed values exceeding the third standard deviation, constituting outliers. The Kolmogorov-Smirnov test revealed a distribution similar to the normal one only in the case of the company's experience gained in the largest export market. However, after the aforesaid transformations, the skewness ranged from -2 to 2, which allowed us to implement linear regression analysis because the remaining assumptions of this analysis were met.

RESULTS AND DISCUSSION

To verify our research hypotheses, we ran OLS regression analyses with IBM SPSS 23. To capture the contextual role of PD, we computed the full models with independent variables for the whole sample, as well as for sub-groups with PD values below and above the median for the sample. We also compared the coefficients of each hypothesised variable (*e.g.* Dikova, 2009). We built the models hierarchically. Initially, we included control variables and EE and in the second step, we added RC. Before the regression analysis, we verified its assumptions as fulfilled. We removed outliers based on values greater than |3| standardised residuals and a significant result of the Mahalanobis distance test at the level of $p < 0.001$. Table 2 contains the results of this analysis.

In the full sample models, EE did not turn out to be a significant predictor of EP. The addition of RC to the full sample model resulted in an increase of explained variance from 16% to 19%, whereby RC was a strong positive predictor of EP.

In the low PD sub-sample, the basic model was well-fitted and explained 17% of the EP variance. Moreover, EE was not a significant predictor in this model. The addition of RC to the low PD sub-sample resulted in an increase of explained variance of 2% and demonstrated a significant effect of RC.

For the high PD sub-sample, analogical two models explained 19% and 22% of the EP variance, respectively. Again, RC turned out to be a significant predictor of EP. The increase of RC positively affected EP, while EE did not explain EP in either model.

Therefore, H1, according to which EE influences EP positively in both high and low PD markets was not supported. Likewise, H3 on the positive relationship between EE and EP weaker for markets with higher PD, was not supported, either.

At the same time, we supported the hypotheses related to RC. Thus, H2 assuming that RC influences positively EP in both high and low PD markets was supported. Furthermore, H4, stating that the positive relationship between RC and EP is stronger for markets of higher PD was reinforced, based on the comparison of regression coefficients, as well as levels of statistical significance between the low and high PD sub-samples. We also found support for H5, which claims that in markets with higher PD, RC is a stronger predictor of EP than EE.

Table 1. Summary of scales

Variable	Measurement	Cronbach Alpha
Export performance (EP)	How do you evaluate your performance in 2017-2019 in the largest export market (as of 2019) with regard to the items below, on a scale where 1 – significantly below expectations, 4 – in line with expectations, 7 – significantly above expectations: – Sales volume – Sales profitability – Return on sales-related investment – Financial liquidity – Market share increase – Marketing efficiency – Distribution efficiency – Reputation with clients – Overall performance satisfaction	0.89
Relational capital (RC)	Please evaluate the statements below with regard to the cooperation with the key partner in the largest export market (as of 2019) on a scale where 1 – I definitely disagree, 7 – I definitely agree: – Our relationship is characterised by a high level of mutual trust – Our relationship is based on a mutual exchange of experiences and knowledge-sharing – Our relationship is based on mutual commitment and common goals – Once misunderstandings arise, we solve them considering the interests of both parties	0.72
Psychic distance (PD)	Please evaluate the level of differences between Poland and the largest export market (as of 2019) with regard to the aspects below, on a scale where 1 – no significant differences; 7 – very significant differences: – culture (traditions, norms, and values) – Language – people's behaviour – way of thinking – interpersonal relationships – geographical distance (climate, time zones) – level of advancement in applied manufacturing technologies – level of education – political-legal environment – adopted business practices – logistics infrastructure – industry regulations – business ethics – utilisation of the Internet and modern information technologies in business	0.86

Source: own study.

A firm's market-specific relational capital positively affects export performance, this relation is stronger for more distant markets, which proves observations suggesting the role of local partner's embeddedness and knowledge. The more distant the export market, the higher the effectiveness potential built on relational capital. Companies tend to actively use it to diminish the negative influence of distance. Thanks to the capital of knowledge about opportunities and ways of operating in foreign markets, it is possible to compensate for the lack of own experience and draw on the partners' knowledge (Oparaocha, 2015). High-quality relationships stemming from relational capabilities lead to improvements in export performance (Malca *et al*., 2021). Relationship social capital helps reduce feelings of psychic distance and influences decisions about entering foreign markets (Bai *et al*., 2022). The potential of social capital determines the form of entry in relation to the decision to choose alternative modes of coordination, *i.e.* hierarchy, contract, or relational mechanism, or some form combining the merits of each (Asmussen *et al*., 2022; Narula *et al*., 2019; Strange & Humphrey, 2018).

Table 2. OLS regression results

Model	Variables	Psychic distance: low (*n* = 140)			Psychic distance: high (*n* = 122)			Full sample (*N* = 262)		
		B (*SE*)	β	*t*	*B* (*SE*)	β	*t*	*B* (*SE*)	β	*t*
1	Firm age[a]	0.23 (0.58)	0.06	0.39	-0.39 (0.49)	-0.13	-0.81	-0.10 (0.38)	-0.03	-0.26
	Firm size[a]	0.13 (0.09)	0.11	1.40	0.12 (0.09)	0.11	1.28	0.13 (0.06)	0.12	2.08*
	Export share[a]	-0.95 (0.20)	-0.40	-4.83***	-0.79 (0.20)	-0.35	-3.89***	-0.89 (0.14)	-0.38	-6.18***
	Technological intensity	Reference level: low technological intensity								
	Medium	-0.14 (0.12)	-0.11	-1.17	0.23 (0.13)	0.17	1.76^{+}	0.01 (0.09)	0.01	0.16
	High	0.09 (0.13)	0.06	0.65	0.12 (0.12)	0.09	0.96	0.11 (0.09)	0.08	1.19
	EE	**-0.01 (0.02)**	**-0.07**	**-0.47**	**-0.01 (0.01)**	**-0.06**	**-0.39**	**0.00 (0.01)**	**-0.05**	**-0.46**
2	Firm age[a]	0.19 (0.57)	0.05	0.34	-0.26 (0.48)	-0.08	-0.53	-0.08 (0.37)	-0.02	-0.22
	Firm size[a]	0.14 (0.09)	0.13	1.56	0.12 (0.09)	0.11	1.31	0.14 (0.06)	0.13	2.20*
	Export share[a]	-1.01 (0.20)	-0.42	-5.09***	-0.84 (0.20)	-0.37	-4.19***	-0.93 (0.14)	-0.39	-6.51***
	Technological intensity	Reference level: low technological intensity								
	Medium	-0.18 (0.12)	-0.14	-1.46	0.22 (0.13)	0.16	1.66^{+}	-0.02 (0.09)	-0.01	-0.17
	High	0.09 (0.13)	0.06	0.68	0.13 (0.12)	0.10	1.07	0.11 (0.09)	0.08	1.25
	EE	**-0.01 (0.02)**	**-0.07**	**-0.49**	**-0.01 (0.01)**	**-0.07**	**-0.48**	**-0.01 (0.01)**	**-0.05**	**-0.50**
	RC[b]	**-0.77 (0.43)**	**-0.15**	**-1.81^{+}**	**-1.00 (0.44)**	**-0.19**	**-2.27***	**-0.84 (0.30)**	**-0.16**	**-2.77****
1	*F*	4.68***			4.44***			8.13***		
	df	6.134			6.116			6.256		
	R^2	0.17			0.19			0.16		
2	*F*	4.55***			4.68***			8.25***		
	df	7.133			7.115			7.255		
	ΔR^2	0.02^{+}			0.04*			0.03**		
	R^2	0.19			0.22			0.19		

Note. Dependent variable: Export performance. *** - p < 0.001; ** - p < 0.005; * - p < 0.05; $^{+}$ 0.05 < p < 0.01. [a] – variables transformed based on the decimal logarithm; [b] – variables transformed based on inversion (hence the reverse interpretation of the indicator).
Source: own study.

The impact of experience understood as a longer tenure in this market is insignificant. Therefore firms should not assume that the very duration of market presence would automatically bring any advantage to export performance. Instead, EP is rather affected by the awareness of distance from the very beginning, which induces firms to be more diligent, particularly when entering distant markets. Knowledge about them is acquired before entering, as higher objective distance requires actions to reduce the uncertainty associated with its subjective perception. Managing uncertainty and entry risk means that companies do not need to learn markets for so long and the experience related to the time of operating on them does not improve the efficiency obtained at some point. It can be assumed that it stabilises after the initial growth or has an inverted U-shape as a result of inertia related to relying on past experience.

In the case of exporting to distant markets, the prediction of EP by the quality of market-specific relations instead of the years of presence in the market may indicate the adoption of export intermediation strategies and building of lasting ties in supply chains as the dominant forms of presence in foreign markets. Taking care of the quality of relations that bring the opportunity to stabilise the effectiveness of export activities seems to be the dominant strategy of the surveyed firms. Companies might see there the possibility of achieving greater benefits by using the potential of a partnership than by acquiring market-specific knowledge on their own. Participation in trust-based relationships may lead to lowering the subjective psychic distance of decision-makers operating on objectively distant markets, thus it may mitigate the uncertainty and entry risks (Vahlne & Johanson, 2021). Moreover, RC may be affecting export performance in distant markets due to its role as a facilitator in filling in the gaps in company's resources necessary to overcome liabilities of outsidership. Quality of relationships is important for EP in distant export market as it builds the foundations for minimising transaction costs and for more effective usage of joint resources and knowledge (Strange & Humphrey, 2018, Urzelai & Puig, 2019). Furthermore, RC may also stabilize relationships in export markets, diminish the negative effects of dissimilarity and asymmetry of information (Navarro-García *et al*., 2016), enable participation in business networks, which can reduce uncertainty levels brought by PD-related factors and thus enhance the propensity to pursue non-predictive strategies in dealing with liabilities of foreignness and outsidership (Bai *et al*., 2022).

There is also a need to explain how firms manage uncertainty and entry risk. If pre-entry preparation and relationships building prevail, then firms do not need to prolong their presence in foreign markets as it may not be a guarantee of learning. The same time the question arises about the value of such an approach for building firm-specific export market advantages. High-quality relations may pay off for the status quo, which means safety, but thus prevents companies from being more expansive in market penetration even with growing experience (longer lasting presence), especially in uncertain and distant environments (Leonidou *et al*., 2017; Dyer *et al*., 2018)

CONCLUSIONS

The results only partially confirm the general assumptions about firms' export experience and relational capital's positive effect on export performance. Market-specific export experience impact showed up to be statistically insignificant in our sample (H1, H3 not supported). Market-specific relational capital has proven to be a positive determinant of export performance in relevant markets (H2, H5 supported). Relational capital's influence on export performance is stronger for markets characterised by higher psychic distance than those less distant (H4 supported). Given the limited sample size and taking into account the relatively limited level of explained variance in the performance variable, our findings obviously have to be treated with caution.

The insignificant relationship between market-specific EE and EP may suggest that the companies in our sample did not build on prolonging their presence in certain export markets. We cautiously assume that firms' cumulative effect of learning from different markets matters more here. Companies implement this general foreign market knowledge together with market-specific relational capital. The exporters under study care about the quality of relationships with foreign partners as it grants them access to

resources available through partners' local embeddedness, which potentially helps in diminishing the liabilities of foreignness and outsidership as suggested in extant literature (Strange & Humphrey, 2018). Nevertheless, firms adapt foreign market learning process to broad sets of situational factors and may apply different learning strategies (Nordin & Lindbergh, 2019), which will finally affect EP levels.

Although not free from limitations, our research results highlight the need for managers to pay closer attention to the effects of own and collaborative experiential learning and possibilities to use a combination of strategies dealing with PD, exploiting the joint potential of own and partners' market knowledge and commonly developed export-market related capabilities. Managers should prioritise developing high-quality relationships with local partners in markets with high PD. These partnerships must provide critical market-specific knowledge, reduce uncertainties, and facilitate smoother market entry and operations. By investing in trust-building and long-term commitments, firms can leverage local partners' embeddedness to overcome the liabilities of foreignness and outsidership. Meanwhile, managers should recognise that export experience from market tenure alone may not always translate to improved performance, especially in high PD markets. It is essential to adapt strategies based on specific market conditions and continuously update knowledge to stay relevant. This includes customising products and services to meet local demands and preferences. More generally, exporters should encourage experiential learning by entering diverse markets and relationships, which would result in a broad base of international experience. This can enhance a firm's ability to recognise and exploit new opportunities, making them more resilient and adaptable to different market contexts and less susceptible to the aforementioned biases.

Further academic research is needed to search for the exact profits from RC as an enabler of EP, paying attention to the stability of relational rent and the balance between the bright and dark sides of relational experience (Dyer *et al*., 2018; Villena *et al*., 2020). We are aware that the approach to analysis of the impact of PD context on export effectiveness based on comparisons between subsamples dealing with high and low PD may be a limitation, thus, we argue that the results presented shall be treated with adequate caution, and this aspect opens avenues for research using more sophisticated modelling. Our research adds to those exploring 'whether distance matters' and further research shall concentrate on in-depth analyses of 'why and how it matters' as a context for export activities and organizational capabilities development (Lumineau *et al*., 2021, p. 1646).

Although our measure of EE is popular among scholars, it may not be a good proxy of experience defined as cumulated knowledge. Since cumulated experience may be a source of learning the right things but also learning the wrong things or not learning at all along the years of market presence, there is a need to use more developed indexes of experience, reflecting the occasions to learn (Sulimowska-Formowicz, 2018). Moreover, measures indicating market-specific knowledge stemming from experience would be of value (Lawless & Studnicka, 2024a,b).

The insignificant result for EE influence on PE in our analysis draws attention to the methodical aspect of measuring experience. Simple measures based on the length of experience are quite popular proxies for relatively complex promises of value stemming from such experience, namely knowledge of different kinds, which seems to be an unfair simplification. Experience seen as the resource allowing firms to deal effectively with PD-related complexities is not the one connected with years spent in the market but rather with a number of different markets entered with years (Martinez Villar, 2021). We shall conclude important for the methodology of future research. To capture the impact of experience as a proxy of organisational knowledge we shall rather build measures of experience in accordance with definitions assuming that experiential knowledge comes from sets of specific occasions and processes, so we need to look for specific types of experience, areas of its accumulation, not only duration. Experience shall be analysed from the perspective of the nature of learning opportunities and the knowledge that arises from the use of these opportunities.

Finally, we can suggest some more research directions. Since experience measured by time brings imprecise results because there is no guarantee that time spend on an activity equals knowledge accumulation, we should look for consistency in explanations of experience and measures confirming the subsequent emergence of specific types of knowledge. We should also analyse path relationships between experience and its consequences in the form of acquired competences, which may then directly

impact performance, thus mediating the relationship between experience and results. A valuable avenue of research would be to support the logic of the state and change factors proposed in the Uppsala model along with the relations between the market-specific effects of experiential learning and internationalisation capabilities potentially boosted by resources of market-specific relational capital in the context of different levels of market uncertainties. Given the recent observations of curvilinear relationships between RC and performance outcomes, it would also be valuable to explore the long-term value of RC for EP, especially in challenging environments (Dyer *et al*., 2018; Oliveira & Lumineau, 2019).

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Adoption of unmanned, cashierless retail technology in Croatia: A study on student perceptions

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ABSTRACT

Objective: The objective of the article is to examine the technology acceptance of unmanned, cashierless technology. Since 2015, several startups have developed a new technology innovation called unmanned, cashierless technology, which has been steadily spreading globally over the past nine years. This study presents an analysis of user acceptance of this innovation among students in higher education institutions in Croatia.

Research Design & Methods: We examined factors influencing attitudes towards cashless transactions within the framework of the unified theory of technology acceptance and use (UTAUT2). We developed seven hypotheses based on previous literature and research models. We conducted the research through an online survey of Croatian students (n=406). We applied variance-based structural equitation modelling (PLS-SEM) to analyse the primary database.

Findings: The new trend in smart retail could help retailers to find a new way to improve their competitiveness. Based on our results, most UTAUT2 predictors such as performance expectancy, effort expectancy, social influence, hedonic motivation, and price sensitivity significantly influence behavioural intention.

Implications & Recommendations: This study offers implications for existing research on the new technology acceptance and contributes to relevant literature on customer behaviour. Given the importance of customer perception to improve business performance, the current study has some implications for marketers and retailers.

Contribution & Value Added: Investigating the adoption of unmanned, cashless technology, particularly among Generation Z, is an important and actual topic. This research can guide stakeholders and policymakers who are planning to introduce this cashierless technology. Based on the factors analysed, we can identify important and less important factors influencing consumers' intentions. In this way, we can identify certain preferences of the target group analysed and use it as a basis for targeting them (e.g., in a campaign) when opening new stores.

Article type:	research article
Keywords:	smart retail; cashierless stores; unmanned stores; technology acceptance and use; UTAUT2; PLS-SEM
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INTRODUCTION

The twenty-first century has witnessed remarkable technological progress, with artificial intelligence (AI) being one of the most significant advances. Artificial intelligence comprises subsets such as machine learning and deep learning, enabling computers to imitate or even replace human behaviour. Digital transformation has revolutionized manual processes and companies with sufficient resources have rapidly invested in AI to boost their profits (Piotrowski & Orzeszko, 2023; Kliestik *et al*., 2023; Androniceanu, 2024; Androniceanu *et al*., 2023). Hence, digital technologies are becoming increasingly crucial in the context of the fourth industrial revolution, especially for MSMEs (Wong & Yap, 2024; Civelek *et al*., 2023;

Lewandowska *et al*., 2023). According to Davenport *et al.* (2020), Kolková and Ključnikov (2022), AI appears to have an impact on various aspects of business. The key areas of focus within this field include marketing strategies, business models, sales processes, and customer service options (Sieja & Wach, 2023). Moreover, it seems to affect customer behaviour across all industries (Davenport *et al*., 2020; Dias *et al*., 2023). Meanwhile, customer demands are constantly changing (Moraru, 2021) and firms must keep up with these changes to remain relevant (Knežević *et al.*, 2021). To do so, they must become more agile and cost-efficient by reducing operational costs (Minh *et al.*, 2022; Turek *et al.*, 2023). This trend is particularly evident in the retail sector (Ingalagi *et al.,* 2021), because as Knežević *et al.* (2016) found, new market conditions can create opportunities for small retailers.

The retail sector is highly competitive, due to numerous avenues for satisfying the consumer, minimal entry barriers, and the relative ease with which successful business models may be replicated (Śmigielska & Stefańska, 2017). The modern retail structure has evolved through the introduction of new formats since the mid-twentieth century, marked by significant innovations such as online retailing or augmented reality (Jajic *et al.*, 2022). Furthermore, the grocery sector has experienced significant internationalization since the 1980s, further shaping the retail industry. This sector is a prominent example of an innovation-intensive industry and its growing contribution to the overall economy is a consequence of the implementation of a multitude of diverse innovations (Ćuzović *et al.,* 2017).

Since 2015, various startups worldwide, such as AiFi, Aisle24, BingoBox, Cloudpick, Inokyo, and Trigo, have developed cashierless technologies (Schögel & Lienhard, 2020; Andrzejewski & Dunal, 2921; Szabó-Szentgróti *et al.*, 2023a; 2023b). Cashierless store (hereafter cashierless and unmanned terms are used synonymously) is a store with no personnel that can provide 24-hour service without closing, allowing consumers to quickly pick up and pay without time limits and even checkout. It can also quickly generate consumer details and greatly reduce the time consumers spend in the store (Hsu, 2022). According to Ponte and Bonazzi (2023), it is anticipated that these technologies will have a pivotal impact on the checkout process, reducing time requirements and minimising congestion. The first significant breakthrough in this field occurred in 2018 when Amazon launched the Amazon Go store in Seattle, USA. Since 2019, the coronavirus pandemic has led most governments to impose mobility restrictions. Consequently, there has been a notable surge in the interest of businesses in digitisation and the utilisation of digital media for business purposes (Alkhatib *et al.*, 2023). This has led to a continued rise in cashierless technology, such as contactless shopping (Kwon & Ahn, 2023).

The Central and Eastern European region, especially – European emerging markets – including Croatia, has also become part of this trend. The research by Hunady *et al.* (2022) indicates that Croatia exhibits a medium level of technology readiness and in September 2023, the first cashierless smart store was opened by the leading Croatian retail chain Konzum in the centre of Zagreb (URL 1). Thus, the research topic remains pertinent and timely.

However, Payne *et al.* (2023) suggest that the future of cashierless shops remains uncertain. Ray *et al.* (2023) investigated the impact of gratifications and emotions on the acceptance of Amazon Go. The authors propose that scholars should examine the factors that influence the adoption of interactive technologies in countries where cashierless stores are prevalent, except the United Kingdom and the USA, where numerous studies have already been conducted (Türegün, 2019; Ives *et al.,* 2019; Ray *et al.,* 2023). As Vitezić and Perić (2024) propose, an analysis of the attitudes of people living in countries with varying degrees of technological development may prove a fruitful avenue of enquiry for researchers. This research aims to address this gap in the literature by examining the level of acceptance associated with unmanned, cashierless technology in Croatia, where it has been available since the autumn of 2023. The focus is on the impact of cashierless technology on Generation Z consumers. Jung *et al.* (2024) noted that this group is the primary target for stores using this technology.

This article will explain technology acceptance among students enrolled in higher education in Croatia (n=406) based on an online survey data collection. For this purpose, we employed the extended unified theory of acceptance and use of technology (UTAUT2). We conducted the analysis and hypothesis testing using the variance-based structural equations method (PLS-SEM). The article will conclude with suggestions and recommendations for stakeholders and policymakers, as well as research suggestions.

The rest of the paper is structured as follows. The literature review section gives an overview of the main research findings related to UTAUT2 model. Based on the theoretical framework, hypothesises were developed. The next section – methodology – describes the sampling process, the variables definition, and the description of models implemented in hypothesis verification. The findings section includes the key results and the article will end with conclusions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Literature Review

We derived the theoretical framework for our proposed model from the extended unified theory of acceptance and use of technology model (UTAUT2). In recent years, research based on the UTAUT and UTAUT2 models has become increasingly prevalent.

Gumasing *et al*. (2022) investigated the behavioural intentions of the Philippine population to utilise online grocery applications. The researchers employed the UTAUT2 model to ascertain the factors that influence the acceptance and utilisation of online grocery applications amongst Filipinos. They specifically considered the impact of health risks associated with COVID-19. The study found that behavioural intentions and cues to action significantly influenced usage behaviour. The factors that positively influenced behavioural intentions to use online grocery apps were performance expectancy, perceived benefits, cues to action, and perceived severity (Gumasing *et al.*, 2022).

Sun *et al.* (2023) conducted a study examining the utilisation of flash delivery services for imported spirits among Chinese consumers. The study extended the UTAUT2 with the incorporation of knowledge, risk, and innovativeness, thereby facilitating the identification of factors influencing Chinese consumers' decision-making processes. The findings from this study provide insight into the aspirations of imported spirits flash delivery service providers to enhance sales across China. Moreover, they demonstrate the potential of the extended UTAUT2 as a research tool applicable to diverse subject matter.

Kilani *et al.* (2023) conducted a study in Jordan to examine the degree to which UTAUT2 variables can affect the adoption of e-wallets. The results demonstrated that trust is the most influential factor in determining the intention to continue using the technology. This implies that the perceptions and expectations of customers regarding a service provider or system directly impact their future perceptions of the same system.

Zarco *et al.* (2024) conducted an in-depth analysis of biometric payment systems, drawing upon two distinct yet complementary research studies. In the initial study, the researchers identified the variables that predict the intention to use this technology in a sample of 1905 potential users through the application of diverse feature selection methodologies derived from artificial intelligence within a comprehensive model that integrates the tenets of the UTAUT2 model, the general risk theory, and the trust theory. In the second study, the researchers enlisted two panels of experts from the financial technology industry to evaluate these findings. The researchers concluded that the primary factors influencing consumer acceptance of biometric payment cards are perceived risk and social influence.

However, there have been a limited number of studies, primarily in Asia, that have focused on the factors influencing customers' adoption of cashierless technologies and stores. These studies include Qi (2019), Hsu (2022), Lin (2022), and Szabó-Szentgróti *et al.* (2023b). Qi (2019) conducted one of the first studies on consumers' intentions towards checkout-free stores, using the extended integrated technology acceptance model (UTAUT2) in Hong Kong. Qi's (2019) study aimed to investigate the reception of checkout-free stores among Hong Kong residents. Hsu (2022) also carried out a similar study in Taiwan. It revealed that a number of factors influence consumers' intentions. The factors include performance expectancy, effort expectancy, social influences, facilitating conditions, behavioural intention, and use behaviour. Lin (2022) investigated the factors influencing consumers' attitudes and intentions to patronise an unmanned convenience store called X-store in Taiwan (Lin, 2022). In Europe, limited study is available regarding this topic. However, Szabó-Szentgróti *et al.* (2023) proposed a similar model for Hungary, while Hopalı (2023) examined customer attitudes in Turkey.

The following section presents a theoretical and conceptual background for each construct, and in line with that, a series of hypotheses are proposed for consideration.

Hypotheses Development

The extended unified theory of acceptance and use of technology model (UTAUT2) constituted the basis of our hypothetical model. However, we had to adjust the core model (Venkatesh *et al.,* 2012) to the purposes and specificities of this study. We kept and utilized the main constructs from the core model (performance expectancy, effort expectancy, social influence, facilitating conditions and hedonic motivation). We replaced price value construct with price sensitivity. We also excluded the habit latent variable and use behaviour from our model because with regard to this technology, habit and common use are not yet established in Croatia. However, in the scope of habit and frequent use, further research should be conducted. The following section presents the theoretical and conceptual background of each construct, upon which the hypotheses are based.

Performance expectancy (PE): The construct serves to analyse how an individual believes that using the analysed technology will help them to achieve advantages in their performance (Venkatesh *et al.,* 2012). In other words, applying the technology provides benefits to users to finish their tasks, therefore they would be more motivated to use the new technology if it eases everyday life (Venkatesh *et al.,* 2003; Morosan & DeFranco, 2016). In their study, Kapser and Abdelrahman (2020) emphasized that PE is a major construct in various studies that has a predictive effect on Behavioural intention (BI). In the case of unmanned stores, we assume, that shopping in these stores would help individual performance. Thus, we formulated the following hypothesis:

H1: Performance expectancy (PE) has a direct and positive impact on behavioural intention (BI) in cashierless intelligent stores in Croatia.

Effort expectancy (EE): This construct serves to reveal how making efforts affect behavioural intention. Making efforts means how it is easy to learn the new technology and what efforts need to be made to complete a task using the technology (Venkatesh *et al.,* 2012). The concept of unmanned store shopping procedure is to be simple and efficient (Selter *et al.*, 2023; Park, 2023). Therefore, we hypothesised:

H2: Effort expectancy (EE) has a direct and positive impact on behavioural intention (BI) in cashierless intelligent stores in Croatia.

Social influence (SI): According to the core UTAUT2 model, the social influence variable identifies how important it is to an individual that others believe they should use the analysed technology (Venkatesh *et al.*, 2012). Recent studies proved that social influence has an important role in technology acceptance nowadays as well (Nordhoff, 2020; Arpaci *et al.,* 2021; Mitchell *et al.,* 2022). This indicates that those who perceive that influential individuals in their social network endorse the use of automated shops are more likely to utilise them than those who are less convinced that their social network supports the use of such stores. Accordingly, we formulated the following hypothesis:

H3: Social influence (SI) has a direct and positive impact on behavioural intention (BI) in cashierless intelligent stores in Croatia.

Facilitating conditions (FC): The concept of FC construct is how easily the necessary tools or equipment are available to use the technology (Venkatesh *et al.,* 2012; Palau-Saumell *et al.*, 2019). Since shopping in cashierless stores requires mostly a smartphone, a smartphone application, and a bankcard (Ives *et al.,* 2019; Türegün, 2019; Ton *et al.,* 2022a), we hypothesised:

H4: Facilitating conditions (FC) have a direct and positive impact on behavioural intention (BI) in cashierless intelligent stores in Croatia.

Hedonic motivation (HM): Brown and Venkatesh *et al.* (2005) defined HM as "the fun or pleasure derived from using a technology" and according to them this construct plays a major role in technology acceptance. Cashierless stores are considered as a way new shopping experience in most countries. Cutting-edge technologies are increasingly used by retail stores to increase customer experience (Poncin *et al.*, 2017; Adapa *et al.,* 2022; Roshchyk *et al.,* 2022). Consequently, we formed the following hypothesis:

H5: Hedonic motivation (HM) has a direct and positive impact on behavioural intention (BI) in cashierless intelligent stores in Croatia.

Atmosphere (AT): By creating a new construct (Atmosphere), the purpose was to explore whether behavioural intentions are influenced by the specific internal atmosphere of shops. A limited variety of products are offered in cashierless automated shops and a more airy layout is necessary to ensure the required technology (Xu *et al.*, 2020; Schögel, 2020). A lower range of products is more advantageous concerning store experience and focused shopping (Triantafillidou *et al.*, 2017). Accordingly, we hypothesised:

H6: Atmosphere (AT) has a direct and positive impact on behavioural intention (BI) in cashierless intelligent stores in Croatia.

Price sensitivity (PS): Due to the low penetration of technology, respondents are not yet able to assess value for money. Therefore, we substitute the price value construction with price sensitivity (Kapser & Abdelrahman, 2020). Croatian consumers are mainly price-conscious (Milaković & Mihić, 2016) and these shops with limited product variety usually represent higher price levels than discount chains or supermarkets. We assumed that higher prices have a negative effect on the intention of use. Therefore, we formulated the following hypothesis:

H7: Price sensitivity (PS) has a direct and negative impact on behavioural intention (BI) in cashierless intelligent stores in Croatia.

Behavioural intention (BI): This latent variable measures the intention to use the analysed technology (Venkatesh *et al.*, 2012). Since unmanned store availability is limited in Croatia, in this article, we analysed only the intention of use. Concerning the statements of this construct, we needed some editorial changes to make the questionnaire meaningful for the revised technology.

RESEARCH METHODOLOGY

Data Collection

The questionnaire development was in line with the objective of exploring technology acceptance of smart stores, employing validated scales. We asked respondents to rate 29 statements on a Likert scale of 1 to 7, where 1 represented a strong disagreement and 7 represented a strong agreement. These 29 statements (Appendix 1.) accounted for eight latent variables in line with the research model. Given the limited availability of smart stores in Croatia, the objective was to ascertain expectations rather than perceived or experienced opinions. We conducted the survey from November 2023 to January 2024. We applied the snowball sampling method to collect answers. During the sample design, we aimed to interview mostly currently active students, studying at Croatian higher education institutions that are most likely open to this new technology. To prevent any potential confusion, the questionnaire commenced with a definition of unmanned stores. We provided the participants with the information that their responses would be anonymous and that they could cease participation in the survey at any time without providing a reason. We received a total of 484 responses and prior to database analysis a data screening process was necessary to filter out records where the response duration was not appropriate. Moreover, we needed to exclude inconsistent straight-line responses. We based the data analysis on a sample of 406 respondents. We used Microsoft Excel and SmartPLS 3.2.9 (Ringle *et al.*, 2022) software to analyse responses and develop the final proposed model.

