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Barriers to transitioning to circular economy within firms in Western Balkans countries

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Introduction: The circular economy has gained considerable attention within academia and industry as a sustainable alternative to linear economic models that minimize waste and maximize resource value in the production cycle. Despite growing interest in adopting circular economy practices within firms, numerous challenges remain. We address this gap by investigating the barriers to transitioning to a circular economy, as the current implementation in practice often needs to be more complete.

Methods: Using a quantitative approach, this research examines the CE barriers influencing Western Balkans firms to become more environmentally responsible business. The analysis is based on data from the Regional Cooperation Council's Business Balkan Barometer 2024 database, compiled through the Business Opinion Survey, for which logistic regression analysis was employed.

Results: The findings reveal that firms reporting barriers, such as added costs, lack of skills and experience, lack of consumer demand, and lack of government subsidies, are statistically significant in the probability of becoming more environmentally responsible business. By contrast, the lack of legal and regulatory framework was not found to be significant.

Discussion: The study contributes a comprehensive analysis of these barriers that validate and complement previous research, offering stakeholders within Western Balkan countries an additional perspective to overcome the current challenges, thereby fostering the transition to becoming a more environmentally responsible business.

Introduction

Globalization has expanded markets and intensified competition but has also influenced the increased complexity of firms' supply chains (Sheffi, 2018). Lucas et al. (2014) highlights that there is a continuous increase in global consumption, which means more pressure on environmental sustainability and social wellbeing, necessitating an immediate response to the current linear economic model. The linear model, characterized by a take-make-dispose approach, depends on the excessive consumption of natural resources; it has been followed by the global economy, placing significant pressure on the planet's ecosystems. This could be a more efficient approach that results in the loss of materials in landfills (Groene, 2020), the loss of valuable resources, and a decline in biodiversity (Otekenari, 2020).

Current estimates by Circle Economy (2020) indicate that the global economy consumes more than 100 billion tons of material annually, which calls for a shift in this trend to address the demand for population growth and resource scarcity. Failure to

transform consumption patterns will pose significant risks for future generations (The Ellen MacArthur Foundation, 2013). The CE concept is increasingly used by academic policymakers and global firms that can contribute to the shift to a more sustainable economic system (Bradford, 2020; Schroeder et al., 2019). Balaj and Mahmutaj (2023) believe that CE strategies can bring environmental, social, and economic benefits, such as reducing the reliance on new resources, minimizing waste, unlocking new market opportunities, enhancing products' value, and improving social welfare.

Firms strive to continuously bring new products and services to maintain a competitive position in the market. Despite challenges like resource scarcity, many companies continue to remanufacture due to the potential for higher profit margins (Lund and Hauser, 2010). To achieve long-term success, firms have to incorporate principles of sustainable development, which means reducing resource consumption during production and generating revenues from their offerings (Beuren et al., 2013). The circular economy concept has gained attention to address the linearity of current product lifecycles, with specific attention to the irrational use of non-renewable resources, leading to serious ecological and social consequences (Amui et al., 2017). Waste is generated at every stage of the product's lifecycle, with the end-of-life phase being particularly the least sustainable due to the significant waste generated during demolition (Charef et al., 2021). CE concept aims to shift the linear economy into a loop or circular system by repurposing waste from one product as a resource for another (Andersen, 2007). This approach emphasizes using fewer resources for production processes and extending product lifespan (Vatansever et al., 2021) through maintenance and repair rather than producing new products to replace old or damaged ones (Amui et al., 2017).

The CE adoption differs among developed and developing countries. It has been adopted first in developed European countries, such as the UK, Germany, France, and Italy, with the highest average of investments between 2006 and 2016 (Marino and Pariso, 2020). In contrast, the CE concept in developing countries has been limited; it remains a relatively new concept, where consumers and producers adhere to the traditional linear consumption model (Abdul Hamid, 2020). Developing countries urgently need to lead the adoption and implementation of the CE, and the public needs to understand that a CE concept goes beyond just waste management and recycling (Ting et al., 2023). Thus, with the literature gap, especially in developing countries, firms must understand the barriers to transitioning from the dominant linear economy to CE in WBC.

Although research on barriers to the transition to CE (Prendeville et al., 2014; Govindan et al., 2014; Ritzen and Sandstrom, 2016; De Jesus and Mendonca, 2018; Galvão et al., 2018; Ormazabal et al., 2018; Bressanelli et al., 2019; Farooque et al., 2019; Mura et al., 2020) has been growing recently, studies on this topic are still lacking in the context of emerging economies, particularly in the Western Balkans. The study seeks to address this research gap by answering the following question: What barriers do firms in the WBC face in transitioning to a CE? The remainder of the study is organized as follows: Section 2 provides a comprehensive literature review, offering an overview of the CE concept and existing barriers

to transitioning to CE within firms. A description of data collection and methodology is followed. The data analysis and a summary provide suggestions on opportunities for further research and policy and practical implications. This study contributes to a deeper understanding of CE barriers, particularly in developing contexts, for policymakers and practitioners to make effective policies and sustainable business models within firms.

