The link between sustainable entrepreneurial attitude, intention, and behavior: moderating role of circular economy entrepreneurship

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Abstract

Purpose – The transition from intention to behavior remains a challenging and complex process, particularly in the context of sustainability and the circular economy. This study aims to bridge the gap between sustainable entrepreneurial intention (SEI) and sustainable entrepreneurial behavior (SEB) by incorporating attitudes toward sustainable entrepreneurship (ATSE) as an antecedent, based on the theory of planned behavior (TPB). Additionally, the study examines the moderating role of circular economy entrepreneurship (CEE) in strengthening the SEI-SEB relationship.

Design/methodology/approach – The study employs a quantitative approach, collecting survey data from 782 university students in Vietnam. Structural equation modeling (SEM) using SmartPLS 3 is applied to test the proposed hypotheses.

Findings – The results indicate that ATSE positively influences SEI, SEI positively influences SEB, and ATSE also has a direct positive impact on SEB through SEI, suggesting that beyond SEI, ATSE serves as a strong predictor of SEB. The most notable contribution of this study is the moderating role of CEE in the SEI-SEB relationship, demonstrating that CEE helps bridge the gap between SEI and SEB. Students with a stronger orientation toward CEE are more likely to translate their entrepreneurial intentions into actual entrepreneurial behavior. Additionally, our study shows that sustainable entrepreneurial intention and behavior are influenced by certain demographic factors.

Practical implications – The findings provide valuable insights for educators, policymakers, and entrepreneurs, emphasizing the importance of fostering positive attitudes toward sustainable entrepreneurship and enhancing awareness of circular economy opportunities to facilitate entrepreneurial actions.

Originality/value – This study contributes to the existing literature by integrating ATSE and CEE into the SEI-SEB framework, offering a novel perspective on the factors influencing sustainable entrepreneurial behavior. The research highlights the need for targeted educational and policy interventions to promote sustainable business practices.

Keywords Sustainable entrepreneurship, Entrepreneurial attitude, Entrepreneurial intention, Entrepreneurial behavior, Circular economy entrepreneurship

Paper type Research paper

1. Introduction

The sustainable development goals (SDGs) have become a top priority for many countries due to their significant economic, social, and environmental benefits (Griggs, Nilsson, Stevance, & McCollum, 2017; SDG UN, 2019). Achieving these goals requires a multidimensional approach, with sustainable entrepreneurship playing a crucial role in fostering innovation and long-term economic growth. A sustainably developed nation depends on key stakeholders, including entrepreneurs (Veleva & Bodkin, 2018), large corporations (Yasir, Xie, & Zhang, 2022), and government support (Pigosso & McAloone, 2021). However, despite increasing emphasis on sustainability, many countries continue to face severe environmental challenges

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such as pollution, climate change, and resource depletion (Sher, Abbas, Mazhar, Azadi, & Lin, 2020). In response, developed countries have prioritized circular economy (CE) models to reduce waste and dependence on fossil resources. CE offers businesses dual benefits: economic efficiency and environmental sustainability. More recently, the concept of circular economy entrepreneurship (CEE) has gained traction in the entrepreneurship literature, as scholars explore how startups integrate circular principles into their business models (Visser, 2018). Research suggests that sustainable entrepreneurship can mitigate environmental challenges by combining innovation with sustainable business practices (e.g. Schaefer, Corner, & Kearins, 2015; St-Jean & Labelle, 2018). Additionally, it plays a pivotal role in human resource development, equipping the workforce with essential skills for a sustainable economy. Recognizing these benefits, many governments actively promote sustainable entrepreneurship to balance economic growth, social equity, and environmental responsibility (Cullen & De Angelis, 2021; Le, Behl, & Pereira, 2024; Sher et al., 2020).

Sustainable entrepreneurship is defined as the implementation of business practices that simultaneously pursue economic profitability while upholding environmental and social values (Parrish, 2010). Unlike conventional entrepreneurship, which primarily focuses on economic gain, sustainable entrepreneurship drives systemic transformation that influences global business trends (Sher et al., 2020). This form of entrepreneurship not only addresses economic objectives but also embeds corporate social responsibility (CSR) principles into its core strategy, fostering ethical decision-making and responsible resource management. Additionally, sustainable entrepreneurship encourages business models that prioritize circular economy principles, reducing waste and maximizing resource efficiency (Cullen & De Angelis, 2021). By fostering inclusive and environmentally responsible business models, it contributes to building an equitable society while addressing pressing global issues such as social inequality and ecological degradation.

Vietnam provides a compelling context for sustainable entrepreneurship activities due to its unique socio-economic dynamics. In recent days, Vietnam has undergone a rapid economic increase, emerging as one of the fastest-growing economies in the ASEAN region (Tien, Anh, Ngoc, & Nhi, 2019). However, this development has faced highly serious environmental challenges, including pollution, resource depletion and climate change, which underscore the urgent need for more sustainable business practices (The International Trade Administration, 2024). Recognizing these issues, the Vietnamese government has actively promoted entrepreneurship with a sustainability focus, implementing national initiatives, and policies to improve innovation, green and circular economy models (e.g., National Action Plan for Circular Economy by 2023) (Vietnam Briefing, 2025). These supportive policies environment, alongside a strongly promoted entrepreneurial spirit, has created favorable conditions for commitment to social and environmental goals. Moreover, Vietnam's demographic profile highlights a vast potential for sustainable startups: the nation boasts over two million university students as of 2024 (Anh, 2024), forming a large pool of young talent with rising interest in entrepreneurial pursuits (Maheshwari & Kha, 2022). Recently, higher education systems in Vietnam have started to implement sustainable entrepreneurship education programs for students (Bui, Delladio, Serpico, & Trento, 2025). This has significantly increased students' awareness and behavior in the entrepreneurial process. These factors created a unique context for Vietnam to improve sustainable entrepreneurship.