Data Analysis Methodology

For the analysis of the research model, we used the structural equation modelling (SEM) method, which has a wide range of applications in scientific articles (Alavi, 2013; Memon & Rahman, 2013; Zhu *et al.*, 2019; Wei, 2021; Gelencsér *et al.*, 2023; Ton *et al.*, 2022b; D'souza *et al.,* 2021; Lieonov *et al.,* 2022). Our PLS-SEM (partial least squares-structural equation modelling) method is suited for the study of technology acceptance and is a widely used statistical tool by researchers (Lowry & Gaskin, 2014; Alalwan *et al.*, 2017; Indrawati & Putri, 2018; Ameri *et al.*, 2020; Tseng *et al.*, 2022; Kilani *et al.*, 2023;

Stočes *et al*., 2023; Szabó-Szentgróti *et al.*, 2023b). Hair *et al.* (2014) and Leguina (2015) emphasize that the PLS-SEM (also known as PLS-PM) methodology is gaining popularity in scientific publications partly because it allows the estimation of theoretical constructs that cannot be measured directly and the investigation of the relationship between them. Furthermore, PLS-SEM comprises two distinct models: a measurement model and a structural model. The measurement model outlines the indirect relationships between observed variables (indicators) and latent variables. The structural (inner) model describes the relationships (path) between latent constructs. One of the advantages of the method is that it can handle both reflective and formative models (Hair *et al.*, 2011).

Our model of technology acceptance of unmanned stores includes a reflective measurement model, i.e. the manifest variables are considered as the cause of the latent variable. We call these latent variables first-order variables. When we measure the higher-order (*e.g.,* second-order) latent variable with other latent variables it is called a hierarchical (*e.g.,* second-order) latent variable. The structure of the present research model is also a commonly used second-order hierarchical variable, where the relationship between the reflexively measured first-order variable and the formatively measured second-order variable (Figure 1) is investigated (Becker *et al.*, 2012).

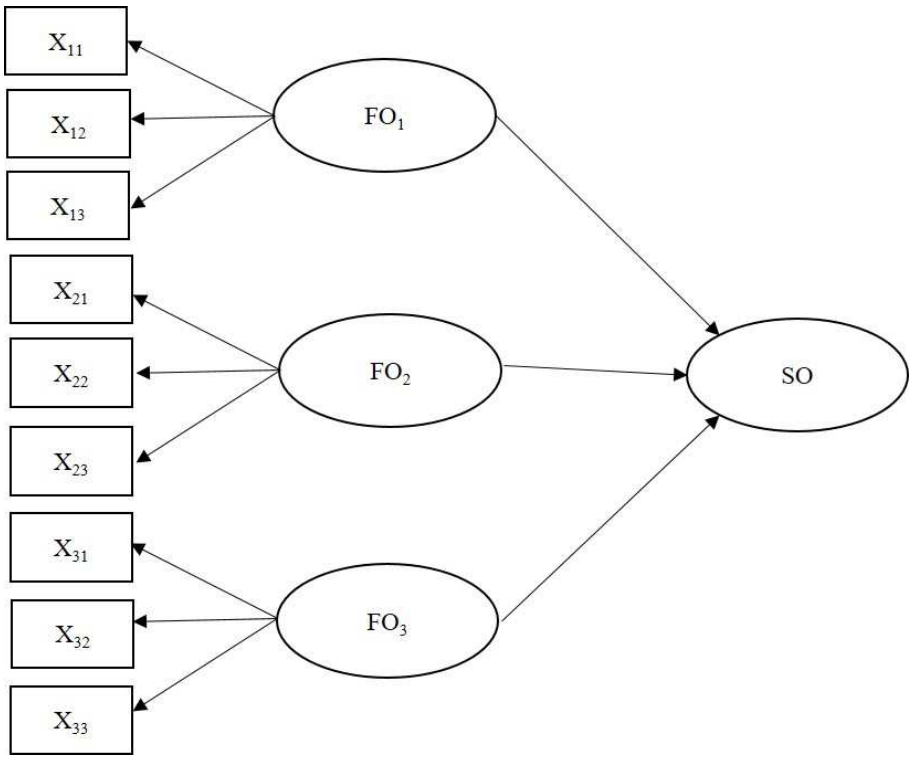

Figure 1. Type II. hierarchical latent variable model

Source: Becker *et al*., 2012.

In the data analysis, we first performed the measurement model testing and then we introduced the structural model estimation and hypothesis testing. In the results and discussion chapter, we will describe the best-fitting model.

RESULTS AND DISCUSSION

Measurement Model

Firstly, we analysed the validity of the reflective measurement model using outer loading values, Cronbach's alpha (α Value), composite reliability (rho_a, CR), and average variance extracted (AVE) measures. As demonstrated in Table 1, the outer loadings were all greater than 0.7, and Cronbach's alpha values exceeded the established threshold of 0.7 (Hair *et al.*, 2011). However, Griethuijsen *et al.* (2014) allow a 0.6 threshold for α Value, which is a less strict requirement. According to Hair *et al.* (2011), composite reliability should be higher than 0,7, but in exploratory research values from

0.60 to 0.70 are considered to be satisfactory. Table 1 presents our CR values, which were above the allowed thresholds. All the average variance extracted (AVE) values for the latent constructs exceeded the suggested minimum limit value of 0.5 (Hair *et al.*, 2010; Hair *et al.*, 2011). After comparing the data to the threshold values, the variables that met the criteria were retained in the final model (Appendix A).

Table 1. Construct reliability, convergent validity and VIF values

Constructs	Items	Outer loadings	p values	α Value	rho_a	CR	AVE	VIF
Performance expectancy (PE)	PE1	0.804	0.000	0.867	0.869	0.910	0.717	1.780
	PE2	0.819	0.000					1.887
	PE3	0.891	0.000					2.772
	PE4	0.869	0.000					2.491
Effort expectancy (EE)	EE1	0.837	0.000	0.886	0.894	0.921	0.744	2.222
	EE2	0.859	0.000					2.167
	EE3	0.886	0.000					2.593
	EE4	0.868	0.000					2.339
Social influence (SI)	SI1	0.886	0.000	0.873	0.878	0.922	0.798	2.273
	SI2	0.891	0.000					2.402
	SI3	0.903	0.000					2.350
Facilitating conditions (FC)	FC1	0.863	0.000	0.776	0.852	0.896	0.812	1.670
	FC2	0.938	0.000					1.670
Hedonic motivation (HM)	HM1	0.903	0.000	0.885	0.886	0.929	0.813	2.630
	HM2	0.913	0.000					2.725
	HM3	0.889	0.000					2.298
atmosphere (AT)	AT1	0.875	0.000	0.705	0.705	0.871	0.772	1.421
	AT3	0.882	0.000					1.421
Price sensitivity (PS)	PS2	0.874	0.000	0.845	0.850	0.906	0.764	2.017
	PS3	0.904	0.000					2.417
	PS4	0.842	0.000					1.881
Behavioural intention (BI)	BI1	0.868	0.000	0.860	0.863	0.914	0.781	2.051
	BI2	0.873	0.000					2.123
	BI3	0.909	0.000					2.495

Source: own study based on calculations in PLS-SEM.

The discriminant validity of the model indicates that the constructs used are sufficiently distinct from one another (Hair *et al.*, 2017). Fornell-Larker criteria and heterotrait-monotrait ratio (HTMT) are expected to confirm that. However, HTMT is considered to be more accurate compared to Fornell-Larker criteria (Henseler *et al.*, 2015). In the present study, we applied both methods to verify discriminant validity (Table 2 and Table 3). According to the Fornell-Larcker criterion, the research model has no discriminant validity issues because the "AVE value of each latent construct is higher than the construct's highest squared correlation with any other latent construct" (Hair *et al.*, 2011). Regarding HTMT values that should be below than 0.9, one value showed a discriminant validity issue between PE and BI constructs. The data has been subjected to a more in-depth analysis to explore the reasons for this HTMT value. We did not obtain better results by excluding manifest variables (statements). Therefore, we had to revise responses. Reducing the number of records showed improvement in HTMT value. However, we decided to keep 406 responses and we considered this HTMT value when formulating our conclusions.

According to Hair *et al.* (2011), variance inflation factor (VIF) values exceeding 5.0 indicate the presence of multicollinearity. Prior to the estimation of the structural model, we conducted a multicollinearity test to evaluate VIF values. The VIF values of our model (Table 1) show no multicollinearity issues between latent constructs. However, the model meets the less permissive 3.0 value.

Table 2. Discriminant validity (Fornell-Larcker criterion)

Constructs	AT	BI	EE_	FC	HM	PE	PS	SI
AT	**0.879**	–	–	–	–	–	–	–
BI	0.535	**0.884**	–	–	–	–	–	–
EE_	0.693	0.684	**0.863**	–	–	–	–	–
FC	0.651	0.428	0.718	**0.901**	–	–	–	–
HM	0.677	0.782	0.754	0.583	**0.902**	–	–	–
PE	0.608	0.834	0.743	0.486	0.785	**0.847**	–	–
PS	0.135	0.498	0.210	0.018	0.362	0.418	**0.874**	–
SI	0.478	0.722	0.586	0.371	0.697	0.737	0.483	**0.893**

Source: own study based on calculations in PLS-SEM.

Table 3. Discriminant validity (HTMT criteria)

Constructs	AT	BI	EE_	FC	HM	PE	PS	SI
AT	–	–	–	–	–	–	–	–
BI	**0.687**	–	–	–	–	–	–	–
EE_	0.874	**0.773**	–	–	–	–	–	–
FC	0.894	0.510	**0.868**	–	–	–	–	–
HM	0.858	0.897	0.846	**0.696**	–	–	–	–
PE	0.779	0.965	0.840	0.592	**0.897**	–	–	–
PS	0.175	0.582	0.233	0.070	0.417	**0.487**	–	–
SI	0.610	0.830	0.660	0.446	0.792	0.846	**0.557**	–

Source: own study based on calculations in PLS-SEM.

According to Hair *et al.* (2011), variance inflation factor (VIF) values exceeding 5.0 indicate the presence of multicollinearity. Prior to the estimation of the structural model, we conducted a multi-collinearity test to evaluate VIF values. The VIF values of our model (Table 1) show no multicollinearity issues between latent constructs. However, the model meets the less permissive 3.0 value.

Structural Model and Hypothesis Testing

Once we tested the variables included in the model, we conducted the structural model assessment via 5000 bootstrap calculations, during which, we evaluated the statistical significance of the path coefficient was evaluated (hypotheses testing). To assess the fitness of the model, we employed the standardized root mean square (SRMR) with a value of less than 0.08 deemed appropriate according to Henseler *et al.* (2016). The model demonstrates an adequate level of model fitness, as indicated by an SRMR value of 0.061, which indicates a good fit. Figure 2 shows a representation of the final model.

According to Knock (2015), common method bias (CMB) can be excluded if a "full collinearity test is equal to or lower than 3.3." Outer VIF values did not show any multicollinearity issues (Table 1) and inner VIF values have been as follows: PE→BI: 3.282; EE→BI: 3.402; SI→BI: 2.585; FC→BI: 2.428; HM→BI: 3.763; AT→BI: 2.396; PS→BI: 1.437. Moreover, EE and HM were not considerably above the limit value. Thus, we detected no CMB in our model.

The final model has an adjusted R^2 value of 0.766 (p=0.000), which suggests that a 76.6% variance of the behavioural intention of cashierless stores can be accounted for by the analysed seven latent variables. Noteworthy, 0.766 value means a strong explanatory power according to Henseler *et al.* (2009) and Hair *et al.* (2011), therefore the structural model was substantial (>0.75). We analysed the relationships of the research model to test seven hypotheses. Results in Table 4 show that performance expectancy (ß=0.439, p=0.000), effort expectancy (ß=0.119, p=0.024), social influence (ß=0.099, p=0.027), hedonic motivation (ß=0.282, p=0.000), and price sensitivity (ß=0.146, p=0.000) significantly influenced behavioural intention (BI) while facilitating conditions (ß=-0.047, p=0.255), and atmosphere (ß=-0.041, p=0.261) have no proven meaningful effect on BI variable.

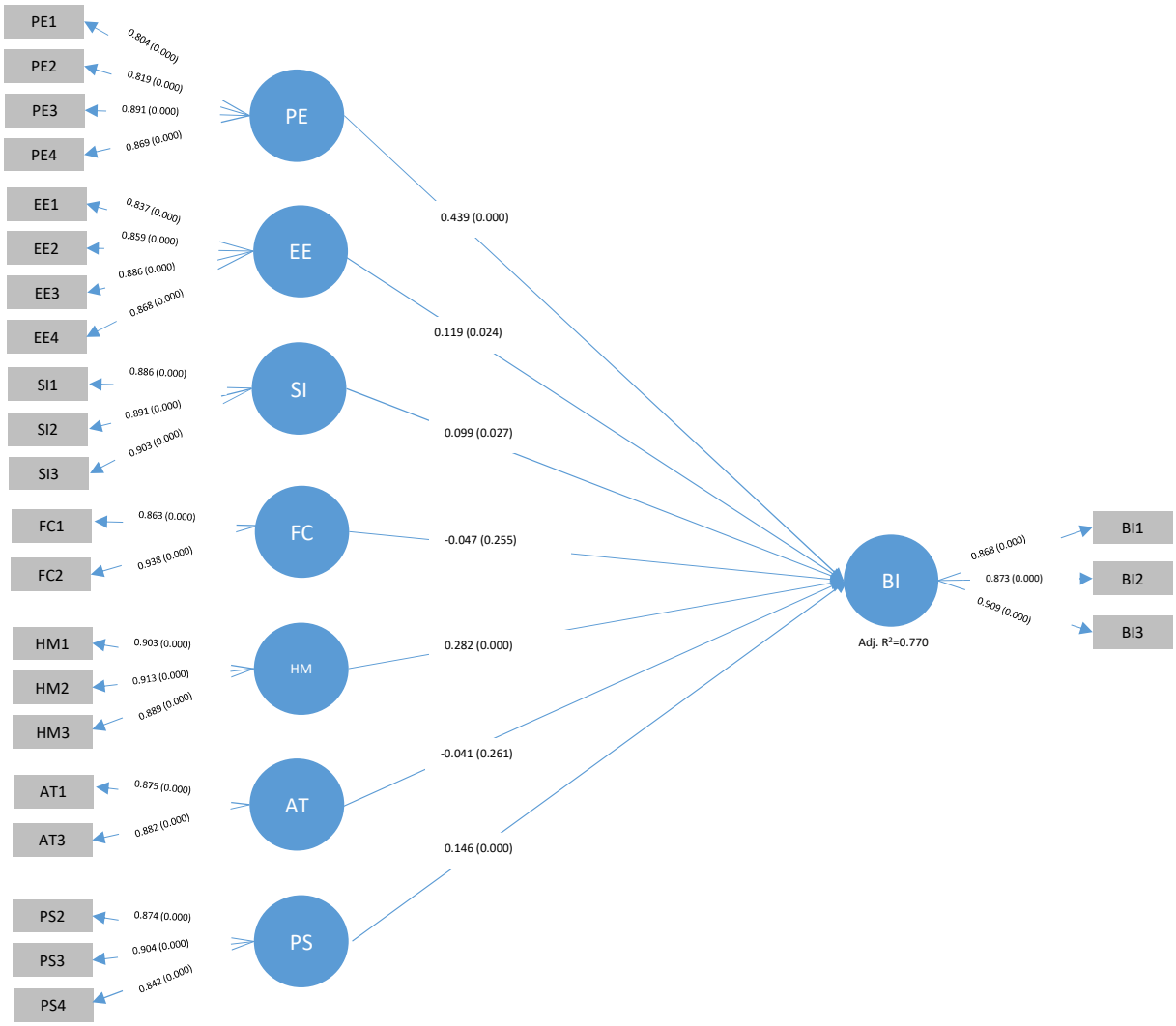

Figure 2. Validated research model of unmanned store technology acceptance in Croatia
Source: own elaboration based on calculations in PLS-SEM.

Table 4. Bootstrap results and hypothesis results

Paths and Hypotheses	Coefficient (ß)	Sample mean	STDEV	t statistics	p values	Hypothesis validation
PE -> BI (H1)	0.439	0.440	0.061	7.134	0.000*	*supported*
EE -> BI (H2)	0.119	0.120	0.053	2.258	0.024*	*supported*
SI -> BI (H4)	0.099	0.100	0.045	2.218	0.027*	*supported*
FC -> BI (H3)	-0.047	-0.047	0.041	1.139	0.255	rejected
HM -> BI (H5)	0.282	0.280	0.053	5.291	0.000*	*supported*
AT -> BI (H6)	-0.041	-0.041	0.037	1.125	0.261	rejected
PS -> BI (H7)	0.146	0.146	0.034	4.331	0.000*	*supported*

Source: own elaboration based on calculations in PLS-SEM.

CONCLUSIONS

As Vitezić and Perić (2024) have posited, technology is evolving at a rapid pace. It is therefore of interest to ascertain whether consumers' attitudes towards AI devices evolve over time and at what rate. The undertaking of new cross-sectional and longitudinal studies in diverse service areas may yield novel insights into the acceptance of AI devices. This study aimed to investigate the factors influencing user acceptance of AI-driven unmanned technologies among Croatian university students, who represent the primary target group for this technology (Jung *et al.*, 2024). We based the model used in the

study on the UTAUT2 model. We collected data through an anonymous online survey. We used the bootstrap method (Table 4) to test the hypotheses using a recommended sub-sample of 5000. The coefficients (ß) were from -1 to +1, the closest coefficient to -1 indicated a strong negative relationship, and the closest coefficient to +1 indicated a strong positive relationship (Hair *et al.,* 2021).

Based on our results, there was a proven statistical relationship (p=0.000) between performance expectancy (PE) and behavioural intention (BI), thus performance expectancy (PE) directly and positively influences behavioural intention (BI) in cashierless smart stores. Therefore, we confirmed the first hypothesis (H1). From a practical point of view, it can be concluded that university students believe that cashierless technology would be useful in their daily lives, which would increase their flexibility and help them to be more efficient and complete their shopping faster. Moreover, the PE variable is one of the main constructs in various studies, and in many cases, it has the strongest predictive effect on BI (Kapser-Abdelrahman, 2020). Prior studies showed a relationship between PE and BI. Arpaci *et al.* (2022) examined Metaverse acceptance and found that people would not avoid using Metaverse if they believed that they would benefit from it easily and quickly. Furthermore, the PE construct is proven to be significant in various fields of science from medical sciences (Schmitz *et al.*, 2022), financial technology (Senyo & Osabutey, 2020) to education technology (Meet *et al.*, 2022).

Noteworthy, the younger generation is receptive to new technology and therefore represents a potential target audience for the development of marketing strategies.

We investigated a statistically significant relationship (p=0.027) between social influence (SI) and behavioural intention (BI). Thus, we confirmed hypothesis three (H3). Social influence has a direct and positive impact on the behavioural intention of these stores, *i.e.* respondents care about other people's opinions on whether they use the technology. It is well established that in some cases, we change our opinions or actions as a result of the opinions of others, and it is particularly true for the younger generations that the opinions of others significantly influence their actions (Deutsch-Gerard, 1955). In their study about mobile banking, Dhingra and Gupta (2020) have come to the same result, namely that SI has a predatory effect on BI. Korkmaz *et al.* (2022) examined autonomous public transport systems in which the authors found that the attitude of people in the user's social circle towards a new technology has a direct impact on the user's attitude towards the technology and thus on their willingness to adopt and use the technology.

We found no proven statistical relationship (p=0.255) between facilitating conditions (FC) and behavioural intention (BI). Thus, there was no confirmed relationship between behavioural intention and the resources needed to shop in unstaffed smart shops, such as smartphones, internet connection, smartphone compatibility, or other technologies used by respondents. This result was surprising because we expected a proven link precisely for this generation. Using smart devices is now taken for granted by this generation, so this may have also played a part in the results. Hence, we rejected hypothesis four (H4), according to which facilitating conditions directly and positively influence behavioural intention in cashierless smart shops. In their studies, Shoheib and Abu-Shanab (2022) found that in the case of social commerce, FC has a proven effect on BI. Meanwhile, Beh *et al*. (2021) found that FC impacts BI in smartwatch use. However, similarly to the results of this study, Nordhoff *et al.* (2020) found no significant effect between FC and BI in the case of automated cars. However, paths have also been examined from other angles and found proven relationships between SI→FC, FC→EE and FC→HM.

We found a statistically proven relationship between hedonic motivation (HM) and behavioural intention (BI) (p=0.000). We confirmed hypothesis five (H5) that hedonic motivation directly and positively influences the intention to use cashierless smart stores. These results suggest that students perceive shopping in cashierless stores as fun and enjoyable, which may encourage them to shop in such stores in the future. Prior research supported the significant relationship between HM and BI (Nordhoff *et al.*, 2020; Nikolopoulou *et al.,* 2021; Arpaci *et al.,* 2022). The customer experience plays an important role for Generation Z and innovative technologies are increasingly being used by retail stores to enhance the customer experience (Poncin *et al.*, 2017; Adapa *et al.*, 2020).

We did not confirm the statistical relationship between atmosphere (AT) and behavioural intention (BI) (p=0.261). Therefore, we rejected our hypothesis (H6) that atmosphere (AT) directly

and positively influences behavioural intention in cashierless smart stores. Accordingly, respondents did not feel they would have advantages from the less crowded location in unmanned shops and the cleaner and simpler interior.

We identified several key considerations for practitioners, given the statistically proven relationship (p=0.000) between price sensitivity (PS) and behavioural intention (BI). This validates our hypothesis seven (H7), indicating that price sensitivity (PS) has a direct and positive effect on behavioural intention for Croatian university students in cashierless smart shops. Previously, Kapser and Abdelrahman (2020) examined PS and their studies have concluded that PS negatively influences BI in Germany, meaning PS was the most relevant construct for user acceptance of autonomous delivery vehicles before the actual market launch of technology. Mathew *et al.* (2023) examined price sensitivity on attitudes about last-mile drone delivery of food products in India. They found that PS impacts attitudes in an emerging country like India where concerns about higher prices of a new technology were validated. Regarding our results, we can conclude that the surveyed respondents were reluctant to pay more for a product, because it is sold in a new technological environment. This result is in line with the fact that Croatian consumers are price-sensitive (Milaković & Mihić, 2016). The other reason may also be that members of this generation do not necessarily have sufficient income. This suggests the need for a well-considered pricing strategy for automated stores where the pricing strategy should be adapted to the size of the shop and the purpose of use (*e.g.,* convenience quick purchase or weekly shopping).

In 2023, Konzum launched the first unmanned automated shop in Zagreb, Croatia. It is still considered a limited availability technology in Croatia and worldwide. However, scholars predict further expansion of this market (Kwon & Ahn, 2023). Knežević *et al.* (2016) found that new market conditions could create opportunities for small retailers. One such opportunity is the distribution of cashierless, unmanned technology. Hence, it is important and timely to investigate the factors influencing behavioural intention and, with the uptake, the actual use, which can serve as a guide for experts.

This research makes a significant theoretical contribution by being the first research in Croatia and the Central-Eastern-European on the topic. We formulated a modified model using the core variables of UTAUT2 and we adapted the model to the technological specificities. We applied further development with a new construct called atmosphere (AT). The construct aimed to explore whether behavioural intentions are influenced by the specific internal atmosphere of shops. We made a comparative analysis with the existing research about technology acceptance and the modified model could serve as a basis for future research on technology adoption and for investigating unmanned technologies.

The managerial implications of this article constitute a valuable contribution to our understanding of the factors influencing the willingness to adopt AI-powered unmanned stores. This is crucial given the growing labour shortage in the retail industry and the need for faster adoption of new technologies. This study could serve as a guide for stakeholders, outlining the strategies, measures, and pricing policies that should be introduced in AI-driven cashierless stores to ensure their success. It is crucial to recognise that the younger generation is receptive to new technologies and enjoys experiencing this new trend. Therefore, they represent a potential target group for the development of business, communication, and marketing strategies. The efficiency of the shopping process is an important factor, thus, the provision of convenience features is essential. The communication strategy of unmanned stores is recommended to be based on our result that the opinions of others are important to Generation Z. Nevertheless, given the price-sensitive nature of the target audience, it is of paramount importance for stakeholders to consider this factor throughout the pricing policy.

We examined the technology acceptance of AI-based cashierless technology among university students in Croatia. However, the findings may be limited by the fact that some respondents did not have experience purchasing in unmanned stores, and thus may not have had a realistic consumer experience. For this reason, we analysed only behavioural intention. Besides that, we collected the data used in this study via an online survey in Croatia and therefore the generalisability and conclusions of the proposed model can be expanded by further research at different locations. The format of cashierless stores is already available in more and more countries such as the United States, Canada, China, Croatia, Israel, Hungary, Poland, and Sweden (Szabó-Szentgróti *et al.*, 2023a).

A future study could investigate the differences in consumer behaviour depending on the country's level of economic development. Furthermore, cross-sectoral data can improve our understanding of how the perceptions of customers with different characteristics influence the strategies that emerge in the retail sector.

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Appendix A: Survey statements

Code	Constructs and statements	Measure source
	Performance expectancy	
PE1	I would find automated smart stores useful in my daily life.	Venkatesh *et al*. (2012), Kapser & Abdelrahman (2020)
PE2	Using automated smart stores would increase my flexibility in my daily life.	
PE3	Using automated smart stores would help me accomplish things more quickly.	
PE4	Using automated smart stores would increase my productivity.	
	Effort expectancy	
EE1	Learning how to shop in automated smart stores would be easy for me.	Venkatesh *et al*. (2012)
EE2	My interaction with automated smart stores would be clear and understandable.	
EE3	I would find automated smart stores easy to use.	
EE4	It would be easy for me to become skilful at shopping in automated smart stores.	
	Social influence	
SI1	People who are important to me would think that I should shop at automated smart stores.	Venkatesh *et al.* (2012)
SI2	People who influence my behaviour would think that I should shop at automated smart stores.	
SI3	People whose opinions I value would prefer that I shop at automated smart stores.	
	Facilitating conditions	
FC1	I have the resources necessary to shop at automated smart stores (*e.g.,* smartphone, internet).	Venkatesh *et al.* (2012)
FC2	I know necessary to shop at automated smart stores (*e.g.,* using the application).	
FC3	Automated smart stores are compatible with other technologies I use (*e.g.,* smartphone). (deleted)	
FC4	I can get help from others when I have difficulties shopping at automated smart stores. (deleted)	
	Hedonic motivation	
HM1	Shopping at automated smart stores would be fun.	Venkatesh *et al*. (2012)
HM2	Shopping at automated smart stores would be enjoyable.	
HM3	Shopping at automated smart stores would be very entertaining.	
	Atmosphere	
AT1	I would prefer automated smart stores to be less crowded with customers.	Own statements
AT2	I would prefer automated smart stores to have a smaller selection of products. (deleted)	
AT3	I would prefer automated smart stores to have clean and simple interiors.	
AT4	I would find products easier in automated smart stores. (deleted)	
	Price sensitivity	
PS1	Automated smart stores would offer me better value for money. (deleted)	Indrawati & Putri (2018), Kapser & Abdelrahman (2020)
PS2	I would not mind paying more to try automated smart stores as a shopping option.	
PS3	I would not mind spending more money to get my shopping done in automated smart stores.	
PS4	If I knew that automated smart stores were likely to be more expensive than conventional shopping options that would not matter to me.	
	Behavioural intention	
BI1	I intend to shop at automated smart stores in the future.	Venkatesh *et al*. (2012), Kapser & Abdelrahman (2020)
BI2	I would always try to shop at automated smart stores in my daily life.	
BI3	I plan to shop at automated smart stores frequently when available in the future.	

Source: own study.

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Cross-border e-shopping on e-commerce B2C multi-sided digital platforms: Antecedents and moderating role of country of location

Marzanna K. Witek-Hajduk, Anna Grudecka

ABSTRACT

Objective: The objective of the article is to investigate the impact of a foreign multi-sided digital platform's (MSP) e-shopping quality (quality of information, payment security, consumer service), image, perceived legal protection of cross-border online purchases on beliefs and attitudes towards cross-border e-purchases on foreign MSPs, along with their influence on e-consumer intentions to purchase, and foreign MSP's country of location as a moderator (EU and USA vs. China).

Research Design & Methods: We surveyed a representative sample of 810 Poles and analysed the gathered data with PLS-SEM.

Findings: Beliefs (with the critical role of trust) and foreign MSPs' ease of use significantly impact e-purchases on foreign MSPs, which is determined by online shopping quality, the image of a foreign MSP, and perceived legal protection of e-purchases. There are differences between consumers purchasing via Western vs. Chinese MSPs regarding the influence of payment security on ease of use and influence on trust in a foreign MSP of the following antecedents: consumer service on a given MSP, its reputation, and perception of prices/costs.

Implications & Recommendations: This article offers valuable insights into e-consumer behaviour useful to MSPs' managers.

Contribution & Value Added: This article develops literature on cross-border e-commerce, especially e-consumer behaviour on MSPs, by examining new factors relevant to online shopping on foreign MSPs and considering the moderating role of an MSP's country of location.

Article type: research article

Keywords: antecedents of cross-border e-shopping; multi-sided digital platforms (MSPs); cross-border e-commerce (CBEC); purchase intentions

JEL codes: M16, M31, F23

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INTRODUCTION

After the COVID-19 pandemic, the development of cross-border e-commerce (CBEC) has accelerated. Therefore, the global value of e-commerce sales will reach 7.4 billion USD in 2025, compared to 4.9 billion USD in 2021 (Statista, 2021). In 2022, CBEC represented 22% of global e-commerce, and China was the leader with a 41% share in 2021 (Accenture, 2019). The CBEC market is projected to attain the value of 2.25 trillion USD by 2026, while in 2019, it was 0.579 trillion USD (Statista, 2021).

Multi-sided digital platforms (MSPs), including Amazon and AliExpress, play an important role in B2C CBEC (Rangaswamy *et al*., 2020), but the majority of studies focus on general issues of CBEC, not specifically foreign MSPs (Chen *et al*., 2023). Moreover, MSPs connect shoppers and suppliers in a single market (Hagiu & Wright, 2015). They sell products from various suppliers and brands, enabling e-

shopping from various countries, and facilitating transactions. E-shoppers buying from abroad amounted to 83% among clients from Nordic countries, 75% – the UK, 65% – the Netherlands, 62% – Germany (Accenture, 2019), and Poland – 46% in 2021 (ARC, 2022). Many European e-consumers shop on MSPs located in the EU, USA, and China. For many of them, AliExpress is one of the top three MSPs (Postnord, 2020). Furthermore, B2C MSPs differ by image, reputation, variety of goods/brands offered and their quality, return policy, and consumer service (Jung *et al*., 2015).