Theoretical background

Circular economy

The increasing global population, rising purchasing power, and growing consumption habits lead to higher demand for limited resources (Andrews, 2015). To achieve sustainable development, shifting from linear to circular models within firms is vital, focusing on promoting efficient usage of resources and waste reduction (Blomsma and Tennant, 2020). The origin of CE has its roots in the work of ecological economist Kenneth Boulding from 1966, who discussed the necessity for a closed economic system to ensure alignment with environmental sustainability (Boulding, 1966; Fischer and Achterberg, 2016). Subsequently, Turner and Pearce (1990) further developed the concept, using the term CE to describe the shift from a linear to a circular economy based on the thermodynamics laws (Ghisellini et al., 2016).

Over time, the CE concept has evolved into a comprehensive economic system. One of the most universally accepted definitions for CE is by the Ellen MacArthur Foundation:

"The circular economy refers to an industrial economy that is restorative by intention; aims to rely on renewable energy; minimizes, tracks, and eliminates the use of toxic chemicals; and eradicates waste through careful design" (The Ellen MacArthur Foundation, 2013). CE is also defined as "a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling" (Geissdoerfer et al., 2017, p. 766). According to the Circular Economy action plan, the "value of products, materials, and resources is maintained in the economy for as long as possible, and the generation of waste minimized... to develop a sustainable, low carbon, resource efficient and competitive economy" (European Commission, 2015). This necessitates a fundamental rethinking of ways we produce and consume, as well as transforming waste into value-added products, and it requires a shift of the entire supply chain—from production to consumption. Kirchherr et al. (2017) defined the CE concept as the shift from end-of-life disposal to reducing, reusing, recycling, and recovering products and materials to achieve simultaneously environmental quality, economic prosperity, and social equity. Similarly, Wu et al. (2014) emphasized that CE systems aim to optimize production levels with minimal use of natural resources, focusing on reusing, recycling, and restoring waste. Previous research affirms the connection between CE and sustainable development (Schoggl et al., 2020), even though there is no clear definition of CE and sustainability (Geissdoerfer et al., 2017).

The principles of CE are commonly explained by the 3R framework, such as reduce, reuse, and recycle (Feng and Yan, 2007; Preston, 2017). The reduce principle focuses on creating less waste (Feng and Yan, 2007). The reuse principle highlights the importance of using products or components that are not waste several times, thereby conserving resources (Castellani et al., 2015). Lastly, the recycle principle involves reprocessing materials to create new products, reducing the amount of waste that would otherwise be discarded (The European Parliament and the Council of the European Union, 2008). However, Ranta et al. (2018) argue that a comprehensive approach to the CE is often undermined by excessive focus on recycling, while the reduce and reuse principles still need to be utilized.

D'Amato (2021) highlights that there are 10 R strategies as primary activities of the CE aimed at restructuring the economic system. The strategies "Refuse," "Rethink," and "Reduce" emphasize smarter product use and manufacturing (Malooly and Daphne, 2023). "Reuse," "Repair," "Refurbish," "Remanufacture," and "Repurpose" focus on extending the life of products and their components (Venturini, 2021). Lastly, "Recover" and "Recycle" target the recovery of raw materials or energy from products at the end of their life cycle (Vermeulen et al., 2019).

The linear economic model is characterized by a high consumption of primary raw materials from the environment. Turner et al. (2019) emphasize that the global population currently uses resources equivalent to one and a half planets. Furthermore, inefficiencies occur at every stage of the product lifecycle, with a significant amount of resources being treated as waste from the extraction stage. In extreme cases, waste leakage occurs throughout the production, distribution, and consumption stages, and the products are discarded in landfills at the end of their use. When the product is consumed, outdated, or broken, it becomes waste, leading to a substantial loss of value. This calls for immediate change so that future generations won't suffer.

In contrast, the CE model seeks to minimize using raw materials to produce the same quantity of products by recirculating waste as secondary raw materials and reusing products and/or components. This approach reduces the waste sent for disposal by recovering resources at various stages of the product lifecycle, where legally permitted (Bianchini et al., 2019). Thus, the CE offers a transformative alternative to traditional linear value chains, replacing the take-use-dispose model with circular processes that enable the indefinite use of materials (Stahel, 2016). CE solutions can benefit the environment by lowering material costs and risks, improving product lifecycles, and generating new jobs as the industry shifts to circular practices (The Ellen MacArthur Foundation, 2013).