Researchers indicate both foreign MSPs' benefits for e-consumers (*e.g.,* access to a greater variety of products/brands/suppliers from worldwide) (Valarezo *et al*., 2018), and barriers: differing legal protection of e-transactions, consumer data collection, products sourced from many, often little-known suppliers/brands, sale of low-quality products, undermining of high-quality product suppliers by those offering low-quality at lower prices (Hagiu, 2015), and higher perceived risk compared to purchases in mono-brand e-stores, especially domestic (Witek-Hajduk & Targański, 2018).

European Union supports CBEC via initiatives implemented as parts of the EU Digital Single Market strategy reducing barriers when entering into CBEC contracts in the EU, improving consumer protection, *i.e.* privacy and personal data protection, transparency, *etc*. (Valarezo *et al.,* 2018).

Despite increasing e-shopping on foreign MSPs, few studies consider CBEC on foreign MSPs (Ma *et al*., 2022) from consumers' perspective, its legal aspects (Huang & Chang, 2017), and studies considering simultaneously these factors are missing. As indicated by Mou *et al*. (2020), only single articles focus on MSPs and CBEC, therefore it requires further investigation. Studies on e-purchase intention explore mainly risk and motivation perspectives (Mou *et al*., 2017) or the impact of product cognition (Zhu *et al*., 2019). Although some studies on consumer behaviour integrate the theory of planned behaviour (TPB) and technology acceptance model (TAM), much fewer do so in the context of e-consumer behaviour, especially with regard to CBEC and MSPs. Little research explores e-consumer purchase intention and integrates TPB and TAM, which are often theoretical bases in research on e-consumer behaviour. Previous findings do not conclusively determine, which antecedents influence purchase intentions on foreign MSPs. Moreover, the conceptual model of this study is enriched with antecedents that were rarely included or not considered altogether in previous research, *i.e.* perceived legal protection of online purchases. Furthermore, it considers previously not included moderator, *i.e.* MSP's country of location.

Researchers suggest that consumer studies on CBEC should include foreign vendors' country of location as a moderator (Ramkumar & Jin, 2019) as only various consumers' nationalities, not MSPs' countries of location were examined (Mou *et al*., 2020b). Thus, we distinguished two subgroups of e-consumers purchasing on foreign MSPs: (1) who made the largest number of e-purchases in the last year on an MSP located in a foreign EU country or USA (C-WEST); and (2) Chinese MSPs (C-CHIN).

Many studies on e-shopping intentions referred to students – mainly Asians, and North Americans (Xiao *et al*., 2019) – thus nationwide representative samples are needed. Previous studies rarely included the perception of legal protection of CBEC and foreign online vendors' image – although they may determine e-consumer behaviour (Huang & Chang, 2017) also with reference to MSPs originating from developed and emerging countries.

In this study, we will verify the following issues based on a representative sample of Poles: (1) influence of antecedents: e-shopping quality, foreign MSP image, perceived legal protection of cross-border online purchases on beliefs and attitudes towards e-shopping on foreign MSPs; (2) influence of these beliefs/attitudes on consumer intention to purchase on foreign MSPs; and (3) moderating effect of country of location of foreign MSP.

This article adds knowledge useful to managers of MSPs by identifying: MSPs' attributes influencing consumer beliefs regarding CBEC, the impact of legal protection, the influence of e-consumer beliefs about purchases on foreign MSPs on their attitudes and purchase intentions, from the perspective of e-purchases on foreign MSPs, and elements enriching literature on CBEC and e-consumer behaviour by considering investigating new antecedents, suitable to e-shopping on foreign MSPs.

This article is structured as follows. First, the literature pertinent to the consumer behaviour, including the theory of planned behaviour and technology acceptance model, is summarized. Next, the

study method is discussed, and it is followed by the research finding. Finally, the paper provides discussion of the study`s outcomes, its limitations and suggestions for further research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The Theory of Planned Behaviour and the Technology Acceptance Model

In many studies on e-consumer behaviour, the most frequently employed theoretical frameworks are the theory of planned behaviour (TPB) and the technology acceptance model (TAM) (Filieri *et al*., 2021). The technology acceptance model fits perfectly various issues of e-consumers behaviour because of its focus on information technologies, proven validity/reliability, extensive application and accumulated research tradition (Sharp, 2007, p. 3). Meanwhile, TPB describes relations between attitudes and one's behaviour, including two sets of beliefs: one's attitudes towards a given behaviour and subjective norms (others' normative expectations), and behavioural control perceived by a consumer, *i.e.* perceptions of the ability to perform a behaviour (Ajzen, 2020). The favourable attitude towards behaviour and supportive subjective norms promote one's motivation to engage in a particular behaviour.

While TPB is a rather vague concept, commonly applied to explain various behaviours (Ajzen, 2020), TAM incorporates constructs from the TPB to formulate a technology acceptance model, assuming that beliefs regarding the ease (effortless) of the usage of a technology influence attitudes toward it (perceived by consumer usefulness, its acceptance and subsequent use) (Davis *et al*., 1989). The variables of TAM include 'better suited to decisions involving few technology usage choices than to situations involving user's voluntary choices,' including online shopping, and sometimes do not capture all the beliefs that determine consumer attitudes toward online shopping and antecedents (Ha & Stoel, 2009, p. 566). This study integrates TPB and TAM: out of TAM, beliefs and attitudes are examined, and as indicated by Ajzen (2020, p. 318) and other antecedents in TPB are also considered: foreign MSP image, image of products and brands sold, their prices and costs (Oghazi *et al*., 2018) – and the quality of e-purchases (quality of information on MSP, security of payment, consumer service (Ha & Stoel, 2009). We scrutinized perceived legal protection, as it may especially impact CBEC (Mou *et al*., 2020a) and e-consumer trust (Kooli *et al*., 2015). The study includes also perceived value which results from the quality of e-shopping or an image of the online seller's influencing e-purchase intentions (Sullivan & Kim, 2018). Studies on e-consumer behaviour on MSPs draw from TPB and TAM and extend them (Oliviera *et al*., 2020).

Quality of E-shopping, Foreign MSP Image, and Perceived Legal Protection as Antecedents

The literature on e-commerce considers various dimensions of e-shopping quality (Ha & Stoel, 2009; Oghazi *et al*., 2018; Widyanto *et al*., 2020; Yang *et al*., 2023), including website's quality of information (whether a given information can be found quickly, is sufficient/reliable); payment security, and consumer service (whether a vendor responds to one's needs, guarantees fast delivery, *etc*.). Sullivan and Kim (2018) and Fang *et al*. (2016) indicate the influence of perceived quality on the perceived value of e-shopping and, consequently, on online purchase intentions, and McKnight *et al*. (2002) – the influence of the website's quality of information on trust towards its gestor. These authors add that it is crucial especially when establishing initial trust, *i.e.* when one starts using a given page, etc. The discussed quality of information is shaped inter alia by its reliability, sufficiency, etc. (Kim *et al*., 2008). In turn, among determinants of payment security, authors indicate such factors as tools protecting buyers (*e.g.* user identification), available payment systems on a given website and confidential data encryption (Adriansahi *et al*., 2020; Kim *et al*., 2008; Oney *et al*., 2017). However, perceived security depends on how well a consumer understands the level of security standards (Friedman, 2000). Considering consumer service, Ha and Stoel (2009) conclude that meeting one's needs, fast deliveries and prompt responses to consumers' inquiries have a direct influence on the ease of use of e-purchases, their perceived usefulness and e-purchase intentions. In turn, Oghazi *et al*. (2018) note that a convenient return policy serves to build trust in an online seller and increases e-purchase intentions. Therefore, both quality of information, payment security and consumer service are important antecedents of e-purchases, besides beliefs about them, *i.e.* the perceived ease of use and trust. Moreover, Kim *et*

al. (2008) confirmed that these factors positively influence consumer trust and the perceived ease of use of e-shopping, resulting in higher purchase intentions. Thus, we hypothesised:

H1: E-shopping quality (ESQ): the quality of information on a foreign MSP (PLQ) (H1a), payment security (PPS) (H1b), consumer service (PCS) (H1c) positively influences perceived ease of use of a foreign MSP (PEU).

H2: E-shopping quality (ESQ): quality of information on a foreign MSP (PLQ) (H2a), payment security (PPS) (H2b), consumer service (PCS) (H2c) positively influences trust in a foreign MSP (TIMP).

Another factor that impacts e-consumer behaviour is the online vendor's reputation, *i.e.* its image, products/brands sold, and prices/costs. It reflects affect-based antecedents and is among the most significant factors to online shopping (Kim *et al*., 2008), including reputation, renown, and honesty. Literature characterizes reputation through past interactions between the parties involved in the transaction and their ratings (Fan *et al*., 2016; Teubner *et al*., 2019). As indicated by Zacharia and Maes (2000), all the above aspects are especially important for first-time transactions. Moreover, consumers increasingly post online information about their purchases. As a result, many ratings of various online sellers are easily available (Reyes-Menendez *et al.,* 2019). Products and brands sold boil down to their reliability, originality, quality and value for money (Özen & Kaya, 2013) with quality being especially important when shopping on foreign MSPs (Mou *et al*., 2020a), *e.g.* consumers purchasing on a Chinese MSP may be concerned about products' quality. It may transfer into the perceived value of e-purchases and consequently into purchase intentions (Özen & Kaya, 2013). Agkeyan-Simonian *et al*. (2012) underline that *e.g.* perceived risk of buying a particular product online with regard to its quality is crucial as consumers cannot examine it physically prior to the purchase. Prices and costs reflect whether all the expenses associated with e-shopping justify the purchase (Oghazi *et al*., 2018). The next aspects that may further raise significance are attractive discounts and sales promotions (Carlson *et al*., 2018). In particular, this regards deal-prone consumers. Kim *et al*. (2008) state that (low) prices/costs positively influence one's trust towards an online vendor. In turn, Sullivan and Kim (2018) highlight that perceived prices transfer into the perceived value of e-purchases, and next – into purchase intentions. Muralidharan *et al.* (2014) underline that monetary cost is one of the key determinants of e-purchases. Considering it, we hypothesised:

H3: Foreign MSP image (FPI), i.e. its reputation (PPR) (H3a), the perception of products/brands (PPB) (H3b), and the perception of prices/costs (PPC) (H3c) positively influences trust in a foreign MSP (TIMP).

Researchers emphasize that the legal protection, *e.g.* sufficient protection of e-consumer privacy and stringent international laws protecting CBEC, may impact one's evaluation of e-transactions and shape confidence to make a purchase (Lwin *et al*., 2007), especially because the institutional-based trust regarding legal protection determines one's trust and e-purchase intentions (Kooli *et al*., 2015). Legal regulations on e-commerce transactions differ between countries/regions. However, in recent years, the protection of consumer rights referring to e-commerce has been largely harmonised within the EU. Moreover, operators of MSPs directing services to consumers residing in the EU should apply the legal protection standards in force in the EU or better, and EU law prohibits a choice of law for CBEC transactions that would deprive EU consumers of protection according to EU standards (Targański & Mokrysz-Olszyńska, 2017).

Other authors support this view (*e.g.* Eastlick & Lotz, 2011; Kooli *et al*., 2014). Legal protection perceived by consumers may be predominantly important for shaping initial trust in an e-retailer (Eastlick & Lotz, 2011) especially as one's personal data he shares with the MSP's provider remains at his disposal after a transaction is made, which may constitute a 'moral hazard problem' (Mou *et al*., 2020b, p. 412). Some even perceive consumer privacy protection as one of the key issues in the growth of e-commerce (Bandara *et al*., 2020). Legal protection can play a distinctive role in purchases outside the EU, namely from China, as European consumers shopping in the EU enjoy special legal protection (Gomez-Herrera *et al*., 2014). Thus, we hypothesised:

H4: Perceived legal protection of online purchases (IFOP) positively influences trust in a foreign MSP (TIMP).

H5: Perceived legal protection of online purchases (IFOP) positively influences the perceived usefulness of purchases in a foreign MSP (PUOP).

H6: Perceived legal protection of online purchases (IFOP) positively influences the perceived value of purchases on a foreign MSP (PVP).

Trust in a Foreign MSP and its Ease of Use

Trust is one's subjective belief assuming that others will fulfil obligations towards him and will act according to the consumer's interest (Yu *et al*., 2015). We may compare trust with an online vendor's trustworthiness, and consumer's general faith in e-shopping (Kim *et al*., 2008). Trust is usually based on previous experiences, *i.e.* crucial factors positively determine the perceived usefulness of online shopping (Ha & Stoel, 2009), their perceived value (Özen & Kaya 2013), and e-purchase intention (Jiang, 2019), also because e-shopping payment often precedes product delivery (Kim *et al*., 2005). Trust may be pivotal to the e-consumer decision-making process (Gou *et al*., 2019), and is more important for online, associated with greater uncertainty, than offline settings (Chen & Barnes, 2007). Trust is a multidimensional construct including inter alia trust towards the retailer itself, towards his country of origin and his website (Safari, 2012). In the international context, Fisher and Zoe Chu (2009) conclude that the vendor's geographical location of the website determines their perceived trustworthiness. As stated by Huang and Chang (2019), the national integrity of the vendor's country, their reputation and policy transfers into his trustworthiness. Besides trust, it may also transfer into consumer privacy and their purchase intentions (Bhattacharya *et al*., 2023). Consumers from the European Union (EECR, 2023) are more confident in their national e-seller which may suggest that they trust them more than foreign ones. Thus, we hypothesised:

H7: Trust in a foreign MSP (TIMP) positively influences the perceived value of purchases on a foreign MSP (PVP).

H8: Trust in a foreign MSP (TIMP) positively influences the perceived usefulness of purchases on a foreign MSP (PUOP).

H9: Trust in a foreign MSP (TIMP) positively influences consumer intentions to purchase on a foreign MSP (IPFP).

Conversely, scholars perceive ease of use as the extent to which technology is effortless and whether one may easily find information regarding an online store's website (Ashraf *et al*., 2014). It directly impacts perceived usefulness (Davis *et al*., 1989) and purchase intention (Abdullah *et al*., 2016). The positive impact of the ease of use on e-shopping is confirmed in some other studies as well (Ying *et al*., 2021), including one on MSPs (Chen & Yang, 2021). Filieri *et al*. (2021) indicate that ease of use positively and directly determines one's satisfaction, as well as behavioural intentions. Thus, we hypothesised:

H10: The ease of use of an MSP (PEU) positively influences the perceived usefulness of purchases on a foreign MSP (PUOP).

Attitudes Towards MSPs and Purchase Intentions

Among attitudes towards MSPs and purchase intentions, the perceived value of e-purchases and perceived usefulness are foregrounded. Sheth (1991) mentions such perceived value dimensions as functional, social, emotional, and epistemic ones, which act independently of each other and additively.

Perceived value usually describes the subjective trade-off between perceived quality and utility (*i.e.* benefits), along with the costs of acquiring a product, is identified with one's attitudes (Özen & Kaya, 2013), being considered a multidimensional construct (Chen *et al*., 2018). Some equate perceived value to the ratio of value for money (Kim *et al*., 2007) Costs are understood broadly, *e.g.* financial ones or perceived risk (Mou *et al*., 2020a). Perceived value has a strong positive influence on e-shopping intentions. Therefore, it may be the key factor affecting purchase intentions (Sullivan & Kim, 2018). Therefore, we hypothesised:

H11: Perceived value of purchases on a foreign MSP (PVP) positively influences consumer intentions to purchase on a foreign MSP (IPFP).

According to TAM, another attitude is the perceived usefulness of online shopping – consumer's belief regarding using a given technology that improves performance, and productivity, and facilitates purchases by saving time or making shopping easier (Moslehpour *et al*., 2018). Moslehpour *et al*. (2018) add that we should understand the perceived usefulness of e-shopping as all the perceived benefits may also constitute an advantage of purchasing in an e-store compared to stationery. Nevertheless, the degree of facitilating e-purchases and its influence on the usefulness of e-shopping in comparision to purchases in stationery stores depends on the stage of e-consumer adoption of purchases via the Internet (Ashraf *et al.*, 2014). The more consumers are familiar with Internet tools, the more they appreciate that e-shopping facilitates the shopping process and higher rate its usefulness, thus increasing their propensity to purchase online. Therefore, we hypothesise:

H12: Perceived usefulness of purchases on a foreign MSP (PUOP) positively influences consumer intentions to purchase on a foreign MSP (IPFP).

Regarding overall e-consumer behaviour, researchers usually consider one's purchase intentions that are justified by TPB, according to which intentions are reliable predictors of one's future actual behaviour (Ajzen, 1991).

Moderating Role of Foreign MSPs' Country of Location

For CBEC, subjective perceptions (lack of trust, cultural barriers, preferences toward domestic suppliers) and objective barriers on the supply side (geographical sales restrictions for products between manufacturers and retailers) can be significant for consumers (Cardona & Martens, 2014). This may explain why consumers tend to choose well-known vendors, and why (positive) experiences motivate them to (re)purchase (Chen & Yang, 2021). Consumers' objections against foreign e-purchases are visible even among European e-consumers shopping in other EU countries (Cardona & Martens, 2014). Therefore, trust plays a crucial role in shaping e-consumer behaviour (Zhu *et al*., 2019). Mou *et al*. (2020a, p. 405) refer to Chinese MSPs to indicate that international buyers may be also 'concerned about the quality of Chinese product, yet they may perceive benefits from purchasing.' This may reflect nationality bias as a (negative) stereotype about a given country-of-origin (location) that impacts consumer behaviour, including attitudes toward products/brands and purchase intentions, which results *e.g.* from assigning lower quality to products/services that originate from a specific country (Hien *et al*., 2020). Thus, we hypothesise:

H13: The relations presented in hypotheses 1-12 have different strengths for consumers who made the largest number of e-purchases in the last year on 'Western' (C-WEST) vs. on Chinese MSP (C-CHIN).

Figure 1 shows the conceptual model reflecting the hypotheses given above.

The conceptual model refers to the TPB and TAM and explains relationships between e-shopping quality, foreign MSP's image and its legal protection of CBEC with beliefs/attitudes towards e-purchases on foreign MSPs, altogether relationships of those beliefs/attitudes with consumer's intentions to purchase on foreign MSPs. Moreover, it considers the foreign MSP's country of location.

RESEARCH METHODOLOGY

To validate the hypotheses, we applied a computer-assisted web interview (CAWI) survey on a representative sample of 810 Polish consumers aged 18-65 years. They were the participants of 'e-panel.pl' by Polish research agency ARC Rynek i Opinia, with approximately 70 000 registered active respondents in the survey year, *i.e.* 2020. We surveyed only consumers who declared purchases on foreign e-commerce MSPs. In total, 48.8% of respondents indicated Chinese MSPs as platforms on which they made the largest number of transactions in the year preceding the survey, while 51.2% indicated EU or US ('Western') platforms. We collected data in June-July 2020.

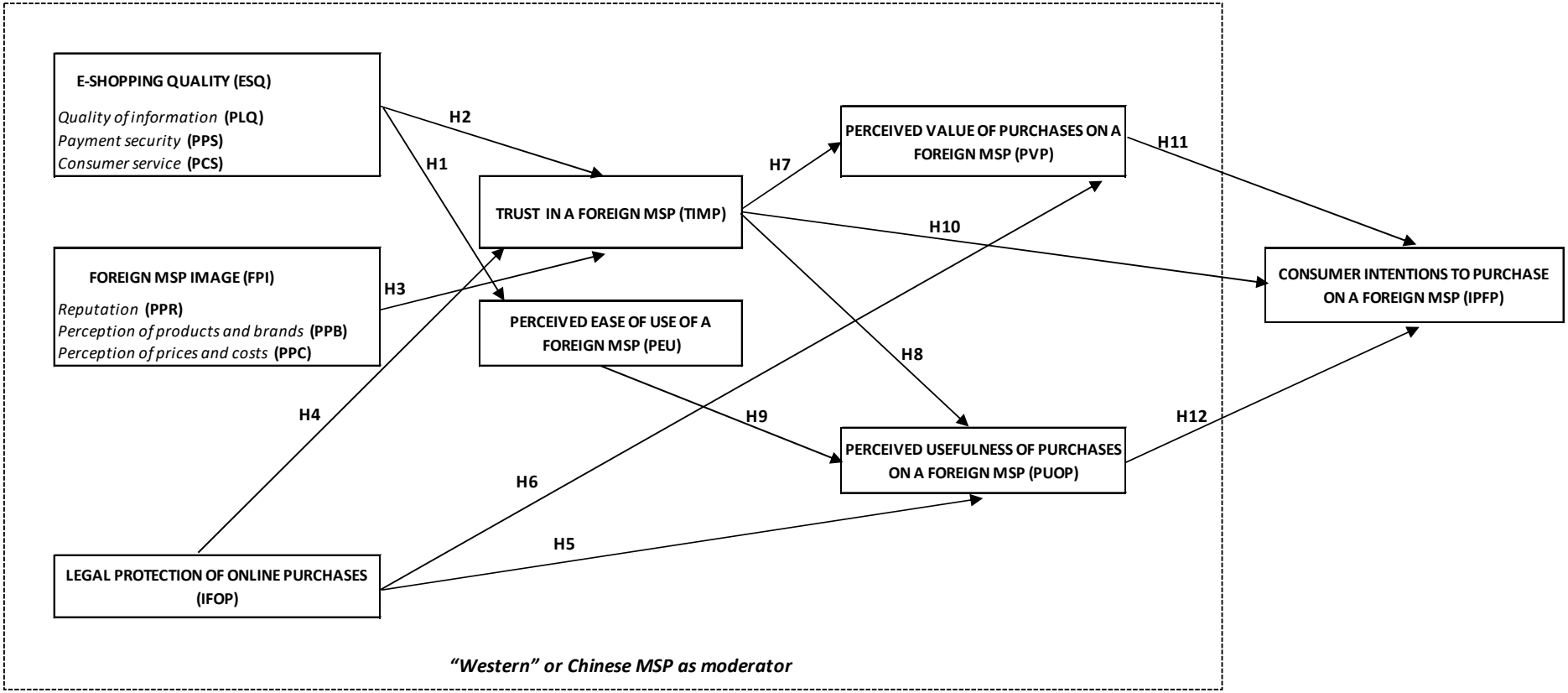

Figure 1. Research model

Source: own elaboration.

The sample's structure (N=810) differs by gender (50.1% M, 49.9% F), age (37.2% -18-34, 43.7% – 35-54, 19.1% – 55-65), residence (18.1% lived in villages, 36.8% – in cities up to 100 000, 45.1% – in cites over 101 000), education primary/basic – 30.8%, secondary – 39.1%, higher – 30.1%), disposable income (in PLN: 1999 or less – 34.1%, 2000-3999 – 43.6%, 4000 and more – 22.3%).

The survey consisted of filtering questions regarding e-purchases on foreign MSPs, metric questions regarding socio-demographic features of participants and their income, and closed ones using a seven-point Likert scale. We sourced the majority of items included within the last group of questions from the literature, *i.e*. previous studies. We did so to apply scales that have been already empirically verified (for details – please see Table 1). In total, we developed and concerned nine items: (1) legal issues, *i.e.* national and international legislation on the protection of e-purchases, legal protection of EU e-consumers and right of withdrawal from a distance contract; (2) perception of prices and costs with regard to lower prices in comparison to stationery stores and overall relatively low prices of products sold on MSPs; and (3) trust in a foreign MSP regarding keeping its commitments, having consumer's best interest in mind and being honest in dealing with customers. The rationale for their development stemmed from the fact that these selected aspects had not been indicated in the questionnaires in earlier studies, while observations of consumer behaviour suggested that they might be relevant. To analyse the data, we applied PLS-SEM (SmartPLS 3 software), for respondents' characteristics – IBM SPSS Statistics 24.0. Noteworthy, PLS-SEM enables testing high complexity of relations between variables and the model's empirical confirmation taking the aspect of causality, which is recommended if variables (*e.g.* measured with Likert scale) do not have normal distributions (Hair *et al*., 2014, p. 46). We applied bootstrapping to estimate estimation errors' distribution and determine the statistical significance of regression paths. After estimating error distribution and determining the statistical significance of regression paths, we conducted the model's quality assessment by applying composite reliability, *i.e.* CR coefficient (acceptable level 0.7-0.95); the accuracy of measurement by applying average variance extracted coefficient (AVE; the level equal to or higher than 0.5) and discriminant validity applying the Fornell-Larcker criterion.

The measurement model can be accepted assuming that measurable variables are not lower than factor loadings describing their correlations regarding hidden variable (minimum value of 0.3); hidden variables explain at least 50% of the variance of their measurable variables (AVE cannot be below 0.5); CR for all constructs is at minimum 0.7.

Adherence to the above recommendations was important as common method bias (CMB) may occur in the PLS-SEM even if a model satisfies the standard assessment criteria based on the confirmation factor analysis (Kock, 2015). Schwartz *et al*. (2017) state that CMB is an insignificant problem, and the problem of correlations between variables measured applying the same method – which predominantly are self-reported surveys – is overstated. Nevertheless, we performed Harman's single-factor test for CMB to establish whether the variance was caused by the reasons rather than by the use of the same types of Likert scales from a single respondent (Fuller e*t al.*, 2016). Considering that the metrics are loaded on a single factor, the number of extracted variance was equal to 48.015% (below the maximum of 50%), which indicated the lack of CMB.

Next, we examined path coefficients and the significance of the difference in path coefficients towards zero using bootstrapping. To verify the H13 hypothesis, we tested the significance of differences in path coefficients regarding the C-WEST and C-CHIN subgroups by using bootstrapping and Welch-Satterthwaite formula.

RESULTS AND DISCUSSION

We evaluated the measurement model's quality with regard to the AVE assessment, total reliability, as well as divergent validity. Table 1 presents factor loadings and synthetic measures for individual constructs.

Table 1. Likert scale measuring reflective constructs, their sources and reliabilities of factor loadings

Statements	Factor loadings	Sources	Statements	Factor loadings	Sources
PCS-Perceived customer service on a foreign MSP (AVE=0.746; TR=0.946)			**PLQ-Perception of quality of information on a foreign MSP and its layout (AVE=0.753; TR=0.948)**		
PCS_1	0.851	Ha & Stoel, 2009	PLQ_1	0.863	Mc Knight *et al.*, 2002
PCS_2	0.769		PLQ_2	0.864	
PCS_3	0.893		PLQ_3	0.872	Ha & Stoel, 2009
PCS_4	0.887		PLQ_4	0.872	Kim *et al.*, 2008
PCS_5	0.89	Oghazi *et al.*, 2018	PLQ_5	0.866	
PCS_6	0.884		PLQ_6	0.869	
PUOP-Perceived usefulness of purchases on a foreign MSP (AVE=0.749; TR=0.937)			**PPC-Perception of prices and costs on a foreign MSP (AVE=0.753; TR=0.938)**		
PUOP_1	0.871	Asharaf *et al.*, 2014	PPC_1	0.75	Oghazi *et al.*, 2018
PUOP_2	0.872	Shang *et al.*, 2005	PPC_2	0.873	Shang *et al.*, 2005
PUOP_3	0.833	Kim *et al.*, 2007	PPC_3	0.895	Delafrooz *et al.*, 2009
PUOP_4	0.893		PPC_4	0.891	Own elaboration
PUOP_5	0.858		PPC_5	0.919	
PVP-Perceived value of purchases on a foreign MSP (AVE=0.777; TR=0.946)			**TIMP-Trust in a foreign MSP (AVE=0.852; TR=0.966)**		
PVP_1	0.921	Kim *et al.*, 2007	TIMP_1	0.929	Kim *et al.*, 2008
PVP_2	0.897		TIMP_2	0.934	
PVP_3	0.794		TIMP_3	0.922	Own elaboration
PVP_4	0.886		TIMP_4	0.896	
PVP_5	0.903		TIMP_5	0.933	
PPB-Perception of products and brands sold on a foreign MSP (AVE=0.722; TR=0.911)			**PEU-Perceived ease of use of a foreign MSP (AVE=0.872; TR=0.965)**		
PPB_1	0.918	Özen & Kaya, 2013	PEU_1	0.939	Asharaf *et al.*, 2014
PPB_2	0.845		PEU_2	0.929	
PPB_3	0.913		PEU_3	0.942	
PPB_4	0.704	Kim & Niehm, 2009	PEU_4	0.927	
IFOP-Perceived legal protection of online purchases (AVE=0.726; TR*=0.949)			**IPFP-Consumer intentions to purchase on a foreign MSP (AVE=0.771; TR=0.944)**		
IFOP_1	0.883	Lwin *et al.*, 2007	IPFP_1	0.887	Kim *et al.,* 2007
IFOP_2	0.842		IPFP_2	0.873	
IFOP_3	0.869		IPFP_3	0.887	
IFOP_4	0.852	Own elaboration	IPFP_4	0.873	
IFOP_5	0.814		IPFP_5	0.881	
IFOP_6	0.876		**PPR-Perceived reputation of a foreign MSP (AVE=0.779; TR=0.933)**		
IFOP_7	0.827		PPR_1	0.793	Kim *et al.*, 2008
PPS-Perceived payment security on a foreign MSP (AVE=0.853; TR=0.946)			PPR_2	0.925	
PPS_1	0.93	Kim *et al.*, 2008	PPR_3	0.907	
PPS_2	0.895		PPR_4	0.899	
PPS_3	0.945		–		

Source: own study (SmartPLS3).

According to Table 1, the interpretation of extracted constructs based on the content of their measures were allowed. Thus, the measurement model was acceptable. Its reliability and convergent validity were correct, *i.e.* values of all factor loadings were higher than the minimum of 0.3; CR for all constructs were higher than 0.7 therefore indicating that there are high levels of correlation between

measurable variables required for measures of reflective constructs and lower than 0.95. Thus, the model was internally consistent; AVE for all the hidden variables were over 0.5.

Model satisfied the criterion of discriminant validity, *i.e.* square roots of the AVE of all latent variables were higher than the correlations of these constructs with others (Table 2).

Table 2. Fornell-Larcker discriminant validity

Variables	IFOP	IPFP	PCS	PEU	PLQ	PPB	PPC	PPR	PPS	PUOP	PVP	TIMP
IFOP	0.852	–	–	–	–	–	–	–	–	–	–	–
IPFP	0.475	0.878	–	–	–	–	–	–	–	–	–	–
PCS	0.445	0.716	0.864	–	–	–	–	–	–	–	–	–
PEU	0.448	0.454	0.384	0.934	–	–	–	–	–	–	–	–
PLQ	0.473	0.774	0.705	0.549	0.868	–	–	–	–	–	–	–
PPB	0.442	0.681	0.708	0.241	0.615	0.850	–	–	–	–	–	–
PPC	0.384	0.669	0.579	0.506	0.613	0.451	0.868	–	–	–	–	–
PPR	0.421	0.772	0.714	0.460	0.845	0.649	0.548	0.882	–	–	–	–
PPS	0.491	0.683	0.710	0.423	0.655	0.616	0.581	0.625	0.923	–	–	–
PUOP	0.472	0.438	0.350	0.756	0.502	0.285	0.448	0.448	0.399	0.866	–	–
PVP	0.447	0.744	0.675	0.473	0.723	0.587	0.752	0.660	0.642	0.440	0.881	–
TIMP	0.512	0.859	0.787	0.434	0.773	0.714	0.606	0.791	0.739	0.421	0.739	0.923

Source: own study (SmartPLS3).

Figure 2 represents the structural model considering standardized regression weights (with acceptable values of -1 to 1) representing the strength of relations between constructs, with values of variance explained by remaining variables considering the inside circles for endogenous variables. It meets the '10 times rule' for estimations applying PLS-SEM (Hair *et al*., 2014, p. 23).

Considering the endogenous variables related to the 'Consumer intentions to purchase on a foreign MSP – IPFP,' 76.7% of the variance was explained (R^2=0.767). Moreover, IFOP, TIMPm and PEU explained 59.6% of the variance of endogenous construct – PUOP (R^2=0.596), while IFOP and TIMP explained 55.2% of the variance of construct PVP (R^2: 0.525). In turn, IFOP, FPI, and ESQ explained 78.3% of the variance of the construct TIMP (R^2=0.783), and ESQ explained only 31.1% of the variance of the construct PEU (R^2=0.311).

Path coefficients evaluated when applying bootstrapping and representing hypothetical relations between hidden variables and relations between constructs' statistical significance were verified (Table 3). Considering that the direct effects may not fully reflect relations between constructs, the hypotheses' verification should be based on the significance of total effects (Hair *et al*., 2014).

Considering the above table, hypotheses tests supported all the postulated paths but two: H1c and H2a. Regarding significance tests of total effects' regression weights, we concluded that:

- PLQ (H1a) and PPS (H1b) positively influenced PEU; there was no significant impact of PCS (H1c) on PEU – H1 partially supported;
- ESQ's dimensions – PPS (H2b) and PCS (H2c) had significant positive influence on TIMP; PLQ (H2a) had no significant impact on TIMP – H2 partially supported;
- FPI's dimensions – PPR (H3a), PPB (H3b); and costs PPC (H3c) had a significant positive influence on TIMP – H3 supported;
- IFOP positively influenced TIMP; PUOP; and PVP – H4, H5, H6 supported;
- TIMP positively influenced PVP and PUOP – H7 and H8 supported;
- PEU positively influenced PUOP – H10 supported;
- TIMP, PVP; and PUOP positively influence IPFP – H9, H11, H12 supported.

To verify H13 hypothesis, we examined differences between consumers' subgroups using the country of location of a foreign MSP (Western markets or C-WEST vs. Chinese MSPs or C-CHIN) as categorical moderators and estimating the moderating impact of these variables on relations between the model's hidden variables (Hair *et al*., 2017, p. 243).

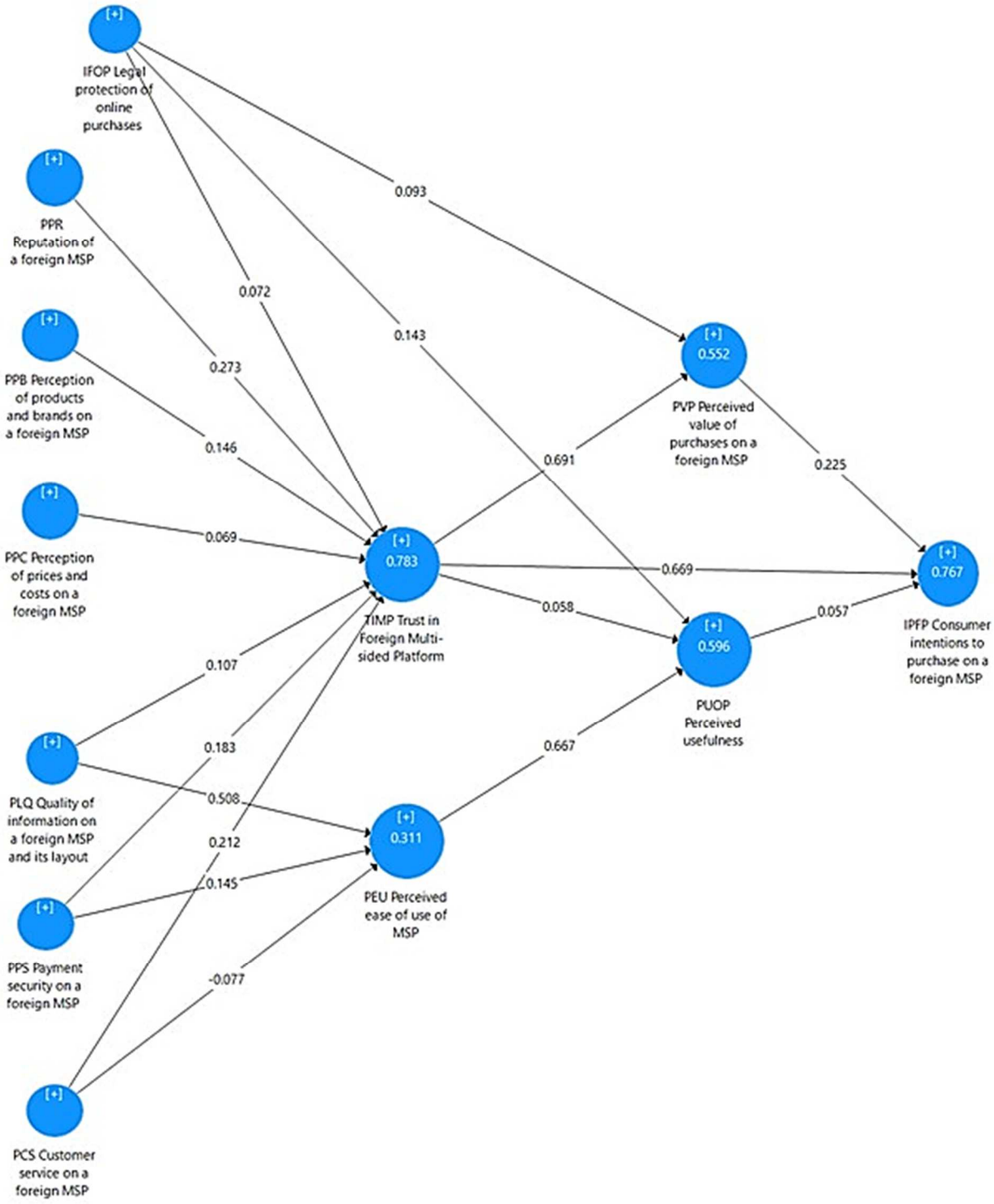

Figure 2. Study's structural model
Source: own elaboration (SmartPLS3).

Table 3. Path coefficients and significance of relations between constructs (considering total effects)

Regression paths	Path coefficients	p
PLQ->PEU	0.508	0.000***
PPS->PEU	0.145	0.012**
PCS->PEU	-0.077	0.194
PLQ->TIMP	0.107	0.126
PPS->TIMP	0.183	0.000***
PCS->TIMP	0.212	0.000***
PPR->TIMP	0.273	0.000***
PPB->TIMP	0.146	0.000***
PPC->TIMP	0.069	0.040**
IFOP->TIMP	0.072	0.004**
IFOP->PUOP	0.143	0.000***
IFOP->PVP	0.093	0.000***
TIMP->PVP	0.691	0.000***
TIMP->PUOP	0.058	0.076*
TIMP->IPFP	0.669	0.000***
PEU->PUOP	0.667	0.000***
PVP->IPFP	0.225	0.000***
PUOP->IPFP	0.057	0.014*

Note: *p<0.10, **p<0.05, ***p<0.01; α=0.10.
Source: own study (SmartPLS3).

Figures 3-4 present structural models estimated by applying PLS-SEM on the samples of C-WEST and C-CHIN.

Table 4 presents path coefficients (total effects) and p-values for models concerning subgroups of consumers C-WEST and C-CHIN.

Table 4. Path coefficients (total effects) and significance of relations between constructs for C-WEST and C-CHIN consumers

Regression paths	C-WEST		C-CHIN	
	Path coeff.	p	Path coeff.	p
PLQ->PEU	0.588	0.000	0.406	0.000
PPS->PEU	-0.028	0.671	0.287	0.001
PCS->PEU	0.039	0.627	-0.100	0.240
PLQ->TIMP	0.123	0.298	0.063	0.311
PPS->TIMP	0.157	0.001	0.191	0.000
PCS->TIMP	0.362	0.000	0.131	0.023
PPR->TIMP	0.177	0.115	0.383	0.000
PPB->TIMP	0.202	0.000	0.133	0.003
PPC->TIMP	-0.077	0.215	0.120	0.007
IFOP->TIMP	0.077	0.041	0.061	0.052
IFOP->PUOP	0.119	0.004	0.169	0.000
IFOP->PVP	0.146	0.000	0.121	0.005
TIMP->PVP	0.711	0.000	0.687	0.000
TIMP->PUOP	0.073	0.155	0.066	0.148
TIMP->IPFP	0.826	0.000	0.824	0.000
PEU->PUOP	0.676	0.000	0.651	0.000
PVP->IPFP	0.227	0.000	0.231	0.000
PUOP->IPFP	0.075	0.030	0.042	0.202

Note: *p<0.10, **p<0.05, ***p<0.01; α=0.10; coeff. – cofficients.
Source: own study (SmartPLS3).

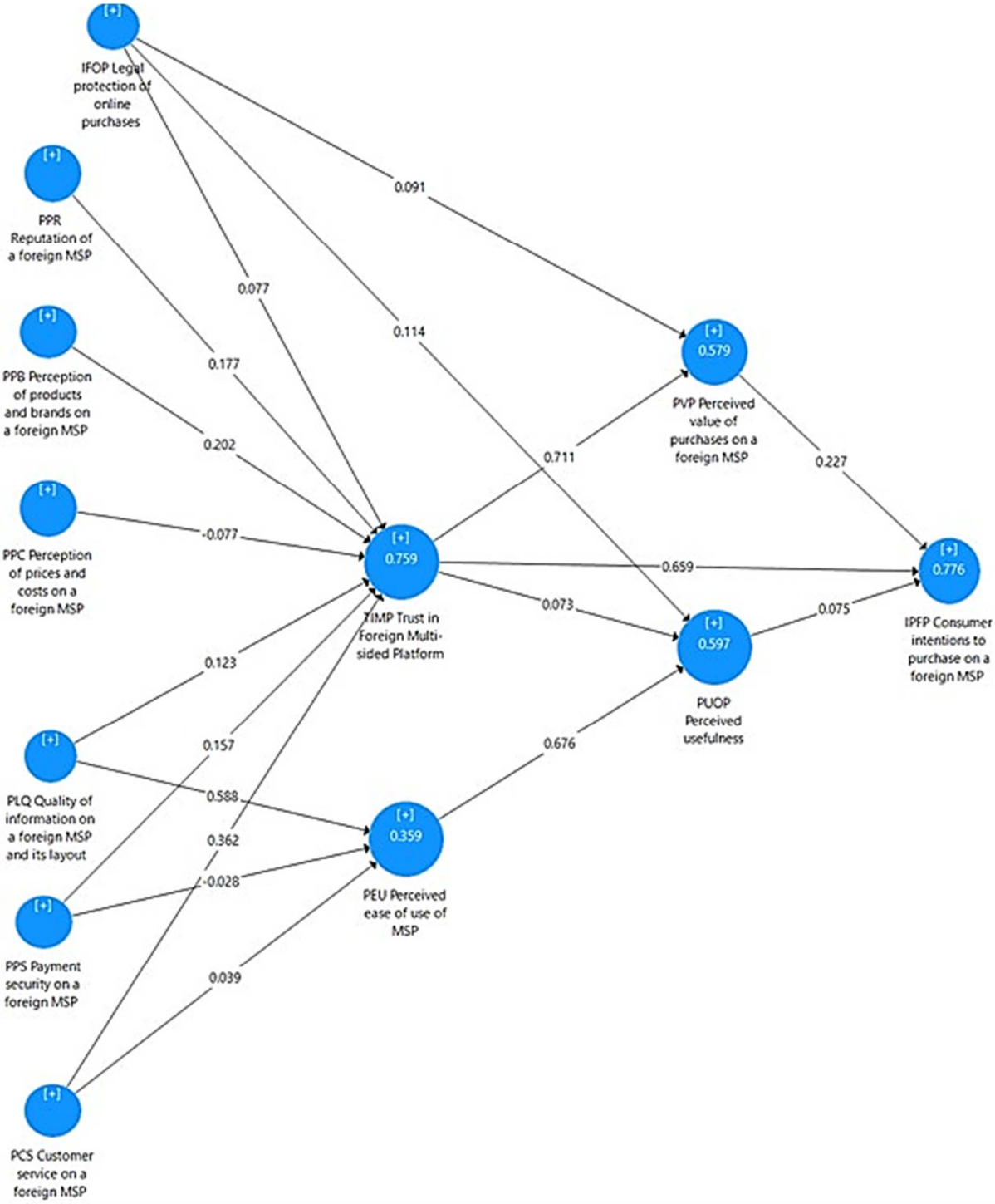

Figure 3. Structural model for C-WEST sample
Source: own elaboration (SmartPLS3).

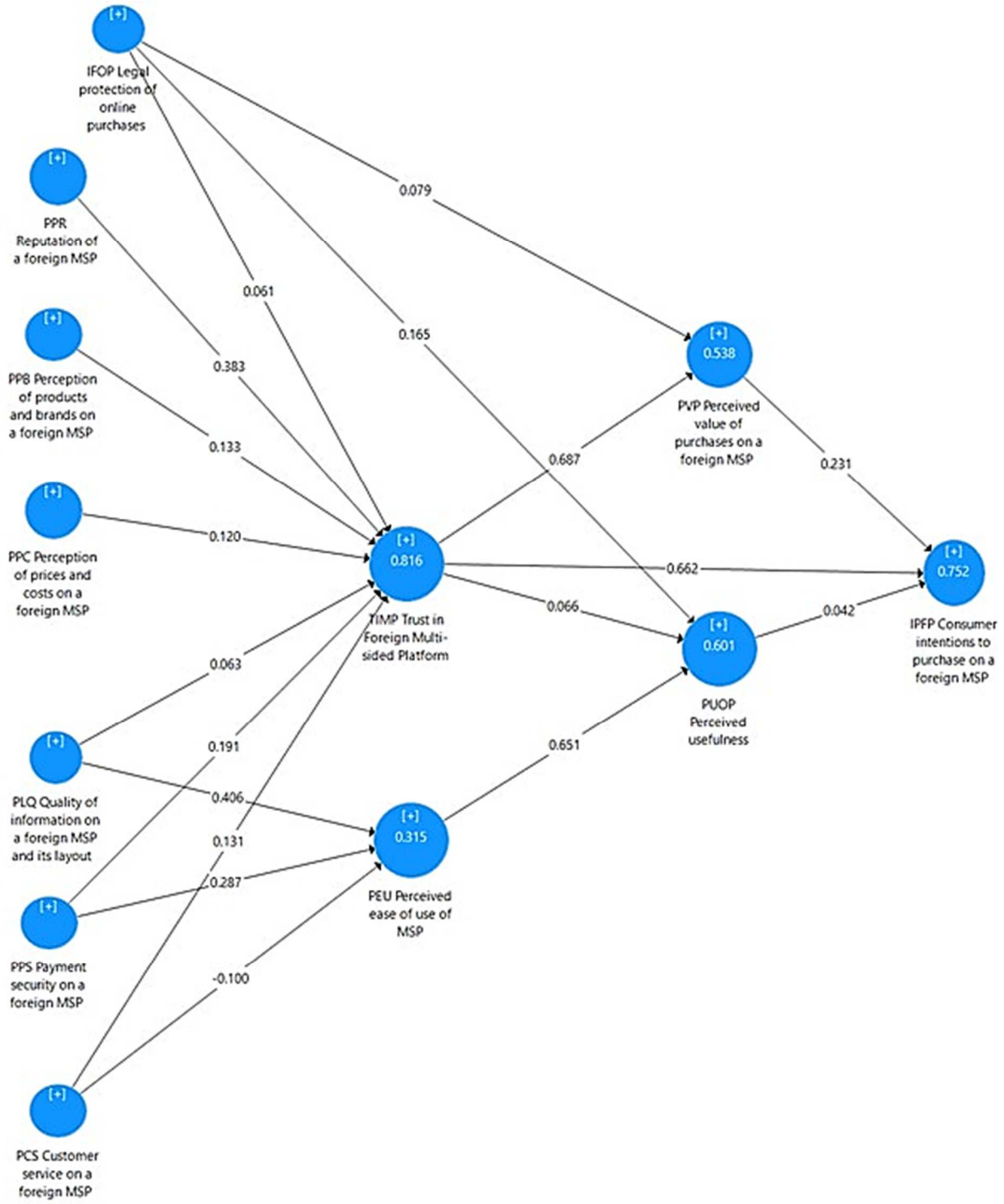

Figure 4. Structural model for C-CHIN sample
Source: own elaboration (SmartPLS3).

As shown in Table 4, significance tests of regression weights (considering total effects) for subgroups of consumers C-WEST and C-CHIN indicated that:

1. For C-WEST and C-CHIN, there are strong statistically significant relations between PLQ and PEU; PPS and TIMP; PPB and TIMP; IFOP and PUOP; IFOP and PVP; TIMP and PVP; PEU and PUOP; TIMP and IPFP; PVP and IPFP;
2. For C-CHIN, there are strong statistically significant relations between PPS and PEU; PPR and TIMP; PPC and TIMP, while for C-WEST no such relations were found;
3. For C-WEST, there is a strong statistically significant relation between PUOP and IPFP, while for C-CHIN no such relation was found;
4. There are statistically significant relations between PCS and TIMP for C-WEST (strong) and C-CHIN (weaker);
5. There are weak statistically significant relations between IFOP and TIMP for C-WEST and C-CHIN;
6. For C-WEST and C-CHIN, there are no statistically significant relations between PCS and PEU; PLQ and TIMP; TIMP and PUOP.

To verify H13, we first tested the significance of differences in path coefficients in subgroups C-WEST and C-CHIN using the bootstrapping and Welch-Satterthwaite equation (Table 5).

Table 5. Welth-Sutterthaith test: C-CHIN vs C-WEST

Regression paths	Path coefficients-differences	p
PLQ->PEU	-0.181	0.128
PPS->PEU	0.314	0.004
PCS->PEU	-0.139	0.236
PLQ->TIMP	-0.061	0.646
PPS->TIMP	0.034	0.628
PCS->TIMP	-0.231	0.009
PPR->TIMP	0.206	0.093
PPB->TIMP	-0.069	0.292
PPC->TIMP	0.196	0.010
IFOP->TIMP	-0.017	0.734
IFOP->PUOP	0.052	0.395
IFOP->PVP	-0.011	0.847
TIMP->PVP	-0.023	0.716
TIMP->PUOP	-0.007	0.914
TIMP->IPFP	0.003	0.971
PEU->PUOP	-0.025	0.703
PVP->IPFP	0.004	0.958
PUOP->IPFP	-0.033	0.490

Source: own study (SmartPLS3).

Table 5 shows that the distinguished subgroups of consumers C-WEST and C-CHIN were characterized by similar values of path coefficients for the majority of the pairs of variables in the model. We found significant differences between C-WEST and C-CHIN only for the following pairs of variables:

- PPS -> PEU;
- PCS -> TIMP;
- PPR -> TIMP (weak);
- PPC -> TIMP.

CONCLUSIONS

Extending TAM with additional belief variables, *i.e.* foreign MSP image and legal protection, this study confirmed that e-shopping quality on foreign MSPs (i.*e.* the quality of information and payment security) positively influences the ease of use, while consumer service is not significant. Maybe because

MSPs do not differ significantly by consumer service, *e.g.* return mode. For trust in a foreign MSP, consumer service and payment security play an important role – similar to previous studies (Puntatoya, 2019) – with no significant impact of the quality of information on MSP, unlike in other research (Ha & Stoel, 2009). Concerning the high importance of payment security, almost half of respondents in the year preceding the survey had mainly made purchases on Chinese MSPs, so their legal protection was lower. Meantime, the issue of security is one of the key concerns regarding e-purchases and is linked also to the legal protection of consumers, *e.g.* rights regulating online payments (Amin & Nor, 2013) or the right to get secure repayment if the product does not meet arrangements makes consumers more confident in e-purchases (Oktavilia & Tohari, 2023). Respondents indicated a significant role of consumer service in building trust in foreign MSPs – *e.g.* whether they receive information quickly – so the quality of information available on the site is less meaningful. As in Hagiu's (2015) study, all e-shopping quality dimensions, and payment security influence trust and ease of use of purchases on foreign MSPs. Moreover, this research confirms the significant influence of foreign MSP image on consumers' trust, thus supporting its addition to TAM (Özen & Kaya, 2013). Similarly, legal protection (Kooli *et al*., 2015) directly and positively affects trust, perceived usefulness and value of purchases on foreign MSPs. Although we did not identify studies relating to MSPs and legal protection, our results are consistent with the findings of Qin *et al*. (2018) who noted that perceived low risk of CBEC transfers into an increase in purchase intentions – as perceived low risk increases trust, and moreover these factors are shaped by appropriate institutional arrangements, including legal protection.

This study supports other TAM research (Ha & Stoel, 2009), as beliefs positively affect attitudes toward CBEC, with trust directly influencing the perceived value and usefulness of purchases on foreign MSPs, while ease of use influences usefulness. Similarly. to other studies, we noted the direct positive influence of trust on purchase intentions on foreign MSPs, and the perceived value and usefulness of purchases on foreign MSPs, with trust being the strongest determinant. Again, a high percentage of respondents who purchase mainly on Chinese MSPs may explain the phenomenon of the highest impact of trust on purchase intentions on foreign MSPs.

This study confirmed significant differences between subgroups of consumers C-WEST and C-CHIN regarding the influence of payment security on ease of use of a foreign MSP, along with the influence on trust in a foreign MSP of such antecedents as consumer service on a given MSP, reputation of a foreign MSP, and the perception of prices/costs. However, payment security on a foreign MSP influences the perceived ease of use and reputation of a foreign MSP only for C-CHIN, along with the perception of prices/costs impacting trust in a foreign MSP. As in other studies (Gomez-Herrera *et al*., 2014), the significance of payment security for perceived ease of use of an MSP for consumers purchasing mainly on Chinese MSPs, may stem from the higher perceived risks (*e.g.* financial) and their non-positive reputation. The impact of the perceived reputation of an MSP on trust for this MSP for C-CHIN consumers may result from doubts of EU consumers regarding Chinese products and sellers (Mou *et al*., 2020a). Following Huurne *et al*. (2017), the reputation of an MSP may guarantee customers that they will not be disappointed, increasing trust in an MSP.

Considering the relationship between perception of prices/costs and trust in a foreign MSP for C-CHIN consumers only, they focus on relatively low prices (Mou *et al*., 2020a) offered by Chinese platforms, while following the relatively low (monetary) risks associated with these purchases, because perceived risk increases as the prices increase, which may transfer into trust increase. The perceived usefulness of e-purchases strongly influences the intention to purchase on foreign MSPs only for C-WEST consumers. We found no such impact is found for C-CHIN.

As we mentioned above, when purchasing Chinese MSPs, both C-CHIN and C-WEST consumers may focus on relatively low prices, not attaching high importance to the perceived usefulness of e-purchases. According to the report by Gemius (2020), Poles shopping online are predominantly driven by (low) prices and low delivery costs. Moreover, the impact of consumer service on a foreign MSP on trust in a foreign MSP is stronger for C-WEST consumers. As previous studies show, various stereotypes about the country of origin matter, including the location of a foreign MSP (Mou *et al*., 2020a), hence consumers may better perceive Western MSPs than Chinese.

The study extends international marketing literature, especially on CBEC and e-consumer behaviour with reference to MSPs, by investigating new antecedents of consumer behaviour that are relevant to CBEC on foreign MSPs, *e.g.* the legal protection of e-purchases as an important determinant of e-consumer behaviour in the international context (Huang & Chang, 2017). This research also examines the moderating role of an MSP's country of location, which, according to our best knowledge, has not yet been considered along with consumers' purchase intentions on foreign MSPs. It integrates TPB and TAM, providing new TAM antecedents and empirically verifies their validity, and focuses on CBEC on foreign MSPs, which have not yet been the subject of comprehensive research. Considering changes in consumer behaviour over time (Matt *et al*., 2019), it updates knowledge on CBEC and e-consumer behaviour. Moreover, it is based on a study on a representative national sample of consumers from a European emerging market, unlike the majority previous studies on non-representative samples, often students from Asia and the USA.

The research was limited to Poles. Therefore, it would be valuable to conduct studies investigating other nations and considering cultural differences. Other factors determining e-consumer purchase intention on foreign MSPs are worth considering, *e.g.* socio-demographic, psychographic factors, and other product categories. To provide a more comprehensive picture of consumer behaviour, scholars could consider qualitative studies. The moderating role of the. stage of e-shopping adoption of a consumer on, *e.g.* perceived usefulness of purchases on foreign MSPs should also be considered, because of its importance for e-consumer behaviour (Ashraf *et al*., 2014).

When shaping MSP's international marketing strategy, managers can benefit from this study's identification of antecedents of CBEC and e-consumer purchase intentions. When creating an international marketing strategy, MSPs' decision-makers should focus both on e-consumers' beliefs about CBEC on foreign MSPs (with the dominant role of trust), and e-shopping quality, MSP image, and the perception of the legal protection of CBEC, which may all significantly impact e-consumers' beliefs, attitudes and purchase intentions. As perceived legal protection of CBEC is a significant factor affecting *e.g.* trust in a foreign MSP (and transferred into e-purchase intentions), authors recommend highlighting this aspect on a website to deliver consumers higher confidence in e-purchases. We postulate analogous recommendations for other issues considered in this study, e.g., different aspects of e-shopping quality and foreign MSP image. Noteworthy, although some factors occurred not to be significant for e-consumer behaviour (*e.g.* consumer service), such conclusions require careful consideration. This aspect should not be ignored when shaping strategies and become a subject of in-depth studies, as high standards for consumer service are normal nowadays.

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Green economic development and entrepreneurship transformation

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ABSTRACT

Objective: The article aims to analyse the role of entrepreneurship transformation in attaining green economic development among EU countries for the 2007-2022 period.

Research Design & Methods: This study applied the following methods to check the hypothesis of the study: the Malmquist–Luenberger productivity index for measuring green economic development; fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS), systems and first-difference generalized method of moments (GMM) – to check the entrepreneurship transformation effect on green economic development.

Findings: The findings of the study demonstrate a strong positive correlation between green economic development and the transformation of entrepreneurship, highlighting the crucial link between economic prosperity and initiatives in the green economy. The analysis confirms that historical changes in productivity related to green economic practices have a positive effect on future developments. Furthermore, the significant coefficients for green economic development emphasize the enduring nature of green economic practices.

Implications & Recommendations: The empirical results allowed us to outline the following suggestions: 1) government policies should focus on initial investments in green practices, incentivizing businesses through financial mechanisms and robust regulations to foster economic and environmental sustainability; 2) enhancing green economic development requires simplifying the process for creating new businesses, particularly green startups, and offering financial and procedural support to inject innovation and economic vitality into the sector; 3) trade openness is crucial for boosting green economy productivity, necessitating policies that lower trade barriers while incorporating environmental standards to ensure sustainable growth; 4) fostering innovation in environmental technologies with increased government funding and strategic partnerships between academia, industry, and government needed to propel sustainable economic transformation.

Contribution & Value Added: The value added by this article lies in its empirical grounding and practical implications, which guide policymakers regarding the importance of supporting entrepreneurial initiatives to drive green economic development. It suggests targeted government policies that incentivize the adoption of green practices, simplify processes for new green startups, promote trade openness, and foster innovation through increased funding and collaboration.

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INTRODUCTION

The EU countries have embraced a strategy of green transformation with the ambitious goal of becoming the first fully green economies in the world (Hussain *et al.,* 2021; Kedward & Ryan-Collins, 2022; Titko *et al*., 2023b). This commitment is part of a broader initiative to strengthen their green economic development on the global stage. By prioritizing sustainable practices and policies, such as

the European Green Deal (Madaleno & Nogueira, 2023), the EU aims to reduce carbon emissions, increase renewable energy usage (Jin *et al*., 2023), and promote sustainable industry practices across all member states. This proactive approach positions the EU as a leader in environmental stewardship and enhances its competitiveness in the rapidly growing global green economy (Sulich & Zema, 2023; Szczepańska-Woszczyna *et al.,* 2022; Tkachenko *et al.*, 2019).

Scholars widely acknowledge entrepreneurship as a pivotal driver of a country's development, particularly when aligned with the concept of green transformation (Chygryn *et al.,* 2022; Ziabina & Dzwigol-Barosz, 2022). Entrepreneurs are at the forefront of innovation, job creation, and economic diversification, which are essential elements for achieving sustainable growth. Their input in addressing environmental, social, and economic challenges helps directly advance green transformation goals (Ashraf, 2024; Chkareuli *et al*., 2024; Dacko-Pikiewicz, 2019a; Huseynov, 2021; Chygryn *et al*., 2023; Us & Gerulaitiene, 2023; Titko *et al*., 2023a; Yang & Liu, 2024). Thus, governments must foster a supportive environment that stimulates the growth and sustainability of entrepreneurial ventures. Effective incentive mechanisms are crucial in this regard. For example, recognizing the significant impact of entrepreneurship, the European Union reported that SMEs alone provide two-thirds of the total private sector employment in the EU (Saura *et al.*, 2023; Sannikova *et al.*, 2023; Sánchez-Robles *et al.,* 2024), demonstrating the extensive role of entrepreneurship in job creation and economic stability. As studies show (Li *et al.*, 2024; Hakhverdyan & Shahinyan, 2022; Khalatur & Dubovych, 2022; Yu & Zheng, 2024), governments should consider financial support such as grants, low-interest loans, tax incentives, and subsidies specifically targeted at green businesses and social enterprises. In 2020, the European Commission launched the European Green Deal Investment Plan (2020) aiming to stimulate investment in sustainable projects and additional measures to support up to 1 trillion of investment over the next decade. This kind of financial backing not only encourages new business ventures but also supports their development and scalability. Moreover, scholars have outlined the importance of a regulatory environment that promotes innovation while minimizing unnecessary burdens (Lagodiienko & Yakushko, 2021; Gobniece & Titko, 2024). Streamlining administrative processes, protecting intellectual property rights, and ensuring transparent and fair market access are key components. For example, the EU's Digital Single Market strategy is designed to open up digital opportunities for business and enhance Europe's position as a world leader in the digital economy (Michulek & Gajanova, 2023; Dabrowski *et al.*, 2023; Zhanibek *et al.,* 2022; Szczepańska-Woszczyna & Muras, 2023; Saura *et al*., 2022a). Beyond financial and regulatory frameworks, governments should promote an entrepreneurial culture through education and training programs that equip individuals with the necessary skills and mindset. The EU countries should implement the necessary mechanisms to support business development, which, in turn, could enhance the green economic development of EU countries. This strategic support is essential for fostering a business environment that aligns with the goals of sustainable development and environmental stewardship. To effectively design and apply these mechanisms, it is crucial to understand and empirically justify the impact of entrepreneurship on the green economic development of EU countries. This understanding will enable the effective tailoring of the right mix of incentives and stimuli to promote entrepreneurship. This could consequently strengthen the green competitiveness of the EU.