Existing barriers to transitioning to CE

The focus of this research is on the barriers to adopting CE practices. Scholars have categorized them into different categories. Govindan et al. (2014) identify barriers related to outsourcing, technology, knowledge, and finances, as well as involvement and support barriers. Similarly, Ritzen and Sandstrom (2016) identified five main categories of barriers: financial, structural,

operational, attitudinal, and technological. Moreover, Farooque et al. (2019) highlight barriers such as lack of financial resources, limited expertise, technology, and information, organizational culture and management, benefits uncertainty, lack of economies of scale, weak environmental regulations and enforcement, lack of market preference or pressure, and inadequate collaboration from supply chain actors. De Jesus and Mendonca (2018) distinguish barriers between hard barriers (technical, economic, financial, and market) and soft barriers (institutional, regulatory, social, and cultural). Galvão et al. (2018) explore key challenges to CE, such as technology, policy and regulations, finance and economy, performance indicators, customers, and social factors. Additionally, redesigning the CE supply chain has been seen as a key barrier in literature (Bressanelli et al., 2019). Goyal et al. (2018), in their study on CE implementation in a developing country context such as India, identified four primary categories of obstacles: infrastructure-level barriers and challenges, technology barriers and challenges, ineffective policy and social barriers and challenges, and traditional approaches for processing of e-waste in developing countries. Similarly, Kirchherr et al. (2018), through a comprehensive study involving a survey of 208 participants and interviews with 47 experts, classified 15 barriers into four major categories: cultural, market-related, regulatory, and technological constraints.

Based on the literature review, this study focuses on the main barriers to CE adoption in the WBC. Specifically, the research examines the following barriers: added costs, lack of skills and experience, lack of legal and regulatory framework, lack of government subsidies, and lack of consumer demand.

Added costs

Financial barriers represent a significant barrier to shifting to the CE model. Ritzen and Sandstrom (2016) identify challenges related to the time and investments required to change business models, adapt technical aspects, and manage relationships with customers, distributors, suppliers, and production systems. Additionally, firms face high uncertainty related to revenue outcomes. This aligns with findings from other scholars, who emphasize the high initial investment costs and low returns as the most critical barriers to CE adoption (Geissdoerfer et al., 2023; Vatansever et al., 2021; Hopkinson et al., 2018; Rizos et al., 2016). A key contributor to these challenges is restructuring existing facilities that were not originally designed to accommodate CE practices. Agyemang et al. (2019) illustrate this point by testimony of one interviewee, who noted:

"The initiative involves cost due to restructuring a decade-old plant built a decade ago when there was no knowledge of CE." This highlights the financial and operational challenges of adapting older industrial facilities to meet circular economy standards, which may not have been a priority at the time of construction.

Financial constraints are also associated with environmentally friendly packaging costs, which hinder the adoption of CE (Vatansever et al., 2021). For instance, a study covering 30 countries worldwide highlights a rapid increase in sustainable packaging regulations. These regulations mandate the use of eco-friendly packaging to reduce its negative impact on human health and minimize environmental harm (Cherel-Bonnemaison et al., 2022).

Lack of skills and experience

A significant barrier to adopting CE is the limited knowledge and expertise required to transition from a linear to a circular model. CE is far more than recycling; it necessitates transformative changes in business strategies to integrate it into their operational processes (AlJaber et al., 2023; Melati et al., 2021). There needs to be more familiarity with CE core concepts among individuals working in firms. At the same time, some understand that the overall awareness could be better because of their sustainability-related responsibilities. Holly et al. (2023) highlight the findings in the Austrian survey, where over 60% of respondents from politics, education, and economics reported a need for more information related to the CE concept. Such findings underscore a widespread lack of understanding of this concept, which hinders its adoption and contributes to a slow shift in CE progression (AlJaber et al., 2023; Jaeger and Upadhyay, 2020). To address the challenges to CE transition, skills and capabilities for circularity can be defined as the capacity to reorganize, reroute, transform, shape, and integrate current core competencies with external resources, circular strategies, and complementary assets (Bertassini et al., 2021). However, firms often demonstrate insufficient capacity to drive innovation within the CE framework. To bridge this gap, firms can establish industrial clusters, which would contribute to sharing knowledge and expertise and strengthening strategic standing for CE adoption (Holly et al., 2023).

Ritzen and Sandstrom (2016) highlight resistance to adopting new sustainable business models, which requires a fundamental shift from a traditional product approach to a product-service system orientation. Additionally, there is a need for more skilled employees capable of implementing CE principles (Govindan et al., 2014), and many companies find it costly to hire such professionals to support the CE transition (Agyemang et al., 2019). To address these barriers, firms should develop strategic capabilities to implement CE practices (Sousa-Zomer et al., 2018; Hopkinson et al., 2018). This includes cultivating new organizational competencies, such as team motivation, fostering a supportive organizational culture, and encouraging broad participation in sustainability initiatives (Accenture Strategy, 2014). Also, raising awareness of the economic and environmental benefits of CE among stakeholders is crucial to advancing the production and adoption of circular products (AlJaber et al., 2023).

Lack of legal and regulatory framework

Regulatory barriers encompass the absence of global agreements on material exchange and usage, creating challenges for firms operating within international supply chains (Hartley et al., 2022). For instance, UK policy has "mostly overlooked the upstream impacts of resource extraction… especially when those impacts occur outside UK borders" (Hill, 2015). These barriers extend to regulations that hinder procurement and production processes, further complicating CE implementation (Hartley et al., 2022). Regulatory barriers persist within WB region due to the underdeveloped institutional and regulatory capacities, which hinder effective implementation of CE initiatives. To address these problems, it is necessary to have long-term planning and financial support which would facilitate the integration of CE within firms (Ignjatović et al., 2024).