This article aims to analyse the transformative impact of entrepreneurship on green economic development among EU countries from 2006 to 2022. It seeks to bridge the gap between entrepreneurial ventures and sustainable economic practices, providing insights into how the entrepreneurial landscape fosters a more sustainable and economically viable green economy. The article is original in several ways. Firstly, the study enhances the understanding of the dynamic relationship between green economic development and entrepreneurship transformation by providing a comprehensive empirical framework through the use of advanced econometric models such as GMM-SYS and GMM-FD. This study offers a nuanced perspective on how past performance in green practices influences future outcomes, thus significantly contributing to the academic literature on sustainable economic development. Secondly, the study underscores the foundational role of new business density in the economic landscape, particularly within the context of European Union policies. The adopted research methodology allows for a detailed examination of how entrepreneurial activities

contribute to broader economic and environmental goals, emphasizing the integration of new business dynamics into sustainable policy frameworks. Thirdly, the study broadens the empirical base concerning the impact of macroeconomic factors such as gross national income and trade openness on green economy productivity. By doing so, it enriches the dialogue on how economic strength and openness influence sustainable practices, providing valuable insights for policymakers and stakeholders involved in shaping economic policies that support environmental sustainability.

The article is structured as follows. The first section will present a literature review – an analysis of the theoretical landscape linking green competitiveness and entrepreneurship to justify the research hypothesis. Next, there will come research methodology – an explanation of variables and sources, methods, and instruments for testing the research hypothesis. Then, we will move to results and discussion – exploration of the empirical results of the investigations. Finally, we will present conclusions summarizing the core results, policy implications, limitations, and further directions for investigation.

LITERATURE REVIEW

The interplay between entrepreneurship and green economic development in EU countries is intricately connected to the evolving policy landscape and innovative business practices, as highlighted by recent scholarly research. A significant study by Sulich and Zema (2018) delves into how EU nations are fostering environments conducive to green entrepreneurship. They noted the considerable positive spillover effects that supportive policies can have on enhancing green economic development across the region (Sulich & Zema, 2018). Bogoslov *et al.* (2022) explore this idea further in the context of the European Green Deal. They examine how this sweeping policy initiative redefines the entrepreneurial landscape, boosting both green innovation and competitiveness within the EU. Avlogiaris *et al.* (2023) highlight the dynamic relationship between state policies and entrepreneurship in Europe's transition to green growth in the post-lignite era. They question whether governmental policies and entrepreneurial actions are in sync or at odds in driving the green transition. Their findings suggest that achieving green growth necessitates a collaborative approach where both the state and entrepreneurs work as allies rather than adversaries. In a different context, Chen *et al.* (2024) explore how the trade of mineral resources and the development of financial markets influence green entrepreneurship within resource-rich economies. They argue that financial development and resource management are critical in fostering an environment conducive to green entrepreneurial ventures, indicating that strategic financial policies and resource trade can bolster or hinder green innovation. Studies have examined the significance of green finance in supporting sustainable business start-ups (Raza *et al.,* 2023; Kwilinski *et al*., 2023a; 2023b; Luo *et al.*, 2024; Wu *et al.*, 2024). They highlight that green finance mechanisms are essential for enabling entrepreneurs to launch and sustain businesses that contribute to environmental sustainability, thus enhancing green economic development across Asian markets. Moreover, Sifa *et al.* (2021), Kwilinski *et al*. (2023d), Lesniak *et al.* (2023), Letunovska *et al.* (2022) and Szczepańska-Woszczyna *et al.* (2024) address the compounded challenges posed by climate change and the COVID-19 pandemic in Bangladesh. They discuss how entrepreneurship can mitigate these crises by promoting sustainable development and poverty eradication through innovative and environmentally friendly business practices. Wei *et al.* (2023) provide empirical evidence on the role of environmental entrepreneurship in promoting sustainable green development in emerging Asian economies. Their study underscores the positive impact of environmental entrepreneurship on sustainable development, demonstrating that innovative green business practices are crucial for achieving long-term sustainability goals.

Furthermore, Fankhauser *et al.* (2013) enriched the concept of green economic development by introducing the 'sailing ship effect.' This phenomenon suggests that traditional industries may innovate in response to advancements in green technologies, thereby not only preserving but also enhancing their competitive edge in the environmental sector (Fankhauser *et al.,* 2013). Complementing this perspective, Dabbous *et al.* (2023) investigate the impact of digitalization on green entrepreneurship. Their findings indicate that the twin transitions of digital and green innovations are pivotal, showing how digitalization underpins green entrepreneurial ventures and bolsters sustainable com-

petitiveness (Dabbous *et al.,* 2023; Kwilinski, 2023a; 2023b). In a more technologically focused analysis, Makhloufi (2023) investigated the influence of big data analytics capabilities and green absorptive capacity on fostering green entrepreneurial orientation and eco-innovation. His study suggested that leveraging technological and cognitive capacities to interpret environmental data significantly boosts eco-innovation and, consequently, a country's green economic development (Makhloufi, 2023). Sotarauta *et al.* (2021) outline the roles of change agents in promoting green path development in Northern Europe. Their work underscores how leadership, policy advocacy, and grassroots initiatives are crucial in driving regional transformations toward sustainability, highlighting the multifaceted approach needed to achieve green economic development. Previous studies have outlined the role of eco-innovation strategies in identifying and capitalizing on new business opportunities that enhance enterprise growth and sustainability (Ben *et al*., 2019; Gu, 2024; Kwilinski *et al.*, 2023c; 2024). They argue that by integrating eco-innovation, businesses not only support environmental goals but also gain a competitive edge in the market, which has a positive effect on the green economic development of the country. In contrast, Hinderer and Kuckertz (2024) examine the potential conflict between degrowth attitudes and venture scaling among entrepreneurs. They suggest that while entrepreneurship enhances green economic development, the emphasis on degrowth – prioritizing sustainability over traditional growth metrics – may impede the rapid scaling that is often necessary for competitive success. In the Pacific region, Michalena (2017) discusses the integration of knowledge and innovation as key drivers for building countries' green economic development and entrepreneurship. We did not include the studies of Michalena (2017) and Rajiani and Kot (2020). Szczepańska-Woszczyna and Gatnar (2022), Vaníčková and Szczepańska-Woszczyna (2020), and Wróblewski and Lis (2021) underscore the importance of coopetition, *i.e.* cooperative competition among firms and the government to leverage shared knowledge and innovation for entrepreneurial success in green sectors. Ngondjeb *et al.* (2020) explore how green entrepreneurship could lead to sustainable economic and social development. Their research is pivotal for understanding how green entrepreneurship serves as a pathway to a green economy, particularly in emerging markets where aligning business practices with sustainability principles is both a challenge and an opportunity.

Ansah and Sorooshian (2019) emphasize the significant role of the private sector in responding to climate change, suggesting that businesses are crucial to the transition towards a green economy. Their analysis highlights that proactive corporate strategies are essential for enhancing environmental quality and achieving sustainability goals within the EU, positioning the response of the private sector as a key driver of green economic development. Drago and Gatto (2022) contribute to the methodology by proposing an interval-valued composite indicator for measuring energy efficiency and green entrepreneurship. This tool aids in evaluating the performance of businesses in achieving energy efficiency and fostering green growth within the EU, offering a measurement approach to assess and enhance green economic development. Liargovas *et al*. (2017) highlight the effectiveness of support mechanisms and initiatives for SMEs in promoting green growth. They argue that well-designed support systems are crucial for enabling small and medium enterprises to contribute to green economic development in the Western Balkans, providing a blueprint that could be extended to broader EU contexts. Nadiroh and Emilkamayana (2021) examine the efficiency of green economic development in supporting environmental policy. Their findings underscore the importance of aligning policy frameworks with green economic development initiatives to enhance environmental and economic sustainability. Singh *et al*. (2023) discuss policy implications from selected countries for promoting a sustainable future through green entrepreneurship. Their analysis highlights the critical role of policy frameworks in enabling green entrepreneurial activities that contribute to sustainable economic development.

RESEARCH METHODOLOGY

This study examined the impact of entrepreneurship transformation on green economic development utilizing data from 2007-2022 from 26 European countries. We excluded the Netherlands due to data limitations. In this analysis, green economic development is considered the dependent variable. The Malmquist-Luenberger productivity index is employed to compute the measures of green economic de-

velopment (Oh, 2010; Zhao *et al.,* 2022; Chen *et al*., 2023). The Malmquist-Luenberger productivity index is an extension of the traditional Malmquist productivity index, which is specifically adapted to include undesirable outputs such as environmental pollutants. This index is particularly valuable for assessing productivity changes over time in contexts where environmental impact plays a crucial role. It decomposes total factor productivity change into efficiency change and technological change, providing insights into how technological advancements and efficiency improvements contribute to green economic development. The Malmquist-Luenberger productivity index is calculated using distance functions that accommodate both desirable and undesirable outputs. We can express the general formula for the Malmquist-Luenberger productivity index between two time periods (t and t+1) as:

$$TFPCH = \sqrt{\left(\frac{D_{t+1}(x_{t+1}, y_{t+1}^{+}, y_{t+1}^{-})}{D_t(x_{t+1}, y_{t+1}^{+}, y_{t+1}^{-})}\right) \times \left(\frac{D_{t+1}(x_t, y_t^{+}, y_t^{-})}{D_t(x_t, y_t^{+}, y_t^{-})}\right)} \quad (1)$$

in which $TFPCH$ represents green economic development; $D_t(x_t, y_t^{+}, y_t^{-})$ and $D_{t+1}(x_t, y_t^{+}, y_t^{-})$ are the distance functions at time t and t+1, respectively; x represents input quantities; and y^{+} and y^{-} represent desirable and undesirable output quantities, respectively.

Carbon dioxide is considered a major undesirable output, mirroring its common classification in environmental economic studies, such as those by Ang (2004), who emphasizes the significance of accounting for environmental externalities in productivity assessments. Traditional economic factors such as capital and labour were included, reflecting the methodology used by Kumar and Russell (2002), who explored the dynamics of productivity under varying input conditions. Furthermore, this study incorporates renewable energy as one of the input variables, drawing on the innovative approach of Zhou and Ang (2008), who argue for the inclusion of renewable resources to capture the evolving nature of energy consumption and its effects on productivity. The choice of gross domestic product (GDP) as the desirable output follows the precedent set by Kumar and Managi (2009), who examined the relationship between environmental performance and economic output, providing a comprehensive view of how economic activities correlate with environmental sustainability.

A $TFPCH$ greater than 1 indicates an improvement in total factor productivity from period t to t+1, meaning that the unit has become more efficient, benefitted from technological advancements, or both. A $TFPCH$ less than 1 signifies a decline in productivity, indicating reduced efficiency or technological regression. An $TFPCH$ equal to 1 suggests no change in productivity between the two periods.

To measure entrepreneurship transformation ($Business$), we selected the indicator of the new business density rate. This metric, which quantifies the number of new business registrations per 1000 people, provides a direct measure of the rate at which new enterprises are being created, which is crucial for understanding the dynamic nature of economic transformation and innovation (Zheng *et al*., 2023). Studies by Acs *et al*. (2009; 2013) demonstrated the relevance of this metric in capturing the entrepreneurial trends that significantly impact economic growth and structural change. Moreover, this indicator is used in the Global Entrepreneurship Monitor reports (GEM, 2024), which underscore its wide international comparisons for entrepreneurial activity.

In addition to $Business$, we selected several other explanatory variables: $Innov$ represents the number of patents in environment-related technologies. This indicator is pivotal for understanding the role of technological innovation in driving environmental sustainability and economic growth (Urbaniec *et al.,* 2021). It helps assess how advancements in technology can spur green practices and solutions within industries; GNI measures the total domestic and foreign output claimed by residents of a country, encompassing wages, profits, and taxes minus subsidies. The GNI is a broad measure of economic activity and prosperity and is used to gauge the economic strength of a nation and its capacity to support sustainable practices through available financial resources (Gracia & Siregar, 2021); trade openness (TO) is included as a variable to examine the effects of economic integration and global market access on green economic practices. Trade openness reflects the extent to which a country engages in international trade, with higher values indicating greater openness. This metric is essential for analysing how external economic relationships influence the adoption and diffusion of green technologies and practices, facilitated by increased competition, innovation, and knowledge transfer from

more developed markets (Wu, 2022). We collected the data for the chosen variables from the World Development Indicators (WDI) of the World Bank, Eurostat, and the Global Entrepreneurship Monitor reports (GEM, 2024). Table 1 summarises the statistics of the collected data.

Table 1. Summary statistics

Variables	N	Mean	SD	Min	Max
$TFPCH$	416	0.997	0.045	0.535	1.183
$Business$	416	6.138	5.350	0.309	38.196
TO	416	126.765	69.475	45.419	393.141
$Innov$	416	12.589	4.751	0.840	45.210
GNI	416	31756.923	18923.349	4820.000	89200.000

Source: own study.

We constructed the following econometric model to identify the role of entrepreneurship transformation in promoting green economic development:

$$TFPCH_{it} = \alpha + \beta Business_{it} + \gamma Controls_{it} + \varepsilon_{it} \quad (2)$$

in which $Controls$ are control variables, including TO, $Innov$, and GNI; i is the country; t is the time; and ε is the error term.

To analyse the impact of entrepreneurship transformation on green economic development, we initially used the Shapiro–Wilk W test to assess the normality of the data distribution. In the subsequent stage, we calculated pairwise correlations and variance inflation factors (VIFs) to investigate the relationships between variables and detect potential multicollinearity (Shrestha, 2020). High VIF values indicate problematic multicollinearity, which could distort regression outcomes. Given the panel data structure, we employed several unit-root tests to ensure the stationarity of the series. These included first-generation unit root tests such as the Levin–Lin–Chu, Breitung, and Hadri LMs, as well as second-generation tests such as Pesaran's CADF and CIPS (Pesaran, 2021; Im *et al.,* 2023). Pesaran's CADF test differs from standard unit root tests because it accounts for cross-sectional dependence among panel data series, enhancing its applicability to datasets where economic variables are influenced by common factors across entities. The CADF test modifies the traditional ADF test by including the cross-sectional averages of lagged levels and the first differences of the individual series. This approach helps mitigate the bias that might arise from ignoring cross-sectional dependencies. On the other hand, the CIPS test, an extension of the CADF test, averages the individual CADF statistics across cross-sections to provide a single statistic. This test is particularly useful when dealing with heterogeneous panels where there are variations in the dynamic properties across series. It is robust against both cross-sectional dependence and individual unit root processes, making it suitable for analysing more diverse and complex datasets. We utilized the cointegration tests of Pedroni (2004), Kao (1999), and Westerlund (2008) to ascertain long-term equilibrium relationships among variables. These tests help determine whether a stable, long-term relationship persists despite short-term deviations among the integrated series. We employed fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) techniques to estimate long-term relationships once cointegration was established. These methods are tailored to correct problems such as endogeneity and serial correlation in error terms, which are common in cointegrated panels (Merlin *et al.,* 2021). To address potential endogeneity issues among explanatory variables, the systems generalized method of moments (System GMM) and first-difference GMM were utilized. System GMM combines level and first-differenced equations to enhance estimator efficiency, whereas first-difference GMM focuses on differenced data to eliminate unobserved fixed effects.

RESULTS AND DISCUSSION

The results of the Shapiro-Wilk W tests for normality (Table 2) indicated that none of the data distributions were normal, with V statistics greater than 1 and probabilities less than 1% for all indicators. To address this, we transformed all variables using logarithms to approximate a normal distribution, which enhances the validity of statistical tests that assume normality. This transformation also helps

to mitigate the impact of extreme values or outliers. Moreover, when logarithms are used, the coefficients in the regression can be interpreted as elasticities, representing percentage changes.

Table 2. Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
$TFPCH$	416	0.240	216.710	12.821	0.000
$Business$	416	0.788	60.420	9.777	0.000
$Innov$	416	0.936	18.110	6.904	0.000
GNI	416	0.912	25.182	7.690	0.000
TO	416	0.965	10.013	5.492	0.000

Source: own study.

The results of pairwise correlations (Table 3) show that higher national income and greater openness significantly enhanced green competitiveness. Moreover, $TFPCH$ also exhibited positive correlations with $Business$ and $Innovation$, suggesting that business activity and innovation modestly contribute to green competitiveness.

Table 3. Pairwise correlations and statistical VIFs

Variables	$TFPCH$	$Business$	$Innov$	GNI	TO	VIF
$TFPCH$	1.000	–	–	–	–	–
$Business$	0.150	1.000	–	–	–	1.03
	(0.003)		–	–	–	
$Innov$	0.104	-0.031	1.000	–	–	1.00
	(0.040)	(0.542)		–	–	
GNI	0.220	0.115	-0.024	1.000	–	1.05
	(0.000)	(0.023)	(0.642)		–	
TO	0.294	0.148	-0.043	0.209	1.000	1.06
	(0.000)	(0.003)	(0.397)	(0.000)		

Source: own study.

The VIFs for all variables range from 1.00 for $Innov$ to 1.06 for TO, indicating minimal multicollinearity. Specifically, a VIF of 1 signifies no correlation with other variables, and as values slightly increase – while still remaining close to 1 – it indicates only a minimal increase in variance due to weak correlations with other variables in the model. The VIF results demonstrate that each variable contributes uniquely to the regression model without much redundancy from overlapping information with other predictors. This suggests that the model parameters are well estimated, and the predictors provide distinct and valuable insights into the model.

At the next stage, we applied unit-root tests (Levin–Lin–Chu, Breitung, Hadri LM, Im–Pesaran–Shin) to check the data stationarity (Table 4). The findings show that most variables were nonstationary at the level. However, at the 1st difference, all the data tend to be stationary.

In comparison to other traditional unit root tests such as the Levin–Lin–Chu, Breitung, and Hadri LMs, both Pesaran's CADF and the CIPS provide a more nuanced approach by considering cross-sectional dependence, which is often present in macroeconomic panels. Pesaran's CADF test results indicate that some of the variables in their natural log form show stationarity on their own ($TFPCH$, $Innov$), whereas others require differencing to achieve stationarity ($Business$, GNI, TO), as seen from significant CADF statistics and corresponding p values. The CIPS test, which aggregates individual unit root tests across a cross-section, shows that variables generally became stationary when differenced. The critical values at different significance levels for a sample size of N = 27 and T = 17 were -2.14, -2.25, and -2.45 for the 1%, 5%, and 10% significance levels, respectively.

We used the Pedroni, Kao, and Westerlund tests to assess the long-term equilibrium relationships among the analysed variables (Table 5). The results of the Pedroni tests were compelling and strongly indicated the presence of cointegration. This suggests a strong and statistically significant long-term relationship among the variables.

Table 4. The findings of the unit-root test

Variables	Levin–Lin–Chu		Breitung		Hadri LM		Im–Pesaran–Shin		Pesaran's CADF		CIPS
	St.	p	St.	p	St.	p	St.	p	St.	p	St
$TFPCH$	-1.819	0.035	0.608	0.728	32.106	0.000	1.725	0.958	-2.092	0.039	-1.749
$d.TFPCH$	-9.417	0.000	-7.509	0.000	-0.971	0.834	-8.317	0.000	-2.549	0.000	-3.447
$Business$	-0.118	0.453	0.665	0.747	30.224	0.000	2.178	0.985	-1.939	0.160	-1.945
$d.Business$	-8.804	0.000	-7.395	0.000	-0.242	0.596	-8.359	0.000	-2.292	0.004	-3.205
$Innov$	-6.972	0.000	-2.410	0.008	4.037	0.000	-7.341	0.000	-2.588	0.000	-3.756
d.$Innov$	-12.695	0.000	-7.882	0.000	-4.223	1.000	-10.908	0.000	-3.932	0.000	-4.799
GNI	6.597	1.000	5.268	1.000	31.869	0.000	3.953	1.000	-0.746	1.000	-1.330
d.GNI	-2.752	0.003	-5.121	0.000	0.931	0.176	-8.122	0.000	-2.259	0.006	-3.329
TO	0.704	0.759	1.679	0.954	30.294	0.000	2.772	0.997	-1.713	0.554	-1.429
d. TO	-14.028	0.000	-9.831	0.000	-1.157	0.876	-7.848	0.000	-2.473	0.000	-2.585

Note: St. – Statistic; p – p value.
Source: own study.

Table 5. The cointegration results for the analysed variables

Test	Statistic	p value
Pedroni tests		
Modified Phillips–Perron t	4.863	0.000
Phillips–Perron t	-5.044	0.000
Augmented Dickey–Fuller t	-5.988	0.000
Kao tests		
Modified Dickey–Fuller t	-0.615	0.269
Dickey–Fuller t	-2.239	0.013
Augmented Dickey–Fuller t	1.472	0.071
Unadjusted modified Dickey–Fuller t	-1.963	0.025
Unadjusted Dickey–Fuller t	-3.051	0.001
Westerlund test		
Variance ratio	2.251	0.012

Source: own study.

However, the modified Dickey–Fuller t-statistic indicated a weaker cointegration, with a statistic of -0.615 and a p value of 0.269. However, other Kao test results, the Dickey–Fuller (t-statistic of -2.239, p value of 0.013) and the Augmented Dickey–Fuller (t-statistic of 1.472, p value of 0.071) provided moderate to marginal evidence of cointegration. Morerover, the unadjusted modified Dickey–Fuller t-statistic and the unadjusted Dickey–Fuller t-statistic, with p values of 0.025 and 0.001, respectively, strengthen the argument for a significant long-term relationship. The Westerlund test's variance ratio statistic of 2.251, with a p value of 0.012, further supports the presence of cointegration among the variables. This test confirms that despite short-term variations, there is a stable long-term equilibrium relationship that binds these variables together, maintaining balance over time. These results underscore the robustness of the cointegration among the variables, highlighting a consistent, long-term comovement.

To check for the presence of cointegration among variables, this study applied fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS). Considering the findings (Table 5) that all analysed variables were statistically significant in both models (FMOLS and DOLS), excluding *Innov* in DOLS was not statistically significant.

The robust t-statistics underscore the reliability of the FMOLS and DOLS results, indicating that variables such as *business, innovation*, *GNI*, and TO play pivotal roles in influencing the dependent variable (green economic development) over the long term.

In the systems GMM model, as presented in Table 7, the lagged variable of TFPCH has a coefficient of 0.0104, which is significant at the 1% level, indicating a notable but moderate impact of past changes in green economy productivity on current economic conditions. The first-difference GMM model

shows a stronger effect with a coefficient of 0.0196, which is also significant at the 1% level, suggesting that immediate past changes in green economy productivity have a more pronounced influence on current outcomes. Regarding business activity, the systems GMM model reveals a coefficient of 0.000190 for business, with a highly significant p value, highlighting its stable influence within the model. The first-difference GMM model provides a slightly higher coefficient of 0.000305, indicating an incrementally stronger effect of recent changes in new business density rates on economic conditions. For *Innov*, which focuses on patents in environment-related technologies, the coefficients show a stronger relationship: 0.00669 in the systems GMM and 0.00857 in the first-difference GMM, both of which are statistically significant at the 1% level. These results underscore the importance of innovations in environmental technologies as having a more substantial and consistent impact compared to the more marginal impacts observed with new business density rates.

Table 6. FMOLS and DOLS results

Variables	FMOLS	DOLS
Business	0.121***	0.001***
	(7.465)	(2.291)
Innov	0.056***	0.001
	(9.404)	(0.579)
GNI	0.054***	0.012***
	(81.482)	(2.712)
TO	0.075***	0.007**
	(87.884)	(1.795)
Observations	390	390
Number of id	26	26

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1; in brackets – values of t-statistics.
Source: own study.

Table 7. The outputs of the systems GMM (1) and first-difference GMM (2) techniques

Variables	(1)	(2)
	GMM-SYS	GMM-FD
$L.TFPCH$	0.0104***	0.0196***
	(0.000670)	(0.000770)
$Business$	0.000190***	0.000305***
	(5.92e-05)	(7.11e-05)
$Innov$	0.00669***	0.00857***
	(0.000297)	(0.000417)
GNI	0.00309***	0.00273***
	(0.000591)	(0.000569)
TO	0.00969***	0.0152***
	(0.000545)	(0.000628)
$Constant$	0.892***	0.856***
	(0.00599)	(0.00659)
Sargan	1.000	0.003
Hansen	1.000	0.785
AR(1)	0.015	0.015
AR(2)	0.432	0.785

Note: Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1
Source: own study.

The GNI coefficients are also positive and significant in both models (0.00309 in GMM-SYS and 0.00273 in GMM-FD). This indicates that an increase in the GNI tends to positively influence green economy productivity, possibly reflecting that higher national income levels facilitate better resource allocation towards sustainable practices. Trade Openness showed coefficients (0.00969 in GMM-SYS and 0.0152 in GMM-FD), both of which were significant at the 0.01 level. This finding

implies a robust positive relationship between trade openness and green economy productivity. Higher levels of trade openness are associated with increased exchange of green technologies and practices, which in turn boosts productivity in this sector.

The models' diagnostics, including the Sargan test and Hansen test, confirmed the validity of the instruments used, showing no rejection of the model. Furthermore, the AR(1) and AR(2) tests indicated no autocorrelation in the first-differenced errors, underscoring the models' robustness and the findings' reliability.

CONCLUSIONS

The study results indicate that there is a significant positive relationship between green economic development and entrepreneurship transformation, emphasizing the interconnectedness of economic prosperity and green economy initiatives. Firstly, the analysis supports the theory that past productivity changes in green economic practices (TFPCH) positively influence future developments. The significant coefficients for lagged TFPCH in both the GMM-SYS and GMM-FD models underscore the persistence of green economic practices, suggesting that once established, these practices tend to generate continuous improvements over time. He and Farouk (2015) support this finding. They discuss how such initial investments may create a foundation for sustainable growth and continuous improvement in environmental practices. Furthermore, it aligns with Horbach *et al.* (2012), who found that established green business practices generate ongoing improvements, reinforcing the results regarding the persistence of green economic practices. Secondly, the impact of new business density is relatively significant, underscoring the foundational role that new enterprises play in fostering economic dynamics. The systems GMM model reveals a coefficient of 0.000190 for business, with a highly significant p value, highlighting its stable influence within the model. The first-difference GMM model provides a slightly higher coefficient of 0.000305, indicating an incrementally stronger effect of recent changes in new business density rates on economic conditions. Similar to the findings in the paper by Cumming and Groh (2018), these results align with the conclusion that new enterprises are pivotal in driving economic and environmental resilience. These results are vital for EU policies aimed at supporting the integration of economic growth with sustainable practices, suggesting that encouraging new business formation, particularly in the green sector, could be a potent driver of broader economic and environmental resilience. Furthermore, the data suggest that a higher GNI within European countries facilitates the advancement of green economy productivity. According to the findings of Aghion *et al.* (2009), the broader economic strength provided by higher GNI in these countries significantly enhances the advancement of green economy productivity. Therefore, the economic strength of a nation provides the necessary resources and infrastructure for sustainable practices more effectively than new business density alone. Moreover, the results contradict the claims that trade openness could have a detrimental effect on green practices. Instead, the positive coefficients associated with trade openness in enhancing green economy productivity reinforce the view, as Frankel and Rose (2005) indicated, that openness to international markets encourages the adoption and diffusion of green technologies. For $Innov$, which focuses on patents in environment-related technologies, the coefficients show a stronger relationship: 0.00669 in the systems GMM and 0.00857 in the first-difference GMM, both of which are statistically significant at the 1% level. These results underscore the importance of innovations in environmental technologies, as they have a more substantial and consistent impact than the more marginal impacts observed with new business density rates. $Innov$ suggested that technological advancements in the green sector are crucial for driving the transformative processes of green competitiveness and entrepreneurship.

Considering the empirical results, we can outline the following policy implications for enhancing green economic development through entrepreneurship:

1. Governments should focus on policies that promote initial investments in green economic practices, as such investments have demonstrated lasting impacts and a tendency to generate continuous improvements over time (Mesagan *et al.,* 2020; Moskalenko *et al*., 2022a; 2022b). The foundational investments in green practices create a sustainable growth model that continues to yield

environmental improvements. The initiating robust green practices not only contribute to immediate environmental benefits but also sets a precedent for ongoing economic and ecological gains. This cyclical reinforcement of green initiatives through policy leads to a self-sustaining model where economic development and environmental sustainability are mutually reinforcing. This suggests that government interventions, such as providing financial incentives for businesses adopting sustainable practices, could accelerate the adoption of green technologies (Gavkalova *et al.,* 2022). Such incentives might include tax breaks, subsidies, or preferential lending rates for projects that demonstrate clear environmental benefits. Furthermore, establishing strong regulatory frameworks that require or encourage environmental reporting and sustainable practices can further reinforce the importance of these investments. By fostering an economic environment that values sustainability, governments can induce a paradigm shift where businesses begin to view green investments as vital to their competitiveness and not just as regulatory compliance or public relations efforts. This approach not only benefits the environment but also enhances the long-term viability of businesses that adopt these practices, as it can lead to increased consumer and investor support for companies, leading to sustainability (Saura *et al.,* 2022b).