There is still a lack of adequate policies and regulations specific to circular economy, which results in the absence of standardized processes, unclear information, and insufficient guidance for procurement procedures to follow when reusing components (Häkkinen and Belloni, 2011). Additionally, Roos (2014) emphasizes the complexity of existing regulations, an inadequate legal system, and a weak institutional framework as a significant barrier to CE adoption. The lack of comprehensive regulations hinders achieving a zero-waste society and represents a gap in the CE transition (Mahpour, 2018). The ineffective implementation of environmental legislation and limited government support are barriers to CE implementation (Kayikci et al., 2021). Shams (2020) highlights that policies are crucial in closing resource loops and extending the product lifecycle. However, current regulations primarily focus on recycling, neglecting other essential aspects of CE, such as reuse and remanufacturing, which play an important role in developing sustainable business models.

Lack of government subsidies

A study by Vatansever et al. (2021) identifies the lack of government support as a significant barrier to CE practices. Similarly, other scholars have emphasized the absence of CE incentives as a key impediment (Hart et al., 2019). Government subsidies and unaccounted externalities favoring linear production systems hinder CE implementation (Melati et al., 2021). Rizos et al. (2016) argue that various forms of financial support are crucial for implementing CE principles, for which government support is necessary (Ting et al., 2023). In this context, Shams (2020) suggests that reducing Value Added Tax (VAT) on circular products and decreasing subsidies for products derived from linear economic models is crucial for incentivizing the shift toward CE.

Lack of consumer demand

Consumer demand for sustainable products is a key driver that has influenced firms to shift to CE (Lee, 2016). However, there exists a significant level of risk and uncertainty about the customer demand for sustainable products, as many customers may need to pay more attention to the environmental impact of the goods. While there is extensive literature on consumer awareness of sustainable products, a significant gap often exists between consumers' positive attitudes toward sustainability and their actual purchasing behaviors, which is known as the attitude-behavior gap. It suggests that despite expressing concern for environmental issues, many consumers do not consistently choose sustainable products, due to the higher prices of sustainable goods, limited availability, and purchasing habits. Saha (2021) highlight that the market share of sustainable products remains low despite the fact that a substantial number of consumers' express intentions to buy sustainable products. Similarly, financial constraints can impede the purchasing of sustainable products (Yener et al., 2023). Thus, uncertainty about consistent customer demand for sustainable products persists. Moreover, the cost of environmentally friendly products can be higher due to the upfront investment required for sustainable production practices (Pheifer, 2017). Concerns about product quality, particularly items made from recycled or refurbished materials, further complicate consumer acceptance (Ritzen and Sandstrom, 2016). Vatansever et al. (2021) highlight

a lack of consumer awareness, preference, or pressure as a major barrier to transitioning to CE. The low level of consumer awareness about CE principles hinders the implementation of such practices within firms. Traditional consumer preferences for ownership are often driven by factors, such as status signaling, personal identity, and perceived control over products (Astrom and Martin, 2018). However, the CE model emphasizes access over ownership through business models such as product-as-a-service, leasing, and sharing economy initiatives, which promote resource efficiency and extended product life cycles. Thus, consumers may be reluctant to shift toward service-based or shared consumption models (Tukker, 2015; Bardhi and Eckhardt, 2012).

Based on the theoretical and empirical evidence, the following hypotheses were formulated.

- H1: Firms reporting added costs as a barrier to transitioning to CE have a higher probability of becoming a more environmentally responsible business.
- H2: Firms reporting a lack of skills and experience as a barrier to transitioning to CE have a higher probability of becoming a more environmentally responsible business.
- H3: Firms reporting a lack of legal and regulatory framework as a barrier to transitioning to CE have a higher probability of becoming a more environmentally responsible business.
- H4: Firms reporting a lack of government subsidies as a barrier to transitioning to CE have a higher probability of becoming a more environmentally responsible business.
- H5: Firms reporting a lack of consumer demand as a barrier to transitioning to CE have a higher probability of becoming a more environmentally responsible business.

Research methodology

Research context

The CE transition in WBC is important, particularly as the region deals with significant environmental challenges and seeks sustainable economic development. The WBC, characterized by high levels of pollution and resource depletion, must shift from traditional linear economic models to more sustainable practices that emphasize resource efficiency, waste reduction, and the regeneration of natural systems (OECD, 2022). This transition is crucial for mitigating climate change impacts and aligns with broader European Union goals, such as those outlined in the European Green Deal. The CE framework allows regional businesses to innovate, enhance competitiveness, and create new jobs while addressing pressing environmental issues (Bregu, 2024). More specifically, strategic documents related to resource efficiency and waste management have been adopted in Serbia. North Macedonia has progressed with drafting a National Waste Management Strategy, which comprise of CE principles. CE principles has been also incorporated in the national strategies in case of Montenegro and in broader environmental and waste management strategies in case of Albania. Bosnia and Herzegovina are in initial stages of developing a national circular economy strategy, while Kosovo has made some progress in aligning environmental policies with EU standards. Indeed, the adoption of

CE principles and related strategies varies across WBC, but each of them is demonstrating some progress in advancing with such initiatives (RECONOMY, 2024).

However, several barriers hinder firms in the WBC from fully embracing the principles of CE. Existing research indicates that many firms perceive added costs as a significant obstacle, needing more skills and expertise, insufficient regulatory frameworks, and limited government subsidies (Bregu, 2024). These barriers can prevent companies from investing in sustainable technologies and practices necessary to transition to CE successfully. Understanding these challenges is essential for developing targeted policies that empower firms to adopt circularity. The hypotheses formulated in this study aim to explore these barriers systematically, providing empirical evidence on how they impact firms' environmental responsibility. By investigating these dynamics, this study seeks to offer valuable insights that can inform policy development and enhance the capacity of businesses in the WBC to transition toward more sustainable practices.

Dataset

To evaluate research hypotheses, the study uses a quantitative approach to examine the CE barriers influencing firms in the WBC to become more environmentally responsible businesses. The advantage of the quantitative approach is the ability to include a large sample size to increase the generalizability of the results. In this research study, the sample included 1,200 from within WBC, enhancing generalizability and providing exploratory findings. This research study utilizes data from the Regional Cooperation Council's (RCC) Business Balkan Barometer 2024 database, which was compiled using the Business Opinion Survey and included approximately 200 businesses from each Western Balkan economy. The Balkan Business Opinion Survey 2024 gathered data through interviews with experienced interviewers. CAPI methodology was used in this research, which used translated questionnaires and digital forms for consistent data collection. Furthermore, the entire digital questionnaire was reviewed jointly by project coordinators/economy team leaders and interviewers, emphasizing strict quality control measures and reliable and accurate data. The findings from empirical data were consistent with the literature, which is additional proof of the high validity and reliability of the data for this current research.

Table 1 summarizes the sample distribution by economy and size. The total sample is 1,200 interviewed firms within WBC: Albania ($N = 200$), Bosnia and Herzegovina ($N = 200$), Kosovo ($N = 200$), North Macedonia ($N = 200$), Montenegro ($N = 200$), and Serbia ($N = 200$). In terms of firm size, the distribution is as follows: 59.9% ($N = 719$) micro-enterprises, 25.4% ($N = 305$) small enterprises, 12.1% ($N = 145$) medium enterprises, and 2.6% ($N = 31$) large enterprises.

Dependent and independent variables

In this research study, the binary dependent variable represents the firm's perceived transition to becoming a more environmentally

TABLE 1 Sample distribution by economy and size.

Economy	Interviews	Percentage
Albania	200	16.70%
Bosnia and Herzegovina	200	16.70%
Kosovo	200	16.70%
North Macedonia	202	16.70%
Montenegro	200	16.70%
Serbia	200	16.70%
Total	**1,200**	**100%**
Size	Interviews	Percentage
Micro (0–9 employees)	719	44%
Small (10–49 employees)	305	39%
Medium (50–249 employees)	145	15%
Large (250+ employees)	31	3%
Total	**1,200**	**100%**

responsible business. The dichotomous variable is coded with a value of 1 if the firm perceives becoming a more environmentally responsible business will influence its business decisions in the next 12 months and a value of 0 if it perceives becoming a more environmentally responsible business will not influence its business decisions in the next 12 months.

The independent variables, also binary, are employed to test the influence of barriers to CE transition within firms in becoming a more environmentally responsible business. These variables are defined as follows:

- Added costs—a dichotomous variable with a value of 1 if added costs are one of the main barriers to shifting toward a circular economy in their line of business and a value of 0 if they are not.
- Lack of skills and experience—a dichotomous variable with a value of 1 if lack of skills and experience is one of the main barriers to shifting toward a circular economy in their line of business and a value of 0 if it is not.
- Lack of legal and regulatory framework—a dichotomous variable with a value of 1 if the lack of legal and regulatory framework is one of the main barriers to shifting toward a circular economy in their line of business and a value of 0 if it is not.
- Lack of government subsidies—a dichotomous variable with a value of 1 if lack of government subsidies is one of the main barriers to shifting toward a circular economy in their line of business and a value of 0 if it is not.
- Lack of consumer demand—a dichotomous variable with a value of 1 if lack of consumer demand is one of the main barriers to shifting toward a circular economy in their line of business and a value of 0 if it is not.

Descriptive statistics

An overview of descriptive statistics is presented, followed by the correlation of variables employed in a multivariate analysis. Subsequently, the discussion focuses on the logistic regression

model and the estimated results concerning firms' probability of becoming more environmentally responsible businesses. The descriptive statistics, comprising variables related to CE barriers, are detailed in Table 2.