2. The influence of new business density on green economic development is significant, highlighting the role of new enterprises in fostering economic dynamics. Policies to simplify business creation and support for green startups could significantly impact the green economy. As noted by researchers, the emergence of new businesses, especially those committed to sustainable practices, injects innovation and vitality into the market, which can lead to broader economic and environmental benefits (Audretsch *et al.,* 2006). Facilitating the growth of green startups not only supports job creation but also promotes the dissemination of innovative green technologies and practices. To this end, governments can implement specific measures such as providing streamlined processes for business registration, reducing bureaucratic hurdles, and offering financial incentives such as grants, low-interest loans, or tax relief specifically targeted at green enterprises. Furthermore, establishing eco-industrial parks and offering preferential treatment for green businesses in public procurement can substantially boost these startups (Cohen & Winn, 2007). Moreover, fostering partnerships between academic institutions, industry leaders, and startups can accelerate the development and commercialization of sustainable technologies. By creating an ecosystem that nurtures collaboration, governments can ensure that green startups not only survive but also thrive and lead the way in sustainable development.
3. The importance of trade openness in enhancing green economy productivity is highlighted, suggesting that policies encouraging greater market openness could foster the adoption of green technologies. This connection between trade liberalization and environmental sustainability has been explored extensively in the literature, where it is argued that open markets facilitate the exchange of goods, services, and knowledge, including environmentally friendly technologies and sustainable practices (Frankel & Rose, 2005; Dean *et al.,* 2009). By lowering trade barriers, countries can access advanced technologies that might be too costly or complex to develop domestically, thereby accelerating their green transformation. Policies that promote trade openness should also be accompanied by measures that ensure that these technologies are adapted and utilized effectively within local contexts. This includes investing in domestic capabilities to absorb and implement new technologies, such as improving educational systems, supporting technical training, and fostering PPPs (Grossman & Helpman, 1991). Furthermore, to mitigate any potential negative impacts of trade on the environment, such as increased pollution from higher production volumes, trade agreements must include strong environmental provisions. These provisions enforce standards for environmental protection, encourage the use of green technologies, and promote sustainable resource management among trading partners (Copeland & Taylor, 2004; Dacko-Pikiewicz, 2019b).
4. The significant impact of innovation in environmental technologies suggests an area for policy support. Funding for research and development in green technologies should be a priority (Drożdż, 2019; Kwilinski, 2024). This emphasis is well supported by the literature that highlights how technological innovation drives the transformation toward a more sustainable economy (Jaffe *et al.,* 2005; Brych *et al.,* 2021; Kolosok *et al*., 2022; Çidik *et al.,* 2023; Kwilinski, 2019). Governments should increase

the allocation of funds dedicated to the research, development, and diffusion of green technologies. This can include direct funding for public research institutions as well as incentives for private sector participation, such as tax credits or innovation grants. Moreover, fostering a supportive regulatory environment that encourages the adoption of new technologies is critical. Policies that reduce the risk associated with investing in new technologies catalyse private sector investment and innovation. For example, establishing predictable and stable policy frameworks can provide certainty that businesses need to invest in long-term R&D projects (Hall & Helmers, 2013). Collaboration between universities, government research institutions, and industry can further enhance the effectiveness of innovation in environmental technologies. Such partnerships can facilitate the transfer of knowledge and technology from research labs to market applications, accelerating the pace of innovation and its adoption in the marketplace (Cohen *et al.,* 2002; Kiselicki *et al.,* 2022; Veckalne *et al.,* 2023).

This article adds scientific value by providing a comprehensive empirical framework using advanced econometric models (GMM-SYS and GMM-FD) to analyse the dynamic relationship between entrepreneurship and green economic development in the EU from 2006 to 2022. It highlights the critical role of new business density in driving sustainable economic practices within the context of EU policies. Furthermore, it enriches the empirical understanding of how macroeconomic factors such as gross national income and trade openness impact green economy productivity, offering valuable insights for policymakers and stakeholders.

Despite these valuable findings, this study has several limitations that future investigations could address. Constraints related to data availability and quality may have restricted the breadth and depth of the analysis, potentially limiting the representativeness of the results. Furthermore, the study's focus on specific variables might have overlooked other influential factors, leading to potential bias from omitted variables. Concerns regarding the stationarity of variables, as well as the adequacy of the sample size and scope, further underscore the need for cautious interpretation of the findings. Future research could benefit from enhanced data collection efforts, methodological refinements, and broader considerations of variables such as technological advancements, regulatory changes, consumer behaviour, and environmental policies. Incorporating cross-country comparisons and assessments of long-term dynamics would also contribute to a more comprehensive understanding of green economic development. These endeavours would strengthen the empirical base, provide deeper insights into the multifaceted nature of green economic practices, and offer more robust policy recommendations for fostering sustainable economic growth.

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Intellectual capital and new ventures early internationalization: Firm-level analysis of Austrian SMEs

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ABSTRACT

Objective: The objective of the article is to explore the impact of intellectual capital on firms' propensity for early internationalization.

Research Design & Methods: The scientific argument relied on scrutinizing the current knowledge base in the field and conducting empirical studies among Austrian startups. From these studies, we constructed a logistic regression model.

Findings: According to the study findings, there exists a favourable dependence between prior international experience, level of education, and the early internationalization of new ventures.

Implications & Recommendations: The study carries several practical implications. Entrepreneurs aiming for early internationalization should draw on their prior international exposure and recruit employees with similar experience. Furthermore, the significance of education level was noteworthy. A higher level of education correlates with a higher probability of early internationalization.

Contribution & Value Added: The article addresses areas of research that have not yet been explored in early internationalization analyses. It can act as a foundation for more comprehensive studies on this phenomenon, including ventures from different countries.

Article type:	research article
Keywords:	international new ventures; internationalization; early internationalization; Austria; intellectual capital
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INTRODUCTION

Research on the internationalization of enterprises began gaining traction in the literature around the 1960s. Since the early 1990s, there has been a heightened focus on small and medium-sized enterprises (SMEs). The initial exploration of SME internationalization dates back to the mid-1970s. Swedish researchers Johanson and Vahlne (1974) were pioneers in this respect. They introduced the Uppsala internationalization model (Johanson & Vahlne, 1977; Johanson & Wiedersheim-Paul, 1975), which constitutes a pivotal contribution to shaping the internationalization theory of SMEs within the realm of international entrepreneurship. Oviatt and McDougall (1994) further advanced this theory by defining international new ventures (INV), also known as international start-ups. This emphasis on a distinct type of venture fuelled increased scholarly attention to early internationalization, diverging from traditional sequential models established by Johanson and Wiedersheim-Paul (1975) and Johanson and Vahlne (1977). The exploration of international entrepreneurship and the concept of INV has enriched our understanding of SME internationalization dynamics.

In contrast to the conventional notion of gradual development, early internationalized SMEs place significant emphasis on knowledge as a crucial factor in the initial phase of internationalization

(Schwens *et al.*, 2010). Contemporary perspectives in international entrepreneurship propose that these start-ups actively seek both tangible and intangible resources beyond national borders due to limited access to the domestic market (Bishop, 2008). Being initially obscure to the public and constrained by their small size, these start-ups face challenges in acquiring the necessary resources for survival and early internationalization (Zahra, 2005).

There are several reasons for investigating the phenomenon of early internationalization. Firstly, early internationalization is a relatively new area of research and therefore not yet sufficiently recognized (Pathania & Tanwar, 2024). Research on the internationalization of enterprises began gaining traction in the literature around the 1960s. However, since the early 1990s, there has been a heightened focus on small and medium-sized enterprises (SMEs). Secondly, existing internationalization theories do not adequately explain the phenomenon of the internationalization of new economic entities. Thirdly, there is a relationship between early internationalization and the process of gaining competitive advantage.

Despite progress in research on SME internationalization, there are still many gaps in the literature. One of the main shortcomings in research is the lack of a uniform approach to defining early internationalization and a lack of agreement on the criteria that determine when we can consider a company as early internationalized. Some definitions focus on the time of activity in foreign markets, while others consider the scale of international sales. Research on SME internationalization indicates that scholars typically see early internationalization as a process of international development that begins in the early stages of a firm's existence and involves gradually increasing involvement in foreign markets (Rialp *et al*., 2005). Furthermore, there is a need to understand how various factors, such as intellectual capital, influence early internationalization. Existing research suggests that intellectual capital may play a crucial role in the early internationalization process (Musteen *et al*., 2014; Schwens *et al*., 2011; Zahra, 2005). Another gap in the literature is the limited amount of research on the role of intellectual capital, especially its elements, in the context of SMEs' early internationalization.

After the introduction, we will present a review of previously published scientific research on the role of intellectual capital and its components in the early internationalization process of the enterprise. Next, we will present the results and conclusions arising from our research conducted based on the applied binary logistic regression model.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Intellectual Capital and New Ventures' Early Internationalization

In recent decades, intellectual capital, also referred to as an intangible asset (Keong Choong, 2008; Derun & Mysaka, 2021; Klimontowicz & Majewska, 2022), has played a pivotal role in establishing the international success of start-ups. Despite the heightened attention directed towards the concept of intellectual capital, a lack of consensus persists regarding its components and definition (Choo Huang *et al*., 2007). Scholars understand this multidisciplinary concept diversely across various business-related dissertations.

Choo Huang *et al.* (2007) cite the definition proposed by the OECD, which defines intellectual capital as the economic value of two categories of intangible assets within a company – organizational (structural) capital and human capital. On the other hand, Edvinsson (1997) asserts that intellectual capital primarily encompasses the knowledge, expertise, processes, and technologies of the company, as well as customer relationships and professional skills. Scholars widely acknowledge that intellectual capital forms the foundation of enterprises' competitive advantage and innovation (García-Perez *et al*., 2023; Nadeem, 2020; Mishchuk *et al.*, 2023).

Human capital comprises an integral part of the human entity, including skills, knowledge, experience, and ideas that are utilized in the provision of services within a business. However, human capital is not limited solely to the knowledge and skills that individuals possess and utilize; it also encompasses their ability to create these resources. It consists of what people know and their ability to learn and collaborate with others, which can be beneficial to the organization (Kmecová & Androniceanu, 2024). Although a company does not own human capital, it can hire it under specific conditions outlined in a contract (Bryl & Truskolaski, 2017). As Ordónez de Pablos (2002) indicate, the value of human capital in a

company arises from the total value of the investments made in training employees, developing their competencies, and their future (Androniceanu, 2023). In the competition in the contemporary international market, the value of human capital for a company is even greater because, as noted by Ndinguri *et al*. (2012), due to the specific characteristics of individuals, human capital becomes difficult to imitate and therefore plays a strategic role in maintaining a competitive advantage for the organization.

Traditionally, intellectual capital can be categorized into three distinct classifications: (1) human capital, (2) structural capital (also referred to as organizational capital), and (3) relational capital (alternatively known as social capital) (Šimpachova Pechrova & Šimpach, 2024; Crupi *et al*., 2021; Kianto *et al*., 2017; Seetharaman *et al*., 2004). These categories are associated with knowledge embedded in individuals, organizational structures, processes and systems, as well as relationships and networks (Kianto *et al.*, 2017; Court & Arikekpar, 2022). Previous researchers examining the components of intellectual capital found that it comprises different levels, encompassing the individual, organizational, and network dimensions. In this context, intellectual capital extends beyond the knowledge possessed by individuals, encompassing the information accumulated in an organization's databases, processes, systems, and business relationships (Crupi *et al.*, 2021).

Peña (2002) emphasized that the human capital of entrepreneurs, specifically the efforts and knowledge possessed by the entrepreneur, stands out as the primary determinant of start-up success. The early stage of a venture's existence positively influences the start-up's business performance. Peña (2002) further highlighted that during the initial phases of a start-up, spanning from its inception through the subsequent years, organizational capital (pertaining to the firm's attributes) and relational capital (related to relationships with external stakeholders) emerge to complement the organization's human capital. These three forms of capital are intricately interrelated and mutually reinforce one another. In a survey of 114 Spanish start-ups, Peña (2002) discovered that elements of entrepreneurial human capital – such as education, prior business experience, and motivation level – positively influence the performance of these ventures. Similarly, components of organizational capital (*e.g.* the venture's adaptability to change, and ability to implement appropriate strategies) and relational capital (*e.g.* effective interaction with diverse stakeholders during the initial years of business) exhibit positive correlations with start-up growth. Moreover, Sardo and Serrasqueiro (2017) noted the dominant role of intellectual capital in augmenting the wealth of European firms. They observed how intellectual capital, encompassing knowledge, expertise, and innovation play a pivotal role in enhancing the competitiveness and prosperity of these companies within the European market. Their findings underscore the importance of effectively managing and leveraging intellectual assets as a strategic imperative for European firms seeking sustained growth and success in today's dynamic business environment.

Moreover, Gerschewski *et al*. (2015) confirmed the positive impact of intellectual capital on the early internationalization process. Furthermore, Oswal *et al*. (2014), and Ling (2012; 2013) further support this notion, indicating the beneficial influence of intellectual capital on early internationalization efforts.

Consequently, intellectual capital emerges as a catalyst propelling the global engagement of enterprises (Kuděj *et al*., 2023; Civelek & Krajčík, 2022; Ključnikov *et al*., 2022). The nexus between innovative endeavours and intellectual capital is profound given that innovation stems from a process of creative ideation originating from human cognition. Thus, the inherent potential of individuals serves as the cornerstone for the efficacious operation of firms with the human element within an organizational framework evolving into a fundamental prerequisite and bedrock for innovation – a quintessential and indispensable wellspring of inventive advancement (Belniak, 2015).

Role of Human Capital in New Ventures' Early Internationalization

Human capital encompasses not only the knowledge, talent, and experience of an organization's employees but also extends to factors such as creativity and the ability to generate and implement ideas (Prajogo & Oke, 2016; Stuss, 2023). Knight and Liesch (2016) highlight the indispensable role of human capital in the internationalization process of start-ups. This perspective is echoed by Buzavaite and Korsakiene (2019), who emphasize its impact on the identification and exploitation of international opportunities. Given that start-ups often opt for an early internationalization trajectory, they must cultivate a high level of absorptive capacity to rapidly process and internalize market information (Sapienza *et al*., 2006). On-

kelinx *et al*. (2016) propose a hypothesis that the level of human capital will vary based on a firm's internationalization strategy, being particularly crucial for ventures that choose to internationalize early. The argument posits that international start-ups lack the time to organically develop organizational capabilities for internationalization, compensating for this gap through the individual experience and skills embodied in human capital (Onkelinx *et al.*, 2016). The presence of additional human capital is correlated with higher export intensity as elucidated by Onkelinx *et al.* (2016). Stucki (2016) contends that the human capital of founders directly influences the overall performance of the firm and holds significance for the export activities of start-ups. Founders' human capital is closely tied to a firm's ability to identify and capitalize on foreign market opportunities, as well as manage business operations across borders. Consequently, it catalyzes the propensity of start-ups to engage in export activities (Stucki, 2016).

Studies indicate that the competencies, as constituents of human capital, demeanour and commitment of employees exert a substantial influence on the process of firm internationalization (Yamao & Sekiguchi, 2015; Nugroho, 2024; Urban *et al*., 2023). Furthermore, international learning, an inherent component of human capital, functions as a catalytic force, expediting the tempo of internationalization (Chetty *et al*., 2014). Dar and Mishra (2021) found that education level, knowledge, skills, and international experience are essential predictors of internationalization as dimensions of human capital. Furthermore, Baier-Fuentes *et al*. (2018) research underscores the pivotal role of human capital in facilitating firms' rapid internationalization. It conclusively establishes that factors such as education, experience, and skills within the firm significantly influence swift global expansion, emphasizing the critical importance of human resources in maintaining competitiveness in the global market. On the other hand, Ruzzier *et al*. (2007) also consider foreign language skills influencing internationalization. Manolova *et al*. (2002) argue that the international orientation of managers as measured by the time spent abroad due to study or employment, may be necessary for the internationalization process. Cannone and Ughetto (2014) noted that the experiential knowledge accumulated by the entrepreneur as a result of his or her prior international work experience plays a vital role in early internationalization. Isidor *et al*. (2011) hold a similar view. They found that managers with international experience quickly recognize an internationalization opportunity for the firm. Typically, prior international business experience can be crucial in ensuring the venture's sustainability as entrepreneurs will avoid previous mistakes in the new venture or correct business decisions (Peña, 2002). Other studies also support the positive impact of prior international experience on a firm's commitment to foreign operations (*e.g.* Athanassiou & Nigh, 2002; Herrmann & Datta, 2005; Ibeh & Young, 2001). Chandra *et al*. (2009) argue that the greater the venture's prior experience and knowledge, the more likely the start-up will consciously seek out and identify new international opportunities. Knight and Liesch (2016) also confirm that the early internationalization of start-ups may be due to the founders' distinctive entrepreneurial abilities with knowledge and prior experience in managing markets. Thus, based on the above discussion, we hypothesised:

H1a: Small and medium-sized enterprises whose managers have prior international experience are more likely to be early internationalizers than those whose managers do not have such experience.

H1b: The higher the manager's education, the greater the SMEs' propensity to internationalize early.

Role of Structural Capital in New Ventures' Early Internationalization

Structural capital is an organization's inherent attribute designed to facilitate employee learning and skill enhancement. This concept, often referred to as organizational capital in the literature, emphasizes that it pertains to assets intrinsic to the organization and not dependent on individuals. Included within its scope are systems, software, processes, and patents held by the entity. Nawaz *et al*. (2021) argue that organizational capital embodies knowledge embedded within organizational processes and structures. This includes organizational culture, copyrights, trademarks, internal databases, computer systems, and corporate intranets. Ulubeyli and Yorulmaz (2020) assert that structural capital serves as the infrastructure supporting human resources and knowledge within an organization. In addition to the elements previously mentioned by other researchers, they include business development plans, organizational structure, and corporate strategy as components of structural capital. In

his research, Wójcik (2021) highlights the significance of structural capital and its impact on shaping the intangible resources of organizations. He elucidates how the structural framework within an organization contributes to the development and management of intangible assets, influencing their configuration and strategic importance. Hsu and Wang (2012) further divide structural capital into two components: organizational processes and information systems. Organizational processes refer to how individuals utilize information or knowledge resources in the workplace, while information systems encompass the technology employed in knowledge management.

Zakery and Saremi (2021) highlight that ventures can transform experiences and relationships into structural assets that support their international activities. Nawaz *et al.* (2021) argue that entities equipped with comprehensive business processes, reliable ERP systems (including CRM), and well-defined organizational strategies are better equipped to navigate difficulties and challenges during internationalization. Westerlund (2020) observes that internationalized SMEs more frequently leverage CRM systems. The researcher cites studies affirming that effective customer relationship management systems contribute to the growth of start-ups. Given that these ventures need to track and adjust their customer value propositions, as well as communicate both internally and externally, CRM systems become instrumental in delivering high value to customers before, during, and after using products or services (Westerlund, 2020). Rodríguez and Jesús Nieto (2010) found that Spanish knowledge-intensive business service firms exhibit higher export intensity with increasing expenditures on research and development. Cieślik and Michałek (2018) reached similar conclusions demonstrating that R&D investments positively impact firms' export opportunities.

Moreover, Kumar and Sharma (2018) emphasize that the organizational culture of early internationalized start-ups characterized by continuous learning among employees is positively linked to their inclination to internationalize. Moreover, based on the findings of their research involving representatives from business and academia, Korsakienė *et al*. (2017) concluded that various factors, including product technologies, the process of strategy formation, and the culture and organizational structure of an entity play pivotal roles in the internationalization process of ventures.

Within the realm of structural capital, Cho and Kim (2017) propose that safeguarding intellectual property rights can significantly benefit ventures more oriented towards exports in the development of technological innovations. Conversely, Rienda *et al*. (2021) argue that firms with registered trademarks exhibit a stronger presence in international markets, translating into enhanced performance. Thus, we hypothesised:

H2: Small and medium-sized enterprises that sell through online channels are more likely to internationalize early than those that use more traditional on-site channels.

H2a: The relationship between online selling and propensity to early internationalization is moderated by SMEs' manager's experience.

Role of Relational Capital in Early Internationalization

Relational capital, also known as the knowledge residing in the relationships between an organization and its reference groups (Hormiga *et al*., 2011), is a critical component of intellectual capital. Sharabati *et al*. (2010) further elaborate that within the context of intellectual capital, relational capital represents knowledge embedded in a venture's external relationships with various entities such as agents, customers, suppliers, competitors, partners, shareholders, industry associations, society, and government.

The development of relational capital brings several positive effects to the enterprise. Primarily, it leads to increased innovativeness, as collaboration with various stakeholders generates novel ideas. Products and services co-developed exhibit greater originality and are more difficult to replicate, thereby enhancing competitive advantage. Firm flexibility is heightened through partner involvement in the value chain, facilitating cost reduction through shared resources. Collaboration also fosters knowledge exchange, access to new markets and technologies, and expedited implementation of novel concepts, resulting in time savings (Bombiak, 2021). Ulubeyli and Yorulmaz (2020) assert that relational capital holds crucial significance for organizations as it facilitates the creation of organizational value by connecting internal intellectual resources with external stakeholders. This perspective aligns with the findings of

Hormiga *et al.* (2011), who confirmed that relational capital is grounded in the idea that ventures cannot be treated as isolated systems but rather as entities highly dependent on the relationships they establish in their environment. Seetharaman *et al.* (2004) note that relational capital encompasses the externalities of revenue generation for businesses. For instance, customers may be willing to pay more for a brand with an established market position and reputation than for a lesser-known brand.

Relational capital emerges as a crucial factor in the early internationalization of start-ups (Ulubeyli & Yorulmaz, 2020), playing a compensatory role for resource scarcity in these entities (Zakery & Saremi, 2021). Zakery and Saremi (2021) emphasize that start-ups can enhance their relational capital by strategically forming alliances with other domestic entities to establish an effective presence in foreign markets, participating in business networks and meetings, and establishing communication links with host country governing bodies. This approach is grounded in the idea that higher levels of relational capital foster mutual trust and reduce the risk of opportunism in knowledge sharing among participants (Ryan *et al*., 2019).

Empirical evidence from case studies affirms the significance of relational capital in influencing export behaviour. Adopting a resource perspective, Federico *et al*. (2010) emphasize that, particularly in the case of start-ups, entrepreneurs/founders constitute the organization's unique resources. This uniqueness primarily stems from the human and relational capital of these individuals. Entrepreneurs play a pivotal role in creating a critical level of firm-specific capabilities that empower their organizations to engage in international markets right from their inception. Jeong (2016) indicates that networks involving suppliers and customers, categorized as components of regional capabilities, significantly impact the firm's internationalization process. The research by Jardon and Molodchik (2017) confirms that relational capital plays a key role at all internationalization stages, bringing significant benefits and supporting the development of companies in the global market, thereby indicating the advantages of utilizing and cultivating strong inter-organizational relationships in foreign expansion strategies. Similarly, drawing insights from 445 high-tech international start-ups, Cannone and Ughetto (2014). confirm that business networks play a positive role in influencing the extent of internationalization for these ventures.

Businesses can leverage institutional relationships to their advantage. When expanding internationally, it is crucial to cultivate these relationships to enhance the company's relationship capital. The stronger the relationship capital, the greater the likelihood of gaining a competitive edge. To expedite this process in a foreign market, companies might pursue partnerships with entities that have already built their own relationship capital and are willing to share it for mutual gain (Deszczyński *et al*., 2017). Monteiro (2019) contends that growth-oriented companies prioritize personalized interactions with customers and strive to enhance customer satisfaction rather than focus solely on cost reduction. Consequently, based on the preceding discussion, we hypothesised:

H3: Small and medium-sized enterprises belonging to business networks are more prone to early internalization than those that do not belong to any organization.

H3a: The relationship between business networks and propensity to early internationalization is moderated by SMEs' manager's experience.

RESEARCH METHODOLOGY

Sample and Data Collection

Our analysis is based on the firm-level data retrieved from the World Bank Enterprise Survey (The World Bank Group, 2021). Initially, we included 600 enterprises coming from Austria. We surveyed respondents in 2021 and randomly chose the ventures. In the next step, we deleted all missing data and included only firms with less than 50 workers as international ventures are often considered micro or small. We omitted the second criterion for firm size classification as there was no information about this in firm-level data. Finally, we retained 501 ventures. Next, we created a new variable by calculating the difference measured in years between the establishment date and each firm's first overseas sales. We assigned number 1 to those entities that first exported within three years. To the rest of the firms,

we assigned the number 0 (including those firms that realize foreign sales in traditional ways and those that focus only on domestic sales). Table 1 presents the description of all variables used in the study.

Table 1. The list of variables

Variable	Description	Scale
EARLY INTERNATIONALIZATION	First exporting within three years from the establishment (1 = yes, 0 = no).	Nominal
SIZE	Natural logarithm of number of permanent, full-time individuals working in each establishment.	Continuous
FOREIGN OWNERSHIP	Existence of foreign ownership in total firm's ownership (1 = yes, 0 = no).	Nominal
NON-FAMILY BUSINESS	Existence of family ownership in total firm's ownership, which means the same family owns that venture (1 = no, 0 = yes).*	Nominal
GENDER	Gender of top manager (1 = man, 0 = woman)	Nominal
AGE	Age of top manager (in years).	Continuous
R&D	Research and development expenditure (1 = yes, 0 = no).	Nominal
INT EXPERIENCE	Top manager's experience in a multinational firm.	Nominal
EDUCATION	The highest level of education of top manager (1 = no formal education, 2 = primary, 3 = secondary/diploma, 4 = secondary/technical/vocational training, 5 = bachelor's degree, 6 = Master's or PhD degree).	Ordinal
ONLINE SALES	Any part of sales is realized online (1 = yes, 0 = no).	Nominal
MEMBERSHIP	Firm's participation in business organization/network (1 = yes, 0 = no).	Nominal
EXPERIENCE	Manager's experience in the sector (in years)	Continuous

Note: * we assigned number 0 to 'yes' as we consider that family firms are less likely to early internationalize.
Source: own study.

In our sample, 52% were microenterprises that employed less than 10 workers, but the rest of the sample (48%) represented small enterprises that hired less than 50 workers. This distinction between the two categories of companies is in line with the EU proposal for firm classification. Over half of the surveyed firms belonged to the service sector (56%), while 29% represented the manufacturing segment and the rest were retailers (15%).

Research Model

We applied a binomial logistic regression model (Hosmer *et al*., 2013) to verify the dependence between the endogenous variable describing propensity to early internationalization and the exogenous variable describing intellectual capital. Moreover, the logistic regression model is recommended when the assumption of normality distribution of variables may not be met (Hair *et al*., 1998). The dependent variable was a dummy (dichotomous) variable (Hosmer *et al.*, 2013), where when a measured phenomenon occurs then 1 is assigned, but if otherwise then 0 (Sperandei, 2014). The estimation of model parameters $\beta_1, \beta_2, \ldots, \beta_k$ is usually performed using the maximum likelihood method. We maximized the logarithm of the likelihood function with model parameters using iterative numerical procedures.

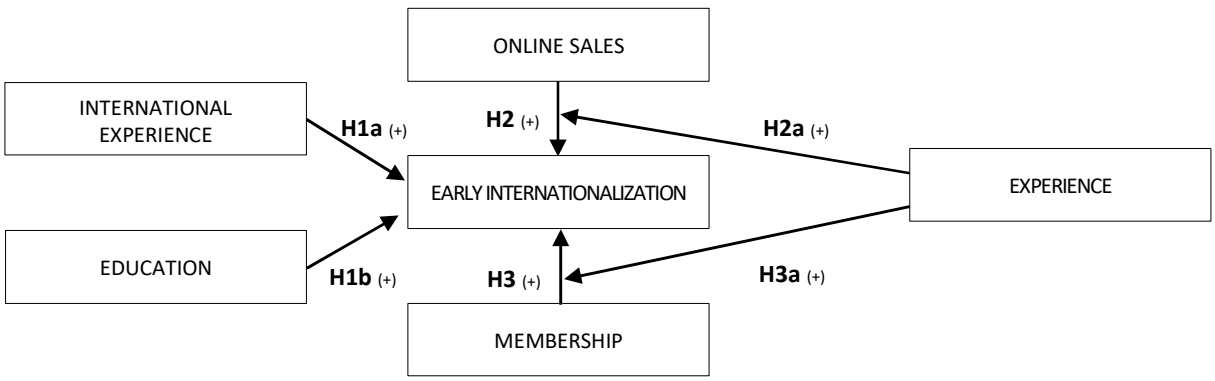

Figure 1. Proposed research model
Source: own elaboration.

The proposed research model (Figure 1) suggests a positive relationship between the three components of intellectual capital and new ventures' early internationalization. To verify such a relationship, we used five variables. The dependent variable represented early internationalization (Table 1). Furthermore, we included seven control variables and we checked the interaction between variables describing both structural and relational capital, and experience. Moreover, in our research, we distinguished those ventures which are internationalizing early and those which are incrementally realizing internationalization. We also checked whether there are differences between innovative new ventures' early internationalization and those that are not innovative.

Measures

Dependent Variable

In our research (Figure 1), the dependent variable was the early internationalization measured dichotomously. If a proper start-up was an early internationalizer, which means that the entity realizes its first foreign sales at most three years after its establishment, we assigned number 1. If the venture started selling its goods or services after three years of inception, we assigned the number 0. Among researchers who understand early internationalization similarly, we can name *e.g.* Li *et al*. (2012), Knight *et al*. (2004) or Santhosh (2019).

Independent Variables

Primary independent variables can be divided into three groups: (1) human capital, (2) structural capital, and (3) relational capital. To the first group, we assigned two variables: INTERNATIONAL EXPERIENCE and EDUCATION. INTERNATIONAL EXPERIENCE is measured by a top manager's previous experience in a multinational firm. This variable is dummy, which means that if a top manager has such experience, then we assigned number 1; otherwise, we assigned number 0. EDUCATION indicates the highest level of a top manager's formal education. This variable was ordinal (1 – no formal education, 2 – primary, 3 – secondary/diploma, 4 – secondary/technical/vocational training, 5 – bachelor's degree, 6 – Master's or PhD degree). We considered that both INTERNATIONAL EXPERIENCE and EDUCATION can serve as some researchers also considered variables describing human capital as such variables, *e.g.* Onkelinx *et al.* (2016) or Jiang *et al*. (2016). We described structural capital using ONLINE SALES dummy variable, which means that if a new venture makes any sales of its product/services via web-based platforms (social media, its own website) or smartphone application, we assigned number 1; otherwise, we assigned number 0. Based on Westerlund (2020), we assumed that early internationalized start-ups were more willing to use online sales channels than traditional exporters. Finally, in our research, we measured relational capital by MEMBERSHIP, related to start-up participation in a business membership organization, trade association, or other business support group. This variable was a dummy, and we assigned the number 1 if the new venture belongs to any business organization, but otherwise, we assigned the number 0. Some research, *e.g.* Baier-Fuentes *et al.* (2018), states that firms' network presence could be related to their early internationalization.

Control Variables

We included several control variables that could potentially impact the results. Firstly, we controlled SIZE (measured by the natural logarithm of the number of workers) as we considered that relatively larger firms have relatively more resources than smaller ones, and it can potentially affect early internationalization. We also controlled FOREIGN OWNERSHIP (measured by the existence of foreign capital in the new venture's ownership structure) as foreign capital investments positively influence firms' internationalization (Woo, 2020). The following control variable was NON-FAMILY BUSINESS (measured by the existence of family ownership in total firm ownership, which means the same family owns that venture). We considered that family businesses are less willing to internationalize earlier (Arregle *et al.*, 2021). Wach (2014) confirmed it when he empirically verified such interdependence between family and non-family firms. It turned out that the average time of internationalization is longer in a family business than those assigned to a non-family group. We also controlled GENDER as we assumed that men are more likely to develop new international business directions than women. It is related to risk propensity. Fur-

ther research shows that women have a higher aversion to risk than men in new venture planning (*e.g.* Ivanova Yordanova *et al*., 2011; Zhang *et al*., 2014). We controlled AGE as we assumed that older top managers may identify an entrepreneurial opportunity quicker than younger ones thanks to to their professional experience (Reuber & Fischer, 1999; Zucchella *et al*., 2007; Zucchella & Scabini, 2007). Lastly, we controlled R&D as some research demonstrates a positive association between R&D spending and early internationalization (*e.g.* Fernhaber & Li, 2013; Sheppard & McNaughton, 2012).

Moderator

Some studies emphasize that experience could affect whether firms spot international entrepreneurial opportunities (*e.g.* Cock *et al*., 2021; D'Angelo & Presutti, 2019; Magnusson & Boggs, 2006; Reuber & Fischer, 1997). One can intuit that managers' work experience may reinforce sales via an alternative path, *e.g.* Internet. Their experience helps them recognize the importance of participating in business networks for further venture development. Online sales may provide an additional source of revenue for the new venture, thereby reducing the cost of international operations, which is critical for micro and small enterprises. We claim that new ventures are more willing to sell via the Internet whose managers have significant sector experience. Moreover, participation in a business network also relates to top managers' experience and their reputation. Extensive experience in the sector could be reflected in higher profits from overseas sales and may indicate the strength of alternative foreign sales channels. Therefore, we decided to include EXPERIENCE (measured by the number of years of professional experience a top manager in the sector has) into our analysis. Work experience in the sector can determine the direction and strength of sales through online channels and influence whether a company integrates into the business network, thus enhancing the moderation effect.

RESULTS AND DISCUSSION

Initially, we checked the credibility of the logistic regression model. We used two criteria that had to be met. Firstly, the likelihood ratio test estimated with the maximum probability should be statistically significant. Secondly, the Hosmer-Lemeshow test should be statistically insignificant (Hair *et al.*, 1998). In the first model, the likelihood ratio test was statistically significant (chi-square=74.960, df=10, p<0.001). The same situation occured for model 2, where chi-square=68.531 (df=10, p<0.001), model 3 (chi-square=40.751, df=10, p<0.001), and model 4 (chi-square=27.798, df=10, p<0.001). Model 5 (chi-square=81.184, df=10, p<0.001), model 6 (chi-square=71.058, df=10, p<0.001), model 7 (chi-square=46.053, df=10, p<0.001), and model 8 (chi-square=31.631, df=10, p<0.001) were also statistically significant in terms of likelihood ratio test. In terms of the Hosmer-Lemeshow test, all models were statistically insignificant, which was the desired result for our deliberations.

In the binomial logistic regression model, the coefficient of determination R-square is not an adequate measure of the quality of model adjustment to variables. Therefore, scholars do not recommend to apply it (Blomstermo *et al.*, 2006). Some researchers suggest using Nagelkerke pseudo R-square or Cox-Snell pseudo R-square (Smith & McKenna, 2013), which for the first model were 0.196 and 0.139, respectively. In terms of model 2, Nagelkerke pseudo R-square was 0.289, but Cox-Snell pseudo R-square was equal to 0.179. For the rest of the models, Nagelkerke (NPRsq) and Cox-Shnell pseudo R-square (CSPRsq) was between 0.127 and 0.299.

We also checked the relationship between variables used in the analysis (Table 2) by calculating the V-Cramer coefficient. Based on Table 2, we observed that there was no strong correlation between the independent variables used in the analysis. The highest relationship occurred between AGE and EXPERIENCE (v=0.389, p<0.001). The manager's age goes hand in hand with their total work experience, which could explain such a noticeable relationship. We resigned from AGE control variable to avoid disturbing the test results while we analysed the interaction between EXPERIENCE and ONLINE SALES and EXPERIENCE and MEMBERSHIP. In contrast, the lowest dependence occurred between NON-FAMILY BUSINESS and INT EXPERIENCE (v = 0.003) and between FOREIGN OWNERSHIP and ONLINE SALES (v=0.008).

Table 2. V-Crammer coefficient

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. EARLY INTERNATIONALIZATION	1.000	–	–	–	–	–	–	–	–	–	–	–
2. SIZE	0.294	1.000	–	–	–	–	–	–	–	–	–	–
3. FOREIGN OWNERSHIP	**0.185*** **	0.248	1.000	–	–	–	–	–	–	–	–	–
4. NON-FAMILY BUSINESS	**0.119** **	0.314	**0.161*** **	1.000	–	–	–	–	–	–	–	–
5. GENDER	**0.135** **	**0.338†**	**0.132** **	**0.095***	1.000	–	–	–	–	–	–	–
6. AGE	0.330	**0.332*** **	0.330	0.318	0.316	1.000	–	–	–	–	–	–
7. R&D	**0.291*** **	**0.359***	**0.092***	**0.139** **	**0.207*** **	0.267	1.000	–	–	–	–	–
8. INT EXPERIENCE	**0.178*** **	0.290	**0.120** **	0.003	**0.142** **	**0.359 †**	**0.135** **	1.000	–	–	–	–
9. EDUCATION	**0.242*** **	**0.350*** **	**0.219*** **	**0.162***	**0.149***	0.285	**0.170***	**0.185** **	1.000	–	–	–
10. ONLINE SALES	0.014	0.265	0.008	0.045	**0.161*** **	0.302	0.007	0.005	**0.134†**	1.000	–	–
11. MEMBERSHIP	**0.074 †**	0.312	0.021	**0.160*** **	0.034	0.289	0.041	0.042	**0.144 †**	0.030	1.000	–
12. EXPERIENCE	0.320	0.288	0.332	0.335	**0.344 †**	**0.389*** **	0.320	0.311	0.284	0.276	0.281	1.000

Note: † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: own study.

Table 3. Binomial logistic regression models

Variables	Model 1			Model 2			Model 3			Model 4		
	Coeff.	**Exp**	**Wald**	**Coeff.**	**Exp**	**Wald**	**Coeff.**	**Exp**	**Wald**	**Coeff.**	**Exp**	**Wald**
Const.	**-2.972*** (0.888)**	**0.051**	**11.206**	**-8.286*** (1.537)**	**0.000**	**29.073**	**-2.783** (1.090)**	**0.062**	**6.519**	-1.836 (1.676)	0.159	1.201
SIZE	0.107 (0,15)	1.113	0.507	**1.016*** (0.229)**	**2.763**	**19.763**	0.032 (0.185)	1.033	0.030	0.014 (0.298)	1.014	0.002
FOREIGN OWNERSHIP	**0.968** (0.391)**	**2.633**	**6.144**	0,015 (0.745)	1.015	0.000	**1.152** (0.492)**	**3.164**	**5.483**	0.270 (0.778)	1.310	0.121
NON-FAMILY BUSINESS	0,314 (0.246)	1.369	1.626	-0.440 (0.400)	0.644	1.211	0.203 (0.305)	1.225	0.444	**1.020* (0.478)**	**2.774**	**4.555**
GENDER	0.360 (0.319)	1.433	1.269	0.426 (0.448)	1.531	0.904	0.037 (0.409)	1.038	0.008	0.476 (0.578)	1.609	0.678
AGE	-0.001 (0.011)	0.999	0.017	**0.048** (0.017)**	**1.050**	**8.129**	-0.005 (0.014)	0.995	0.124	0.008 (0.023)	1.008	0.121
R&D	**1.067*** (0.229)**	**2.907**	**21.797**	**1.786*** (0.350)**	**5.967**	**25.977**	**0.767** (0.267)**	**2.153**	**8.273**	**1.702*** (0.542)**	**5.484**	**9.858**
INT EXPERIENCE (H1a)	**0.536** (0.226)**	**1.709**	**5.603**	-0.430 (0.383)	0.650	1.261	**0.483 † (0.276)**	**1.620**	**3.065**	**0.836† (0.446)**	**2.308**	**3.522**
EDUCATION (H1b)	**0.287** (0.111)**	**1.332**	**6.728**	**0.284† (0.170)**	**1.328**	**2.799**	**0.389** (0.135)**	**1.475**	**8.342**	-0.087 (0.227)	0.917	0.146
ONLINE SALES (H2)	0.157 (0.234)	1.170	0.446	0.376 (0.343)	1.456	1.199	0.336 (0.280)	1.400	1.438	-0.509 (0.512)	0.601	0.986
MEMBERSHIP (H3)	**-0.473† (0.275)**	**0.623**	**2.954**	-0.104 (0.432)	0.901	0.058	-0.089 (0.331)	0.915	0.072	**-1.109* (0.535)**	**0.330**	**4.290**
EXPERIENCE	–	–	–	–	–	–	–	–	–	–	–	–
EXPER. x ONLINE SALES (H2a)	–	–	–	–	–	–	–	–	–	–	–	–
EXPER. x MEMBERSHIP (H3a)	–	–	–	–	–	–	–	–	–	–	–	–
N	501			348			297			204		
Likelihood test	74.960*** (p < 0.001)			68.531*** (p < 0,001)			40.751*** (p < 0,001)			27.798** (p < 0,01)		
H.-L. test	4.074 (p = 0.850)			5.842 (p = 0.665)			8.083 (p = 0.425)			6.857 (p = 0.552)		
Pseudo-R2	0.122			0.205			0.102			0.149		
R2(Nagelkerke)	0.196			0.289			0.174			0.,212		
R2(Coxa-Snella)	0.139			0.179			0.128			0.127		

Note: † p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Source: own study.

Table 3. Binomial logistic regression model – cont'

Variables	Model 5			Model 6			Model 7			Model 8		
	Coeff.	**Exp**	**Wald**	**Coeff.**	**Exp**	**Wald**	**Coeff.**	**Exp**	**Wald**	**Coeff.**	**Exp**	**Wald**
Const.	**-3.284*** (0.925)**	**0.037**	**12.598**	**-8.061*** (1.758)**	**0.000**	**21.031**	**-2.911** (1.135)**	**0.054**	**6.576**	-1.535 (1.834)	0.215	0.700
SIZE	0.124 (0.151)	1.132	0.680	1.040*** (0.232)	2.830	20.121	0.076 (0.188)	1.079	0.162	0.022 (0.302)	1.022	0.005
FOREIGN OWNERSHIP	**0.928** (0.394)**	**2.529**	**5.555**	0.141 (0.758)	1.152	0.035	**1.154** (0.495)**	**3.171**	**5.433**	-0.048 (0.800)	0.953	0.004
NON-FAMILY BUSINESS	0.262 (0.250)	1.299	1.095	-0.394 (0.404)	0.675	0.951	0.156 (0.310)	1.169	0.253	**0.917† (0.485)**	**2.503**	**3.573**
GENDER	0.407 (0.326)	1.503	1.565	0.288 (0.447)	1.334	0.415	0.042 (0.418)	1.043	0.010	0.521 (0.592)	1.684	0.774
AGE	–	–	–	–	–	–	–	–	–	–	–	–
R&D	**1.079*** (0.231)**	**2.940**	**21.795**	**1.808*** (0.353)**	**6.096**	**26.290**	**0.766** (0.271)**	**2.150**	**8.005**	**1.765** (0.570)**	**5.844**	**9.589**
INT EXPERIENCE (H1a)	**0.542** (0.226)**	**1.720**	**5.775**	-0.260 (0.375)	0.771	0.482	**0.466† (0.275)**	**1.594**	**2.885**	**0.983* (0.458)**	**2.674**	**4.607**
EDUCATION (H1b)	**0.279** (0.112)**	**1.322**	**6.237**	**0.337* (0.173)**	**1.401**	**3.785**	**0.405** (0.137)**	**1.499**	**8.723**	-0.130 (0.235)	0.878	0.306
ONLINE SALES (H2)	**1.431** (0.598)**	**4.183**	**5.727**	-0.603 (0.975)	0.547	0.383	**1.802** (0.729)**	**6.061**	**6.101**	0.778 (1.265)	2.178	0.379
MEMBERSHIP (H3)	-0.473 (0.702)	0.623	0.454	1.178 (1.299)	3.249	0.823	-1.029 (0.882)	0.357	1.361	-0.219 (1.301)	0.803	0.028
EXPERIENCE	0.009 (0.023)	1.009	0.142	**0.072† (0.039)**	**1.074**	**3.414**	-0.009 (0.029)	0.991	0.103	0.007 (0.043)	1.007	0.026
EXPER. x ONLINE SALES (H2a)	**-0.051* (0.022)**	**0.950**	**5.368**	0.033 (0.032)	1.034	1.089	**-0.057* (0.027)**	**0.945**	**4.546**	-0.050 (0.049)	0.951	1.032
EXPER. x MEMBERSHIP (H3a)	-0.001 (0.025)	0.999	0.002	-0.046 (0.040)	0.955	1.316	0.034 (0.032)	1.034	1.127	-0.033 (0.046)	0.968	0.503
N	501			348			297			204		
Likelihood test	81.184*** (p < 0.001)			71.058*** (p < 0.001)			46.053*** (p < 0.001)			31.631*** (p < 0.001)		
H.-L. test	7.925 (p = 0.441)			4.109 (p = 0.847)			4.581 (p = 0.801)			6.339 (p = 0.609)		
Pseudo-R2	0.132			0.212			0.115			0.169		
R2(Nagelkerke)	0.212			0.299			0.194			0.239		
R2(Coxa-Snella)	0.150			0.185			0.144			0.144		

Note: † p < 0.1, * p < 0.05, ** p < 0.01, ***p < 0.001.

Source: own study.

We created eight binomial logistic regression models (see Table 3). The first model explained ventures' early internationalization in comparison to those that either is internationalize in a sequential path or focus only on the domestic market. The second model refers to late internationalizers (thus we omitted early internationalized ventures). Therefore, we created this model to check whether there were differences between early and late internationalized start-ups. In the third model, we checked the propensity to early internationalization among innovation ventures. In the fourth model, we checked factors affecting early internationalization among non-innovation ventures. Next, the fifth model checked whether EXPERIENCE moderated the strength between online sales and membership and the propensity to early internationalization. We conducted the same procedure for models 6-8 but we checked this relation in reference to late internationalized businesses, innovative ventures, as well as non-innovative enterprises.

Discussion

We observed that among SMEs, those ventures that employ more workers were 1.113 times more propone to internationalize early than those that follow an incremental internationalization paths or focus on domestic sales. However, SIZE was statistically insignificant (odd ratio = 1.113, Wald=0.507), thereby we could not interpret it (Table 3). The situation was different for late internationalizers (model 2 and model 6). In this case, a number of workers played an essential role in explaining incremental internationalization. It means that among micro and small enterprises, those with a higher number of workers were almost three times more propone to internationalization in traditional ways than those internationalizing earlier or focusing only on domestic markets.

In terms of NON-FAMILY BUSINESS (model 1: odd ratio=1.369, Wald=1.626), we saw that 1.369 times more often ventures were early internationalizing their business in the non-family firm rather than in family companies, but the variable was statistically insignificant. Admittedly, in model 4 (odd ratio=2.774, Wald=4.555, $p<0.05$), in which we considered non-innovative ventures, the variable showed statistical significance confirming the propensity for early internationalization in this type of entity was nearly three times higher than in non-innovative family firms. Both GENDER and AGE were statistically insignificant, except AGE in model 2. It turned out that top managers' AGE was more likely to contribute to traditional internationalization than early internationalization or firms focusing on the domestic market (model 2: odd ratio=1.05, Wald=8.129, $p<0.01$).

We found that expenditure on research and development (R&D) in all models could affect the propensity to internationalize. We noticed that ventures that spent some part of their revenue on R&D were almost three times more willing to internationalize earlier than those firms which did not allocate expenditure for those matters (model 1: odd ratio=2.907, Wald=21.797, $p<0.001$; model 5: odd ratio=2.940, Wald=21.795, $p<0.001$). We also noted that the same held true for innovative ventures, where R&D spending may predict a firm's propensity for early internationalization (model 3: odd ratio=2.153, Wald=8.273, $p<0.01$; model 7: odd ratio=2.150, Wald=8.005, $p<0.01$). Our research also confirmed that the existence of FOREIGN CAPITAL in start-ups ownership structure could predict early internationalization (model 1: odd ratio=2.633, Wald=6.144, $p<0.01$; model 5: odd ratio=2.529, Wald=5.555, $p<0.01$), though we could see that this inclination was relatively higher for innovative ventures (model 3: odd ratio=3.164, Wald=5.483, $p<0.01$; model 7: odd ratio=3.171, Wald=5.433, $p<0.01$). Nonetheless, for late internationalizers and non-innovators, this relationship appeared to be statistically insignificant.

In the binomial logistic regression models, we measured the affect of intellectual capital on the propensity to early internationalization. We found that top manager's prior international experience may be a predictor of venture's early internationalization (model 1: odd ratio=1.709, Wald=5.603, $p<0.01$; model 5: odd ratio=1.720, Wald=5.775, $p<0.01$). Almost two times more often, start-ups managed by top managers with prior international experience were willing to internationalize earlier than other ventures. We see that such experience plays a crucial role rather in non-innovative (model 4: odd ratio=2.308, Wald=3.522, $p<0.1$; model 8: odd ratio=2.674, Wald=4.607, $p<0.05$) than innovative ventures (model 3: odd ratio=1.620, Wald=3.065, $p<0.1$; model 7: odd ratio=1.594, Wald=2.885, $p<0.1$), which mean that non-innovative firms rely more on prior international experience in explaining propone to early interna-

tionalization. It does not mean that innovators are not relying on such experience, they do but with a little bit weaker. Based on the above, we may accept hypothesis 1a. Skills and experience of the owner/manager in the international market are consistently identified in numerous scientific studies as one of the primary barriers to the company's internationalization process (Nurfarida *et al.*, 2022). The owner/manager's skills will impact managerial capabilities, which determine the ability to formulate competitive strategies (product, competitive pricing, target market, marketing strategy, etc.) in the international market. The owner/manager's proficiency is instrumental in shaping the company's approach to international expansion, influencing decisions that navigate diverse cultural, regulatory, and competitive landscapes, and ultimately impacting the success of international ventures.

Similarly, EDUCATION, where a higher level of education translates into ca. 1.3 times higher likelihood of early internationalization (model 1: odd ratio=1.332, Wald=6.728, p<0.01; model 5: odd ratio=1.322, Wald=6.237, p<0.01). The situation was similar for late internationalized firms, except that the statistical significance is relatively weaker than for early internationalized firms (model 2: odd ratio=1.328, Wald=2.799, p<0.1; model 6: odd ratio=1.401, Wald=3.785, p<0.05). Noteworthy, among innovative ventures, the top manager's level of education contributed to almost 1.5 times higher propensity of the entity to early internationalization (model 3: odd ratio=1.475, Wald=8.342, p<0.01; model 7: odd ratio=1.499, Wald=8.723, p<0.01). The case was different for non-innovators, where both model 4 and model 8 showed a lack of statistical significance in this regard. Therefore, we could partially accept hypothesis 1b.

In model 1, we found that among the firms selling via the Internet (odd ratio=1.170, Wald=0.446), the likelihood of early internationalization was 1.17 times higher than in the rest of the ventures, but unfortunately variable was insignificant. Similarly, among innovative ventures (model 3: odd ratio=1.400, Wald=1.438) and late internationalizers (model 2: odd ratio=1.456, Wald=1.199), where online sales increased early internationalization inclination, but both variables were statistically insignificant. Therefore, we must reject hypothesis 2. Surprisingly, we noticed that EXPERIENCE was a significant moderator in explaining the relationship between selling via the Internet and the likelihood of early internationalization. In model 5, we could observe a statistically significant interaction between experience and online sales (model 5: odd ratio=0.950, Wald=5.368, p<0.01; model 7: odd ratio=0.945, Wald=4.546, p<0.01). This relationship was especially well-demonstrated in innovative ventures, where EXPERIENCE moderates the effect of ventures' early internationalization inclination among the firms selling online (model 7: odd ratio=6.061, Wald=6.101, p<0.001). Such relations were not confirmed in the case of non-innovators (model 8: odd ratio=2.178, Wald=0.379) as the variable was not statistically significant. Therefore, we could partially accept hypothesis 2a.

As evidenced by studies conducted on Polish enterprises, the findings from research examining the impact of intellectual capital on the early internationalization endeavours of startups also echoed similar conclusions (Bigos & Pera, 2022). Our findings also align with the results of the study conducted by Zucchella *et al.* (2007). Their analyses distinctly illustrate that the salience of antecedent, specific experiences, notably within the realm of internationalization, wielded a substantial influence on the early stages of internationalization, a phenomenon further corroborated by the research undertaken by Debrulle and Maes (2015). The outcomes emanating from the study executed by Wach and Głodowska (2021) additionally corroborate our findings, elucidating the nexus between the educational attainment of entrepreneurs and the momentum of the internationalization endeavour. Their inquiry underscores the pivotal role of educational background in molding the tempo of international expansion.

Based on the result of the binomial logistic regression models, we could not confirm hypothesis 3 that MEMBERSHIP plays an essential role in explaining the propensity to early internationalization. Our research confirmed (weak) legitimacy only for non-innovators (model 4: odd ratio=0.330, Wald=4.290, p<0.05), which was not sufficient as we did not confirm such relation in the other models, except model 1 (odd ratio=0.623, Wald=2.954, p<0.1). Moreover, we noticed that experience did not moderate the relationship between the business network and propensity to early internationalization. Thus, we did not confirm either hypothesis 3 or hypothesis 3a.

CONCLUSIONS

The research confirmed the significance of intellectual capital in the context of early internationalization which is consistent with previous findings. However, not all anticipated hypotheses were confirmed due to lack of statistical significance. Noteworthy, while results concerning the influence of human and structural capital did not yield surprising outcomes, the situation differed regarding the impact of firm membership in business networks on early internationalization processes. Therefore, given these reasons and the understandable research constraints, a continuation of investigations to deepen understanding in this area seems justified. Additional studies may facilitate a better comprehension of why we did not corroborate certain hypotheses and what factors may influence firms' early internationalization. This could lead to a more comprehensive understanding of how intellectual capital and its constituent elements affect firms' international development.

As with all empirical studies, this research has several limitations. Firstly, the research applied the (computer-assisted personal interview. On the one hand, this type of study technique can be considered effective and appropriate. On the other hand, there is always a risk in this type of research that the respondent will not answer honestly, which may distort the results' objectivity. Furthermore, the sample was not large enough and did not include most Austrian firms, which may have resulted in a risk of a lack of representativeness. Another research limitation was that it focused only on micro and small enterprises, while we omitted medium and large enterprises. Furthermore, we based the study on the results of a survey of Austrian enterprises, and thus only in a selected cultural context. Consequently, we should treat such results cautiously, as they may not necessarily be replicated against enterprises in other countries.

Further research on early internationalization also needs to consider changes in the international environment, such as technological advancements, regulatory changes, and changes in trade policy, which may have a significant impact on SME internationalization strategy (Bigos & Michalik, 2023; Gerschewski *et al.*, 2015; Steinhäuser *et al.*, 2021; Wach, 2015).

The study has several practical implications. Entrepreneurs willing to internationalize earlier should rely on their own previous international experience and hire employees with such experience. The level of education is also of considerable importance – the higher the level, the greater the likelihood of early internationalization.

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Predicting South African consumers' intention to continue using their preferred retail bank's services: A model validation

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ABSTRACT

Objective: The objective of the article is to validate a model of the factors, namely ethical responsibility, social responsibility, bank trust, attitude, and brand loyalty, that influence the behavioural intentions of consumers to continue using banking services.

Research Design & Methods: This study focuses on predicting South African consumers' intention to continue using their preferred retail bank's services through a validated measurement model. Using confirmatory factor analysis, reliability and validity analyses, correlation assessments and collinearity diagnostics, the study examines a dataset of 500 participants sourced from a reputable global market research database. The measurement model comprises six latent factors, namely ethical responsibility, social responsibility, bank trust, attitude, brand loyalty and behavioural intention.

Findings: Results indicate strong internal consistency (Cronbach's alpha and CR > 0.85) and convergent validity (AVE > 0.50) across all factors. The model also exhibits good fit indices (PCMIN/DF = 2.610, IFI = 0.943, TLI = 0.937, CFI = 0.943, SRMR = 0.042, RMSEA = 0.057), confirming its psychometric properties.

Implications & Recommendations: This research highlights the interactions among the studied factors and their implications for customer retention strategies, providing actionable insights for banking professionals and policymakers. Future research should explore the relationships between these latent factors to enhance customer retention and satisfaction strategies in the banking industry.

Contribution & Value Added: Brand loyalty remains one of the biggest challenges facing banks today. As such, there is a need to investigate the factors that influence consumers' intention to continue using their preferred retail bank's services to build brand loyalty. This study fills a gap in existing literature regarding banking behaviours in a unique socio-economic South African context.

Article type: research article
Keywords: confirmatory factor analysis; measurement model; validation; reliability; model fit
JEL codes: M20, M30, M31

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INTRODUCTION

Lake (2022) defines retail banks as organisations within the service industry that offer deposit accounts, loans, and many banking services to consumers and owners of small businesses. These banks can take on the form of traditional brick-and-mortar organisations which offer consumers bank branches or online banks that provide consumers with a variety of tools and means to manage their money through the use of a mobile app.

The South African banking industry is continuously evolving (McInnes, 2024). The current financial channels and banking networks within South Africa provide the country with the opportunity to offer global banking services, which has led to the increased availability of national and worldwide banks in South Africa. Currently, South Africa has a total of 30 registered banks, comprising

18 domestic banks and 12 foreign banks with local branches within the country (Cowling, 2024). Consequently, South African consumers have access to many alternatives when choosing their preferred banking services (De Visser, 2019).

The rapid digital transformation that has transcended organisations in recent years has also impacted the retail banking services industry, where customers are expecting more and more from their banks (Humphreys, 2017). Lake (2022) suggests that banks provide consumers with numerous services, ranging from business banking to personal banking, such as deposit, savings, and cheque accounts, to money market accounts, credit cards, personal loans, mortgage loans, automotive loans, wealth management services and insurance. Jackson (2023) highlights that as competition increases between banks, it is becoming more and more prevalent for banks to differentiate themselves from other banks if they wish to remain competitive and to ensure future success.

Sang (2023) suggests that brand-loyal consumers are less likely to switch to alternative service providers, such as competing banks. McInnes (2024) theorises that when banks provide a seamless customer experience, they are not only able to build trust, but they are also able to encourage brand loyalty. Du Toit *et al.* (2023) suggest that brand-loyal consumers spend more with their banks, cost less to serve and are more inclined to recommend their preferred bank to family and friends. As such, brand loyalty is important for the survival, growth, and future success of organisations such as banks.

Although brand loyalty is recognised as critical for the success and sustainability of banks and remains one of the biggest challenges facing banks today (Sharma, 2024), research has not sufficiently explored the specific factors that influence consumers' intentions to remain loyal to their retail banks, particularly in the context of South Africa. The increasing competition and the need for differentiation between banks underscore the necessity for more research into how elements like ethical and social responsibility, trust, and customer attitudes foster brand loyalty.

While corporate social responsibility (CSR) is a well-established concept in general business research, its specific impact on customer loyalty in the retail banking sector is under-researched. This study aims to address this gap in a banking context. By addressing this gap, this study will contribute to a deeper understanding of the factors influencing brand loyalty in South Africa's retail banking sector and provide valuable insights into the evolving consumer expectations in a highly competitive banking environment.

The article is structured to systematically explore and validate a model predicting South African consumers' intention to continue using retail banking services. The introduction sets the study's context, highlighting gaps in the literature. A detailed literature review follows and develops hypotheses around the six factors, namely ethical responsibility, social responsibility, bank trust, attitude, brand loyalty, and behavioural intention. The research methodology outlines the quantitative approach, including data collection and analysis techniques like confirmatory factor analysis (CFA). Results and discussion present statistical findings, assess model validity, and explore theoretical and practical implications. The conclusion summarises contributions, discusses limitations, and suggests avenues for future research. The literature review and development of hypotheses follows next.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Ethical Responsibility

Khour (2017) theorises that banking ethics encompasses the degree to which banks not only value principles but are honest, faithful, impartial, trustworthy, and transparent. Mehta (2024) suggests that ethical banking involves the integration of moral and ethical principles into banking practices, where the focus is on prioritising people, the planet, and ethical values, as opposed to making a profit. Hurd (2022) adds that ethical banking is the practice of selecting financial institutions, such as retail banks, that are known to engage in socially responsible business practices and implement socially responsible investment policies.

Consumers are increasingly in search of financial institutions, namely banks, which have strong ethical reputations, giving consumers the foundation to make informed decisions based on a bank's values and commitment to ethical conduct (Rasheed, 2024). Moreover, the ethical standards and conduct displayed by banks play a major role in creating mutual trust and confidence among consumers (Khour, 2017).

Safdie (2023) postulates that banks that are ethically responsible are more inclined to be as transparent as possible to develop trust and commitment among their stakeholders, particularly consumers. Khour (2017) suggests that by engaging in ethical banking practices, banks can ensure that they protect consumers' interests, keep the banking system stable and preserve or even enhance the reputation of the bank.

As consumers are becoming increasingly adept with regard to digital technologies, they are becoming less trusting. Consequently, organisations such as retail banks, need to ensure that their marketing content is a true reflection of their business practices and values (McInnes, 2024). Moreover, banks must ensure that all their dealings and transactions are fair and done in a transparent manner, providing clear and easily comprehensible information regarding not only the services they offer but also any associated benefits and risks for consumers (Khour, 2017).

Social Responsibility

The idea of CSR has been a fundamental aspect of business operations from the start of modern business practices. While it was initially viewed as a way for organisations to meet their social obligations, organisations are now increasingly seeing CSR as a pathway to maximise profits (Vo *et al.*, 2020). Man *et al.* (2021) add that CSR is vital for economic organisations, such as banks, wishing to develop and establish their bank image and reputation. Abou-El-Fotouh (2016) defines CSR as the degree to which retail banks take cognisance of the impact that their daily operational activities have on society. Hurd (2022) suggests that banks deemed as socially responsible illustrate their commitment to social responsibility in several ways. These include the daily organisational operations of banks, the public endorsements they make to important causes, the community engagement the bank participates in, and the investment policies the bank possesses.

Caporal (2024) indicates that for many consumers, social responsibility is something to consider when choosing their banking services. Consumers want a bank engaged in environmentally friendly practices, diverse in their leadership, and involved in community engagement. Consequently, social responsibility for banks is more than mere charity. It should focus on improving the future of individuals in all communities within which banks operate through social responsibility programs, which will, in turn, sustain these banks and their businesses in the future (Abou-El-Fotouh, 2016). Hurd (2022) suggests that socially responsible banks are banks that are transparent with regard to where they invest customers' money.