Multicollinearity is tested using collinearity statistics, where the variance inflation factor (VIF) is a reciprocal of tolerance (Table 3). At the tolerance, the value needs to be >0.1, so anything <0.1 indicates a potential multicollinearity problem, while anything >10 for VIFs indicates a possible multicollinearity problem. Thus, VIFs show that the data does not show any significant multicollinearity because none of the VIFs is close to the cut-off threshold of 10. Because of this, all these variables can be initially included within the model (Kleinbaum et al., 2007).

Logistic model

The study employs a binary logistic regression model to test the proposed theoretical framework, as this approach aligns with the nature of the research question and the dichotomous dependent variable. Logistic regression is well-suited for analyzing categorical or mixed independent variables, providing statistically robust results. By calculating the probability of success vs. failure, the model expresses outcomes as odds ratios, which reveal the likelihood of the predicted event and the strength of association between variables (Ryzhkova, 2015). Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), a widely recommended correlation and logistic regression analysis tool.

A logistic regression model is applied as a widely recognized method for examining the relationship between a binary dependent variable, such as the probability of becoming a more environmentally responsible business, and a set of independent variables representing barriers to CE transitioning, such as added costs, lack of skills and experience, lack of legal and regulatory framework, lack of government subsidies, and lack of consumer demand. The logistic model is appropriate for predicting a dichotomous variable from a set of predicted variables, showing the independent variables' individual impact on the dependent variable. In line with our hypothesis testing, it includes variables related to barriers to transitioning to CE. Therefore, the logistic regression equation is as follows:

$$P(y = \text{environmentally responsible business} \mid x) =$$
$$\beta_0 + \beta_1 \, Added costs + \beta_2 \, Lack \, of \, skills +$$
$$\beta_3 \, Lack \, of \, legal \, framework + \beta_4 \, Lack \, of \, subsidies +$$
$$\beta_5 \, Lack \, of \, consumer \, demand + \beta_6 \, Firm \, size +$$
$$\beta_7 \, CE \, awareness + \beta_8 \, Green \, Transition \, impact +$$
$$\beta_9 \, EU \, membership + \varepsilon_i \dots.$$

Where P is the probability of becoming a more environmentally responsible business. Table 4 presents the results of logit estimates for firms' probability of becoming a more environmentally responsible business.

The first hypothesis examines the firms reporting added costs as barriers to their transition to CE. A positive association exists between added costs as a barrier and the probability of becoming an environmentally sustainable business, with the significance at the 10% level. This suggests weak evidence supporting the hypothesis that firms perceiving added costs as a barrier may be motivated

TABLE 2 Descriptive statistics of dependent and independent variable.

Dependent variable	Description	Frequency		Percentage	
		Yes	No	Yes	No
Environmentally responsible business	1 = company perceives becoming a more environmentally responsible business will influence their business decisions in the next 12 months, 0 = otherwise	745	290	72%	28%
Independent variables	**Description**	**Frequency**		**Percentage**	
		Yes	No	Yes	No
Added costs	1 = Added costs perceived as a barrier to transitioning to circular economy (CE), 0 = otherwise	212	988	17.7%	82.3%
Lack of skills and experience	1 = lack of skills and experience perceived as a barrier to transitioning to CE, 0 = otherwise	145	1,055	12.1%	87.9%
Lack of legal and regulatory framework	1 = lack of legal and regulatory framework perceived as a barrier to transitioning to CE, 0 = otherwise	112	1,088	9.3%	90.7%
Lack of government subsidies	1 = lack of government subsidies perceived as a barrier to transitioning to CE, 0 = otherwise	155	1,045	12.9%	87.1%
Lack of consumer demand	1 = lack of consumer demand perceived as a barrier to transitioning to CE, 0 = otherwise	74	1,126	6.2%	93.8%
Control variables	**Description**	**Frequency**		**Percentage**	
		Yes	No	Yes	No
Size of the firm	1 = Medium and Large enterprises (50+ employees), 0 = Micro and Small enterprises (fewer than 50 employees)	176	1,024	14.7%	85.3%
CE awareness	1 = Firm has CE awareness, 0 = Firm does not have CE awareness	431	687	35.9%	57.3%
EU membership	1 = Firm believes EU membership would benefit their business, 0 = Firm does not believe EU membership would benefit their business	764	382	63.7%	31.8%
Green transition impact on business	1 = firm believes the Green Transition has an impact on their business, 0 = firm does not believe green transition has an impact on their business	546	488	45.5%	40.7%

to overcome these barriers, leading to environmental sustainability efforts. Thus, the first hypothesis is supported.

The second hypothesis addresses the lack of skills and experience within firms as a barrier to transitioning to CE. The logit estimates show that lacking skills and experience significantly increases the odds of a firm becoming an environmentally sustainable business. For every one-unit increase in the lack of skills and experience, there is a likelihood of becoming a more environmentally responsible business by a factor of 0.872. This supports H2, indicating that firms facing this barrier may seek ways or resources to transition sustainably.

The third variable examines the lack of legal and regulatory framework as a barrier for firms transitioning to CE. This variable is not statistically significant, with a value of 0.751, higher than the confidence level. Because of its non-significance value, this evidence does not support the hypothesis.