In relation to being socially responsible, banks can take advantage of some benefits. These include the development of a strong and positive profile within the communities they serve, enhancing both their local and international economic performance and enabling community development while simultaneously strengthening their profitability (Abou-El-Fotouh, 2016). As such, by engaging in social responsibility, banks can foster an identity and engage with stakeholders, such as their customers, which will go a long way in differentiating them from competitors (Ivascu *et al*., 2023).

Paluri and Mehra (2018) found that although consumers express the need for their banks to engage in social responsibility, this need does not influence their attitude towards their preferred banks. Furthermore, consumer perceptions regarding a bank's involvement in social responsibility were found to be moderate, indicating that banks need to increase their communication about the social responsibility initiatives that they are engaged in. Ha *et al.* (2024) conclude that the extent to which banks engage in social responsibility positively influences consumers' bank selection. By increasing CSR activities, organisations, such as banks, are expected to positively impact customer loyalty (Vo *et al*., 2023).

Bank Trust

According to Kour (2017), banking is based on trust. Consumers entrust their funds to their preferred bank of choice for safety and investment. One of the biggest challenges facing retail banks is building trust (McInnes, 2024).

To build trust and awareness, banks must use their marketing and advertising platforms to engage customers in a way that clearly communicates to customers the bank's ability to provide them with the banking services they need and want (De Visser, 2019). Banks that wish to remain com-

petitive need to ensure that their marketing strategies incorporate tailored content that speaks directly to the needs, wants, and situations relevant to consumers, which is an effective tool for building trust through transparency (McInnes, 2024).

Banks are expected to operate professionally, ethically, and transparently to build confidence among consumers with regard to the banking system (Kour, 2017). Consequently, if banks want to build trust and customer appreciation that goes beyond their product and service offerings, they must develop an emotional connection with customers (McInnes, 2024). Jones (2024) suggests that if banks want to earn consumers' trust, it is imperative for them to understand the anxieties consumers face, particularly with regard to persistently high levels of inflation and ever-increasing interest rates and take proactive measures to reduce these anxieties. Furthermore, banks need to ensure they act in a responsive manner to their customers and their subsequent needs, conducting continuous research to determine if customers are happy with their products and services on offer, if customers are proud and willing to repurchase the products and services already purchased and if the products and services meet or exceed the expectations of their customers (Khowjoy *et al*., 2023).

Crossett (2024) adds that developing consumers' trust assists in building loyalty among consumers towards their preferred bank of choice. Consequently, when consumers have a high degree of trust in a bank, banks can reap the rewards of reputational, financial and competitive benefits, which can be used to expand and extend their customer relationships (Clarke, 2022).

Crossett (2024) theorises that the trust consumers have with regard to their preferred banks drives their behaviour. Clarke (2022) adds that when consumers trust their banks, it influences their behaviour in terms of their willingness to open additional accounts with their preferred bank of choice and recommend the bank to family and friends.

Attitude

Given the ever-increasing use of Internet technology within our everyday lives, consumers have witnessed significant changes within the banking industry, with the introduction of numerous technology-orientated services, including Internet banking, EFT, branchless banking, mobile banking and the like (Shrestha *et al.*, 2020). As such, Safari *et al.* (2022) propose that, given a particular technology, attitudes encompass consumers' assessments regarding the benefit of using such a technology.

Given that attitudes are not permanent and change as services change, it has become increasingly important for organisations within the service industry, such as retail banks, to measure consumer attitudes (Sarker *et al*., 2012). According to Ajzen (2011), consumer attitudes may be used to predict the behavioural intentions of consumers. The same can be said regarding products and services. As such, based on the theory of planned behaviour (Ajzen, 1991), consumers' attitudes towards banking services from their preferred retail banks may serve to predict their behavioural intentions towards the continued use of their preferred retail bank's services.

According to Mansour *et al*. (2016), attitudes towards Internet banking influence the behavioural intentions of consumers to use Internet banking. Consequently, banks need to strive towards delivering quality services to ensure that consumers are satisfied with the services they receive, which will lead to consumers developing positive attitudes towards the services provided by their preferred retail banks (Sarker *et al*., 2012). A consumer's satisfaction with a service alters their subsequent attitudes towards the service, which aids in developing customer brand loyalty. Positive attitudes lead to customer brand loyalty. Therefore, banks must deliver service quality, providing customer satisfaction, which will then develop positive attitudes towards the bank, and ultimately lead to customers becoming brand loyal (Zia, 2020).

Brand Loyalty

Dubina *et al.* (2020) highlight the importance of the concept of brand loyalty within the banking industry. Sang (2023) indicates that to create brand loyalty among digital banking consumers, banks must both increase customer retention and motivate them to spend more with their preferred bank. Similarly, the degree to which consumers are loyal to their preferred bank significantly influences a bank's ability to

retain their customers (Zungu & Mason, 2017). Crossett (2024) suggests that the more purpose-orientated, pre-emptive, and transparent banks become, the more likely they are to build brand loyalty.

Zungu and Mason (2017) highlight the necessity for retail banks to ensure that their employees are adequately equipped with the necessary social skills to serve young customers, as young customers are still in the process of developing loyalty to their chosen banks. As such, it becomes quite easy for them to switch banks if dissatisfied. Sang (2023) suggests that the more brand-loyal consumers become, the less likely consumers will be to switch to alternative service providers, such as competing banks. McInnes (2024) adds that when banks provide a seamless customer experience, they are not only able to build trust, but they are also able to encourage brand loyalty.

According to Sang (2023), banks can increase brand loyalty among consumers by creating content that is engaging and personalised. Du Toit *et al.* (2023) add that banks can enhance their customer engagement through personalised product and service offerings, as well as marketing efforts. The degree to which consumers feel that their preferred bank personalises the services they offer, the more inclined consumers will be to remain brand loyal and advocate for the bank. Waqar and Nabeel (2021) found that social networking significantly influences customer loyalty.

Moreover, Sang (2023) found that for banks to develop consumer brand loyalty within the digital banking space, it is imperative that banks develop social media content for their social media marketing strategies that is interactive, valuable, and pertinent to the needs and desires of their target audiences. Not only will improving a bank's social media marketing activities increase consumers' intentions to use digital banking services, but it will also create favourable impressions and increase customer brand loyalty, which, as Kita *et al.* (2022) rightly note, is important for business continuity.

Behavioural Intention

Safdie (2023) suggests that banks that engage in ethical, responsible behaviours can encourage consumers to open an account and ultimately take better control of their finances. Rasheed (2024) adds that financial institutions, such as banks, that are built on a foundation of ethically responsible behaviour are able to earn the trust and loyalty of consumers. Moreover, consumers who trust their banks are more likely to maintain long-term relationships with their preferred banks, engage in repeat business and recommend their preferred bank to family and friends. Banks can create stable and predictable revenue streams when engaging in ethically responsible behaviour.

Hinson *et al.* (2016) found that bank's CSR activities significantly influence both consumers' attitudes towards their preferred retail banks, as well as consumers' behavioural intentions towards their preferred retail banks. Furthermore, Shah and Khan (2019) suggest that when consumers have positive perceptions towards the social responsibility activities of service providers, such as banks, they are encouraged to remain with the service provider, such as their chosen bank.

De Leon (2019) suggests that trust has a significantly positive influence on consumers' behavioural intention to use mobile banking among retail banking clients. Furthermore, Ngan and Khoi (2020) found trust to be the strongest contributing factor regarding the intention of consumers in Vietnam to accept and use mobile banking services.

Nkoyi *et al.* (2019) highlight that attitudes strongly influence the behavioural intentions of individuals to use a particular technology. If customers have a positive attitude towards e-banking or their preferred banks in general, they will want to continue to use it. Safari *et al.* (2022) found that in the Democratic Republic of Congo the more positive consumers' attitudes are towards the services offered by their preferred retail banks, the higher their intentions are to continue using the services of their preferred retail banks.

Brand loyal consumers spend more with their banks, cost less to serve, and are more inclined to recommend their preferred bank to family and friends (du Toit *et al.,* 2023). Furthermore, Sang (2023) found that brand loyalty directly impacts the likelihood of consumers using digital banking in the future. Jackson (2023) suggests that through the implementation of a robust customer engagement program, banks can demonstrate to their customers how well they understand their needs and how willing they are to assist their customers. This has a significant impact on a bank's ability to cultivate stronger brand loyalty and repeat business.

By including these six factors, we offer a comprehensive, multi-dimensional framework for understanding consumer behaviour in the retail banking sector. Each factor contributes a unique element to the consumer-bank relationship, where ethical and social responsibility address corporate conduct, trust bridges these factors to emotional connection, attitude shapes cognitive evaluations, brand loyalty reflects long-term engagement, and behavioural intention captures future actions. This integrative approach advances both theoretical understanding and practical insights, offering a robust framework for predicting consumer behaviour in modern banking environments. Based on the literature review, this article aims to address the following research question: Is the behavioural intention to continue using banking services a six-factor model that comprises the factors of ethical responsibility, social responsibility, bank trust, attitude, brand loyalty and behavioural intention? Thus, the first hypothesis was as follows:

H1: Behavioural intention to continue using banking services is a six-factor model that comprises the factors of ethical responsibility, social responsibility, bank trust, attitude, brand loyalty, and behavioural intention.

Figure 1 illustrates the specified measurement model.

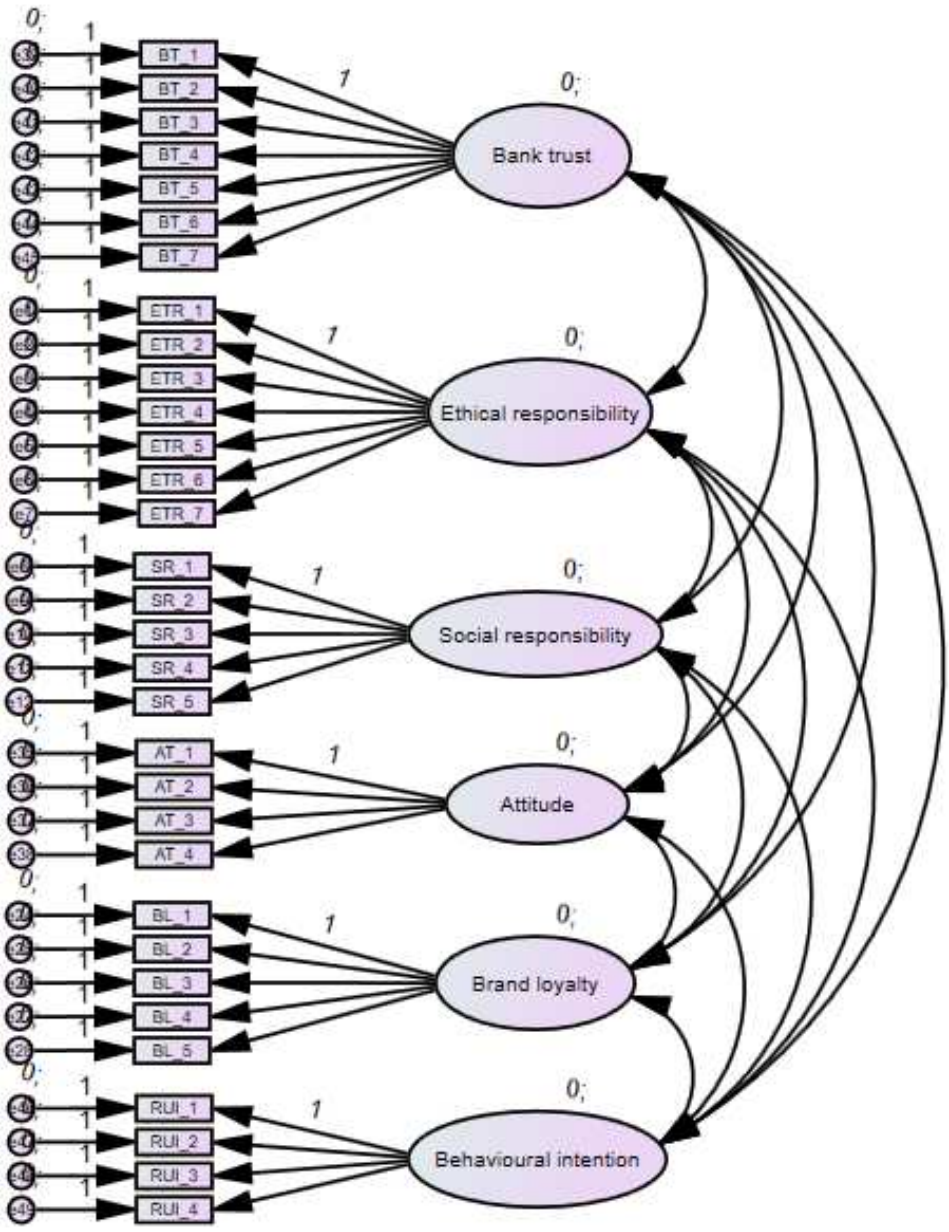

Figure 1. Specified measurement model

Source: own elaboration.

This model integrates Ajzen's (1991) theory of planned behaviour to explain how consumer attitudes toward banking services predict their behavioural intentions to continue using retail banking services. By aligning attitudes with variables such as bank trust, ethical and social responsibility, and brand loyalty, the model links the cognitive and emotional processes that underly consumer decision-making with loyalty behaviours. This contributes to the literature by expanding the Theory of Planned Behaviour's application within the banking industry, particularly in the banking services context, where attitudes toward services play an important role in determining continued usage.

RESEARCH METHODOLOGY

The primary method used to analyse the captured data was quantitative in nature. The study focused on a sample size of 500 banking participants aged 18 years and older, which was drawn from reputable global market research and public opinion data supplier's database, who adhere to ethical standards and POPI Act regulations during their data-gathering process. The focus on a sample size of 500 enhanced both the reliability and generalisability of the study's findings while supporting rigorous statistical analysis. While a non-probability convenience sample may limit generalisability, its use in this study is justified by practical constraints, the exploratory nature of the research, and the focus on model validation. The relatively large sample size of 500 helps offset some limitations by providing a more robust dataset for analysis. Furthermore, while participants were not randomly selected from the entire population but rather chosen based on accessibility and availability from the existing database, the risk of selection bias increases where segments of the population may be overrepresented while others are underrepresented. Although this bias cannot be fully eliminated in convenience sampling, the sample size is adequate to help increase the diversity within the sample. Moreover, participants drawn from a market research panel may be prone to response bias, particularly social desirability bias, where respondents may answer questions in a way that they think is socially acceptable or favourable. In an effort to mitigate response bias, the survey instrument was carefully designed, ensuring that questions were neutrally phrased and designed to elicit honest responses.

All information captured in the study remained confidential and was only reported in aggregate statistical form. Moreover, SPSS and AMOS served to conduct the statistical procedures, namely CFA, reliability and validity analysis, correlation analysis and collinearity diagnostics.

The research instrument for this study was a self-administered electronic questionnaire. The questionnaire included a cover letter explaining the study's intention, a request for participants' informed consent, a section dedicated to gathering participants' demographic information for sample description purposes, and questions about the participants' bank background information. Finally, we also included a section of scaled questions measuring participants' intention to continue using their preferred retail bank's services, which constituted the remainder of the questionnaire. We adapted these scaled-response items from published studies and included ethical responsibility (seven items, Shah & Khan, 2019), social responsibility (five items, Shah & Khan, 2019), bank trust (seven items, Aren *et al*., 2013), attitude (four items, Hsu *et al*., 2006), brand loyalty (five items, Yoo *et al*., 2000; Cheung *et al*., 2020), and behavioural intention (four items, Aren *et al*., 2013; Hsu *et al*., 2006; Khalifa & Liu, 2007). Participants' responses to these scaled questions were measured on a six-point Likert-type scale. We decided to use a 6-point Likert-type to offer more granularity, allowing respondents to express nuanced opinions more precisely than they could with a 5-point scale. This enhanced sensitivity is valuable for capturing subtleties in their responses. Furthermore, a 6-point scale helps mitigate the issue of participants defaulting to the neutral midpoint when unsure or indifferent, as it encourages more thoughtful consideration in their selections.

RESULTS AND DISCUSSION

The sample consisted of 500 participants, with 47.8% males and 52.2% females. The age range was quite broad, ranging from 18 to 55 years. The largest age groups were around the mid-20s to early 30s. Of the nine provinces in South Africa, Gauteng (53.4%) was represented the most, followed by Kwa-

Zulu-Natal (13.8%) and the Western Cape (14.6%). The Northern Cape was the least represented province in the sample (0.8%). Although English was the most spoken language (39.6%), followed by IsiZulu (16.4%), all 11 official South African languages were represented in the sample.

In terms of banking information, Capitec Bank was the most preferred (33.2%) bank, followed by First National Bank (26.4%). Other banks like ABSA (11.2%), Standard Bank (10.6%) and Nedbank (10.6%) were also represented, but to a lesser extent. Most participants have been with their bank for 3 to 6 years (27.8%), followed by those banking for more than 10 years (20.6%) and 1 to 3 years (25.4%).

The measurement model specified for CFA tests the intention of South African consumers to continue using their preferred retail bank's services. The model was a six-factor structure encompassing the following latent factors, namely ethical responsibility, social responsibility, bank trust, attitude, brand loyalty and behavioural intention to continue using banking services. Before conducting the CFA, it is important to establish nomological validity and check for multicollinearity issues. Nomological validity ensures that the constructs within the model are related in a theoretically predictable manner. We used Spearman's Rho correlation coefficients to test this. Furthermore, we performed collinearity diagnostics using tolerance and variance inflation factor (VIF) values to identify potential multicollinearity problems, which could compromise the validity of the regression results.

Table 1. Correlation coefficients, tolerance, and VIF values

Factor	1	2	3	4	5	6	Collinearity diagnostics	
							Tolerance	VIF
Eth_Resp (1)	1.00	–	–	–	–	–	0.32	3.09
Soc_Resp (2)	0.70*	1.00	–	–	–	–	0.44	2.26
Bank trust (3)	0.68*	0.54*	1.00	–	–	–	0.26	3.86
Attitude (4)	0.58*	0.48*	0.67*	1.00	–	–	0.34	2.93
Brand_Loy (5)	0.60*	0.52*	0.69*	0.71*	1.00	–	0.35	2.89
Behave_Int (6)	0.59*	0.53*	0.76*	0.69*	0.70*	1.00	0.30	3.36

Note: Significant codes: $p < 0.001$; Eth_Resp = ethical responsibility; Soc_Resp = social responsibility; Brand_Loy = brand loyalty; Behave_Int = behavioural intention.
Source: own study.

As Table 1 reports, the correlation coefficients between the factors ranged from 0.52 to 0.76. These values indicate moderate to strong relationships between the factors, supporting the theoretical linkages among them. Moreover, the behavioural intention to continue using the retail banking services model's nomological validity was inferred, given the statistically significant positive relationships between each pair of factors included in the model (Hair *et al.*, 2018). Tolerance values ranged from 0.26 to 0.44, all of which were above the commonly accepted threshold of 0.10. This suggests that there was no severe multicollinearity in the model. Moreover, with an average VIF of 3.07, multicollinearity in the dataset was not a concern (Pallant, 2020).

The results from the correlation matrix and collinearity diagnostics suggest that the model was appropriate for CFA. The moderate to strong correlations between latent factors confirm their theoretical relationships and the absence of multicollinearity issues ensures the reliability of the regression estimates. Consequently, the six-factor model can be confidently tested using CFA to validate the measurement model of South African consumers' intention to continue using their preferred retail bank's services. We did this using AMOS.

The first loading on each of the six latent factors was fixed at 1.0, resulting in an over-identified model with 560 distinct sample moments and 111 distinct parameters to be estimated. This equated to 449 degrees of freedom (df), based on a chi-square value of 1171.890 and a probability level equal to 0.001. Given the chi-square value's known sensitivity to large sample sizes (Byrne, 2010), we utilised additional model fit indices to assess fit, including the incremental-fit index (IFI), the Tucker-Lewis index (TLI), the comparative-fit index (CFI), the standardised root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). We also used the PCMIN/DF to assess model fit. For the fit indices, IFI, TLI, and CFI values above 0.90, SRMR and RMSEA values below 0.08 (Malhotra,

2020), and a PCMIN/DF between one and five (StatWiki, 2022) indicated acceptable model fit. Internal-consistency reliability and composite reliability (CR) require a Cronbach's alpha (α) and a CR value of 0.70 or above (Malhotra, 2020), while convergent validity requires latent factor loading estimates and average variance extracted (AVE) values of 0.50 or above.

Table 2 presents the computed estimates for the measurement model, showcasing standardised loading estimates, squared multiple correlation values (R^2), Cronbach's alphas, composite reliability (CR), and average variance extracted (AVE) values.

Table 2. Measurement model estimates

Factor	Standardised loading	R^2	Cronbach's Alpha	CR	AVE
Eth_Resp	0.69	0.48	0.85	0.89	0.54
	0.77	0.59			
	0.79	0.63			
	0.74	0.54			
	0.79	0.63			
	0.70	0.45			
	0.71	0.51			
Soc_Resp	0.77	0.59	0.88	0.90	0.63
	0.81	0.65			
	0.80	0.64			
	0.79	0.63			
	0.80	0.64			
Bank trust	0.83	0.69	0.90	0.93	0.67
	0.83	0.70			
	0.84	0.71			
	0.86	0.74			
	0.76	0.57			
	0.78	0.61			
	0.83	0.69			
Attitude	0.86	0.74	0.89	0.93	0.77
	0.89	0.80			
	0.88	0.78			
	0.88	0.80			
Brand_Loy	0.74	0.55	0.92	0.88	0.56
	0.63	0.39			
	0.81	0.65			
	0.80	0.63			
	0.79	0.62			
Behave_Int	0.88	0.78	0.91	0.89	0.67
	0.87	0.75			
	0.76	0.58			
	0.76	0.58			

Note: Eth_Resp = ethical responsibility; Soc_Resp = social responsibility; Brand_Loy = brand loyalty; Behave_Int = behavioural intention.
Source: own study.

The standardised loadings set out in Table 2 range from 0.63 to 0.89, exceeding the threshold of 0.50. Moreover, the AVE values were all above 0.50, with the lowest being 0.54 for ethical responsibility and the highest being 0.77 for attitude. This indicates that more than half of the variance in the observed variables was captured by the latent factors, which is a good indicator of convergent validity (Fornell & Larcker, 1981). The Cronbach's alpha and CR values for all factors were above 0.85, indicating high internal consistency and reliability of the scales used to measure the factors and confirming that the factors are reliable (Malhotra, 2020). The R^2 values indicate the proportion of variance in each

observed variable explained by the latent factor. Values ranged from 0.39 to 0.80, suggesting a moderate to high explanatory power of the latent factors over their indicators.

The Heterotrait-Monotrait (HTMT) ratio of correlations serves to assess discriminant validity in structural equation modelling. It compares the heterotrait-heteromethod correlations (correlations between different constructs) to the monotrait-heteromethod correlations (correlations within the same construct). For good discriminant validity, the HTMT values should be below 0.90 (Hensler *et al.*, 2015). Table 3 reports the results.

Table 3. HTMT ratio of correlations

Factor	1	2	3	4	5	6
Eth_Resp (1)	1.00	–	–	–	–	–
Soc_Resp (2)	0.72	1.00	–	–	–	–
Bank trust (3)	0.73	0.59	1.00	–	–	–
Attitude (4)	0.66	0.55	0.74	1.00	–	–
Brand_Loy (5)	0.67	0.59	0.74	0.73	1.00	–
Behave_Int (6)	0.62	0.59	0.79	0.73	0.72	1.00

Note: Eth_Resp = ethical responsibility; Soc_Resp = social responsibility; Brand_Loy = brand loyalty; Behave_Int = behavioural intention
Source: own study.

All HTMT values outlined in Table 3 are below 0.90, indicating good discriminant validity among the factors. The relationships between different constructs were strong but not excessively high, suggesting that each factor measured a distinct aspect of consumer behaviour related to their intention to continue using their preferred retail bank's services.

After we confirmed the model's reliability and construct validity, we evaluated the model fit indices using AMOS. The results indicated a good model fit, with a PCMIN/DF of 2.610, an IFI of 0.943, a TLI of 0.937, a CFI of 0.943, a SRMR of 0.042, and a RMSEA of 0.057. Based on these findings, we confirmed that the six-factor measurement model demonstrates the psychometric properties of construct validity, reliability, and appropriate model fit.

Ethical responsibility had a significant positive relationship with consumers' behavioural intention to continue using their retail banks. This suggests that when banks prioritise ethical practices, they are more likely to retain customers. For bank managers, this highlights the importance of promoting transparent and fair practices. From a policy perspective, regulators can emphasise ethical banking as a pathway to consumer protection, fostering trust and long-term financial stability. Similarly, social responsibility and behavioural intention were significantly related but to a lesser extent. This implies that while consumers appreciate banks' social responsibility efforts, such initiatives alone may not be enough to ensure loyalty. Bank managers could integrate social responsibility into their overall business strategy but should not rely solely on it for customer retention. Policymakers may encourage the incorporation of social initiatives, such as community outreach, but these should complement a bank's ethical and customer-centric practices. Moreover, trust in the bank emerged as a key predictor of behavioural intention, underlining that trust is central to maintaining long-term relationships between consumers and banks. Practically, bank managers should continue to build trust through reliable service, transparent communication and safeguarding customer data. For policymakers, promoting strong consumer protection laws, such as the POPI Act in South Africa, can further strengthen trust in the banking sector.

We found attitude towards the bank's services to have a significant relationship with customers' behavioural intentions. Positive consumer perceptions of banking services foster loyalty. This suggests that banks should continuously improve the quality of their services, ensuring that they meet and exceed customer expectations. Training staff to provide excellent customer service and enhancing user experience on digital platforms can strengthen customer attitudes.

Brand loyalty had a strong relationship with the intention to continue using the bank's services. This underscores the importance of cultivating brand loyalty through consistent brand messaging, personalised services and rewards programs. Banks that invest in brand loyalty programs are likely to see higher retention rates.

An unexpected finding was the somewhat weaker relationship between social responsibility and behavioural intention compared to other factors like trust and attitude. This could be due to consumers perceiving social responsibility as a secondary factor, prioritising direct experiences with the bank over broader social initiatives. Furthermore, while social responsibility campaigns are important, their impact may be less immediate or tangible in influencing consumer decisions compared to how well a bank fulfils its direct service promises or builds trust.

The findings of this study also align with previous research findings. For example, Safdie (2023) found that banks that engage in ethically responsible behaviours are more likely to encourage consumers to open an account and ultimately take better control of their finances. Moreover, Rasheed (2024) proposes that financial institutions, such as banks, that are built on a foundation of ethically responsible behaviour can earn the trust and loyalty of consumers. Moreover, consumers who trust their banks are more likely to maintain long-term relationships with their preferred banks, engage in repeat business and recommend their preferred bank to family and friends. Banks can create stable and predictable revenue streams when engaging in ethically responsible behaviour. Similarly, the findings of this study indicate a strong relationship between ethical responsibility and consumers' intention to continue using their preferred retail bank's services.

Hinson *et al.* (2016) found that CSR activities undertaken by banks have a significant effect on both consumers' attitudes towards their preferred retail banks as well as consumers' behavioural intentions towards their preferred retail banks. Furthermore, Shah and Khan (2019) suggest that when consumers have positive perceptions towards the social responsibility activities of service providers, such as banks, they are encouraged to remain with the service provider, such as their chosen bank. As such, the findings of this study are in line with these findings, given that the relationship between social responsibility and consumers' intention to continue using their preferred retail bank's services is strong, albeit not very high.

De Leon (2019) found that trust has a significantly positive influence on consumers' behavioural intentions to use mobile banking among retail banking clients. Furthermore, Ngan and Khoi (2020, pp. 398) found trust to be the strongest contributing factor regarding the intention of consumers in Vietnam to accept and use mobile banking services. As such, the findings of this study indicate that trust does indeed have a strong, although not very high, relationship with consumers' intention to continue using their preferred retail bank's services.

Nkoyi *et al*. (2019) highlight that attitudes strongly influence the behavioural intentions of individuals to use a particular technology. Consequently, this study's findings indicate that there is a strong, although not very high, relationship between consumers' attitudes towards their banks' services and their intentions to continue using their preferred retail bank's services.

Sang (2023) found that brand loyalty directly impacts the likelihood of consumers using digital banking in the future. Based on the findings of this study, it is evident that a strong relationship does exist between brand loyalty and consumers' intention to continue using their preferred retail bank's services.

CONCLUSIONS

The study aimed to explore and validate a measurement model assessing the intention of South African consumers to continue using their preferred retail bank's services. The six-factor model included the latent factors of ethical responsibility, social responsibility, bank trust, attitude, brand loyalty, and behavioural intention. This model demonstrated high reliability and construct validity, with Cronbach's alpha, CR, and AVE values for all factors exceeding the recommended thresholds, thereby confirming the robustness of the measurement scales. Moreover, the model fit indices computed using AMOS indicated a good fit. Therefore, the study concludes and provides strong evidence that the six-factor measurement model is a valid and reliable tool for understanding and assessing the factors influencing South African consumers' intentions to continue using their preferred retail banks.

The study has several limitations. Firstly, it focused solely on South African retail banking consumers, limiting the generalisability of the findings to other contexts or countries. Secondly, the data was collected at a single point in time, preventing analysis of changes in consumer behaviour

over time. Thirdly, the reliance on self-reported data may have introduced bias, as participants' responses might not have fully reflected their actual behaviour. Finally, while the study identified relationships between factors, it did not establish causality.

Future research is necessary to clarify the relationships between these six factors. Specifically, it is important to investigate whether ethical and social responsibility enhances bank trust and whether bank trust influences consumer attitudes. Further examination is needed to determine if these attitudes contribute to brand loyalty and if brand loyalty ultimately drives the intention to continue using the bank's services. Understanding these dynamics will reveal how a bank's ethical and social practices impact consumer trust, the role of trust in shaping positive attitudes, the significance of these attitudes in fostering loyalty, and how loyalty affects customer retention. By exploring these relationships, future studies can provide a detailed understanding of the interactions between these factors, leading to more effective strategies for improving customer retention and satisfaction in the banking industry.

Concluding, the study confirms that ethical responsibility, social responsibility, bank trust, attitude and brand loyalty are correlated with consumers' behavioural intentions to continue using their preferred retail bank's services in South Africa. Among these, ethical responsibility, trust, and brand loyalty stand out as the most critical factors for customer retention. The findings emphasise the need for banks to prioritise ethical practices and build trust to foster long-term relationships. This research makes a valuable contribution to the literature by addressing a gap in the existing banking studies, particularly within the unique socio-economic context of South Africa.

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