The fourth hypothesis is that the lack of government subsidies is a barrier to CE adoption. This highly significant factor ($p < 0.01$) strongly supports H4, meaning that firms reporting a lack of government subsidies are more likely to transition. These findings suggest that reducing such barriers increases the chances of becoming an environmentally sustainable business.

The fifth hypothesis explores the lack of consumer demand as a barrier to CE transitioning within firms. This factor is significant at the 5% level; thus, H5 is supported, suggesting firms experiencing this barrier may proactively become environmentally sustainable businesses.

The control variables examined in this study include firm size, CE awareness, the perceived impact of green transition on business, and EU membership. Of these, all, except CE

TABLE 3 Multicollinearity test of independent variables.

Variable	Tolerance	VIF
Added costs	0.403	2.478
Lack of skills and experience	0.541	1.849
Lack of legal and regulatory framework	0.59	1.696
Lack of government subsidies	0.558	1.793
Lack of consumer demand	0.643	1.554
Firm size (full-time employees)	0.969	1.032
CE awareness	0.156	6.416
Impact of green transition on business	0.955	1.047
EU membership	0.956	1.046

awareness, were statistically significant. Firm size demonstrates a significant positive relationship with the probability of becoming an environmentally sustainable business. This suggests that larger firms, possibly due to greater resources or regulatory pressure on larger entities, are better positioned to adopt environmentally sustainable practices. In contrast, CE awareness is not statistically significant, indicating that awareness of CE principles alone does not predict sustainability transitions. The perceived impact of the green transition on business is a highly significant factor, with firms perceiving a stronger impact of green transition on their business and being more likely to become environmentally sustainable businesses, indicating alignment with perceived benefits. Finally, EU membership significantly increases the probability of firms becoming environmentally sustainable businesses, potentially

TABLE 4 Logit estimates.

Variable	B	S.E.	Sig.	Exp(B)
Added costs	0.587	0.343	0.087*	1.799
Lack of skills and experience	0.872	0.347	0.012**	2.392
Lack of legal and regulatory framework	−0.109	0.343	0.751	0.897
Lack of government subsidies	0.874	0.336	0.009***	2.397
Lack of consumer demand	1.064	0.485	0.028**	2.897
Size	0.631	0.242	0.009***	1.88
CE awareness	−0.238	0.415	0.567	0.788
Green transition impact on business	0.957	0.163	0.000***	2.605
EU membership	0.685	0.165	0.000***	1.983
Constant	−0.326	0.154	0.034*	0.722

Significance estimates $***p < 0.01, **p < 0.05, *p < 0.1$.

due to stricter environmental regulations or access to green funding opportunities.

Results and discussion

The principal contribution of the paper is the relationship between perceived barriers to CE and the probability of becoming a more environmentally responsible business within a sample of firms in WBC, an underrepresented demographic in academic studies. The CE barriers found in this study are consistent with those found in the previous literature (Bressanelli et al., 2019; Farooque et al., 2019; Galvão et al., 2018; Govindan et al., 2014), thereby reinforcing the validity of this study's empirical findings.

Research on the relationship between CE barriers and the transition to becoming environmentally responsible businesses has been relatively scarce, particularly in the context of firms in the WBC. The empirical findings align with previous research that found added costs a significant barrier to CE adoption. Similarly, Geissdoerfer et al. (2023) found that high costs and large initial investments are major barriers to a circular business model transformation and that pre-existing investments are only a hindrance throughout the changes. In line with empirical findings, cost, and financial constraints are barriers that hinder the implementation of CE (Kirchherr et al., 2018).

Empirical evidence supports the hypothesis of a relationship between the perception of a lack of skills and experience as a barrier and transition to becoming an environmentally sustainable business. Our research findings align with the study by Agyemang et al. (2019), who found a significant gap in the current knowledge about sustainability practices within firms in the automobile industry, noting that hiring skilled employees to support products developed under the circular model is very expensive. Similarly, the findings of this study align with existing literature, which identifies technical knowledge and expertise as critical barriers to transitioning from linear to CE (Agyemang et al., 2019; Kumar et al., 2019; Shahbazi et al., 2016). These studies suggest that expertise in adopting CE is essential for successful implementation.

The findings of this study indicate that the legal and regulatory framework was not a significant factor in influencing the

transition to becoming an environmentally sustainable business. Nevertheless, Mangla et al. (2018) highlight that the firms' ability to transition from linear to circular is limited due to government policies' ineffectiveness in supporting CE initiatives. Similar results are also found in a study by Kumar et al. (2019) that perceives inadequate policies and legislation as a big barrier to firms and a lack of effective legislation as a significant barrier by Caldera et al. (2019).

The research findings align with the existing literature on the need for a regulatory framework to incentivize CE adoption (AlJaber et al., 2023; Holly et al., 2023; Kumar et al., 2019). Moreover, firms would be more encouraged to adopt circular practices when providing financial incentives (Shooshtarian et al., 2023). Fiscal incentives through VAT reduction on refurbishment projects can effectively promote CE adoption (Carra and Magdani, 2017).

The empirical data yields significant results supporting the hypothesis that the perception of consumer demand is a barrier to the transition to becoming an environmentally sustainable business. As Ghisellini et al. (2018) suggest, growing market demand for circular products would increase the interest of profit-driven businesses in meeting this demand. However, consistent with empirical findings, Geissdoerfer et al. (2023) identified market barriers, including insufficient customer demand, often restricted by limited social awareness of CE practices. Addressing these barriers requires awareness campaigns to enhance public understanding and acceptance of CE principles. Such initiatives should mitigate negative customer perceptions of reused materials while developing clear standards and regulations for reused resources (AlJaber et al., 2023).

By aligning with existing literature barriers, findings validate the empirical evidence and highlight the importance of policy interventions to facilitate the process toward CE transition within WBC.

Conclusions and implications

The relationship between firms' barriers to transitioning to CE and becoming sustainable businesses has received negligible research attention. This study offers one of the first empirical supports for this relationship, specifically focusing on WBC firms. It provides novel empirical insights that have complemented the current knowledge of the subject matter and enable policymakers to create efficient policies and practitioners to develop sustainable business strategies toward a circular built environment. Also, it is crucial to highlight that this study is limited by the information available in the literature because the debate regarding barriers to transitioning to CE is relatively new. Although relevant CE barriers are identified in the literature, they are rarely empirically based. Next, this study discusses the theory and practical implications of the empirical findings and study limitations that researchers should consider in the future.

Theoretical and practical implications

Given the CE's importance, numerous government initiatives and business commitments have been implemented to promote its

adoption, particularly in developed countries (Winans et al., 2017). In contrast, businesses in emerging economies are often at the beginning stages of CE adoption, urging well-developed business strategies to support a smooth transition.

The successful adoption of CE practices relies on the support from the government and policymakers and the provision of financial incentives. Governments should prioritize the development of policies that support diverse circular strategies to accelerate the transformation process toward CE. Key areas include restructuring supply chains, designing sustainable products, and selecting eco-friendly materials. However, such initiatives may increase product prices, which could cause customer resistance. Thus, circular practices should be incentivized by various fiscal incentives, such as subsidies, tax breaks and others.

Governments need to take a critical role in developing regulations and revising existing legal frameworks that support circular initiatives (Bet et al., 2018). This is linked also with infrastructure investment, from public and private sector, for recycling, waste management, and eco-friendly production. Given that the WBC has lower resource productivity than the EU, the CE may be a suitable strategy for the green transition. WBC should define their national strategies for the green transition and develop regulatory framework following the EU standards and laws, which would also attract EU funding sources. Financial incentives, such as subsidies, grants and loans are crucial for firms to overcome the challenges of initial investments in CE adoption. Also, public-private partnerships funding support firms to develop their CE business models. Specialized trainings, workshops and networks are important to increase skills and capabilities related to taking CE initiatives.

For practitioners, firms can enhance CE adoption by forming industrial clusters, fostering networks for sharing knowledge and expertise, and developing sustainable business models to extend product lifecycles. Collaboration is necessary to ensure CE integration in production processes, especially with supply chain partners. This will also lead to job creation in recycling, remanufacturing and waste management sectors Also, to increase consumer purchase of CE products, consumer awareness campaign can assist to reduce skepticism about reused materials.

There is a complex pathway to circularity, and developing CE models is not the concern of a single firm. Instead, a systemic approach that involves actions from policymakers, enterprises, researchers, and consumers should be adopted to ensure effective transformation to drive sustainability.

Limitations and future research

This study is limited as it is focused solely on firms' perceptions of barriers to transitioning to CE, which implies that the information could have been biased, representing only the viewpoints of WBC firms. More empirical data is needed to understand the barriers of firms that have successfully diversified their operations and transformed their current business models to a more sustainable circular model. This study provides cross-sectional analysis, which makes it difficult to assess how firms' barriers to CE adoption evolve over time.

Based on these limitations, avenues for further research are recommended. First, validating and enriching the findings of firms that have tried or transformed the CE model from different industries, sizes, and locations in developed and developing countries is recommended. Also, future research should focus on prioritization of barriers to compare them and put efforts into which ones to try to minimize first. Also, it is important to track firms' transitions over time, using longitudinal approach, to gain a deeper understanding of the long-term effectiveness and challenges of CE. Moreover, future research should be focused on collaborative networks created between stakeholders to streamline the process of CE adoption.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: https://www.rcc.int/balkanbarometer/results/1/business.

Ethics statement

Ethical approval was not required for the studies involving humans because this is a study done by Balkan Barometer. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

LR: Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. NJ: Methodology, Software, Supervision, Writing – review & editing. BK: Methodology, Supervision, Writing – review & editing. LM: Methodology, Writing – review & editing. TK: Visualization, Writing – review & editing.

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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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The author(s) declare that no Gen AI was used in the creation of this manuscript.

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