Given the growing importance of sustainable entrepreneurship, recent research has focused on understanding how entrepreneurial intentions develop within sustainable contexts (e.g. Yasir et al., 2022; Schaefer et al., 2015; Parrish, 2010; Vuorio, Puumalainen, & Fellnhofer, 2018; Alferaih, 2017; Sher et al., 2020). Most of these studies have adopted all of the components of the theory of planned behavior (TPB) framework to examine how internal

and external factors shape sustainable entrepreneurial intention (SEI). This approach often leads to the relationship between intention and behavior not being fully explored. Indeed, existing research primarily concentrates on intention formation while overlooking the subsequent transition from intention to entrepreneurial behavior (SEB). This presents a critical research gap, as prior studies have established that not all entrepreneurial intentions materialize into actual business activities (Duong, 2022). The challenge of bridging the intention-behavior gap is particularly pronounced in today's competitive business environment, where numerous individual and contextual barriers impede entrepreneurial action.

A promising avenue for addressing this gap lies in circular economy entrepreneurship, which explores circular economy principles to create innovative and sustainable business opportunities (Cullen & De Angelis, 2021; Le et al., 2024). Logically, an entrepreneur's awareness of circular economy opportunities could strengthen the sustainable entrepreneurship intention-behavior relationship by leveraging the potential of this model (Le et al., 2024). The circular economy framework emphasizes the regeneration of resources, minimizing waste, and creating sustainable supply chains, which can lower the barriers to entry for new businesses while ensuring long-term profitability (Nikolaou, Tsagarakis, & Tasopoulou, 2018). Entrepreneurs with a strong understanding of circular economy principles may be more likely to perceive opportunities where others see constraints, thereby increasing their likelihood of transitioning from intention to action (Panait, Hysa, Raimi, Kruja, & Rodriguez, 2022). Some recent studies have explored the challenges and opportunities for entrepreneurs in the context of the circular economy (e.g. Suchek, Ferreira, & Fernandes, 2022; Panait et al., 2022). However, to the author's knowledge, lacking of empirical study focuses on the entrepreneurship process and has examined the moderating role of circular economy entrepreneurship (CEE) in this relationship. These existing studies highlight a significant gap in the sustainable entrepreneurship literature, underscoring the need for further investigation.

To address these research gaps, this study employs part of the TPB framework to examine the relationship between SEI and SEB. This approach ensures two key aspects in the study. First, the research model is theoretically grounded, with the attitude factor in the TPB serving as the starting point for the relationship between intention and behavior. Second, it allows the study to focus on clarifying the gap between intention and sustainable entrepreneurial behavior in the context of the circular economy. Previous studies have shown that there is a gap between intention and behavior in entrepreneurship, as intentions often do not translate into actual behavior (Adam & Fayolle, 2015; Duong, 2022). This gap has widened in the current context, where stakeholders demand that entrepreneurial actions align with social and environmental responsibilities (İyigün, 2015). Therefore, we argue that students with a high awareness of the circular economy (CE) are more likely to exhibit entrepreneurial behavior in this context. In this study, we investigate the role of CEE as a moderating factor in strengthening this relationship. By doing so, this study contributes to a deeper understanding of how sustainable entrepreneurship can be effectively fostered in practice. This study is structured into six key sections: Introduction; Framework and Literature Review; Methodology; Results; Discussion and Implications; and Conclusion and future research.

2. Framework and literature review

2.1 Research framework

Since its development by Ajzen (1991), the theory of planned behavior (TPB) has been widely used to explain individuals' social behaviors. TPB helps clarify how individuals

make rational decisions by weighing the benefits and drawbacks before engaging in a specific behavior (Ajzen, 1991). Notably, prior studies have shown that this theory is particularly suitable for explaining entrepreneurial behavior (Liñán & Chen, 2009). Moreover, recent meta-analytic path studies confirm TPB's relevance in validating the relationship between attitudes and intentions, as well as between intentions and actual entrepreneurial behavior (Alferaih, 2017; Zaremohzzabieh et al., 2019). Additionally, green and sustainable entrepreneurial behaviors have also been examined through this theoretical lens (Yasir et al., 2022). Among these two types of entrepreneurship, the relationship between entrepreneurial intentions and actions has received less attention in the sustainable context (Vuorio et al., 2018). TPB consists of three key components:

(1) Attitude toward: the behavior the extent to which an individual holds a positive or negative perception of a specific behavior;

(2) Subjective norms: the perception of social pressure or expectations from significant others (family, friends, colleagues, society); and

(3) Perceived behavioral control: the extent to which an individual believes they can control a behavior, including factors such as resources, opportunities, and potential barriers.

However, in this study, we do not adopt all three components of TPB but instead focus solely on attitudes toward sustainable entrepreneurship (ATSE) as the foundation for the relationship between sustainable entrepreneurial intention (SEI) and sustainable entrepreneurial behavior (SEB). First, several studies on entrepreneurship in the context of the circular economy and sustainable development have demonstrated that attitudes toward entrepreneurship strongly influence entrepreneurial intentions (e.g. Duong, 2022; Adam & Fayolle, 2015; Vuorio et al., 2018; Yasir et al., 2022). Second, research by Duong (2022), Cui and Bell (2022) has suggested that it is unnecessary to apply all constructs of TPB within a research model. Third, our primary objective is to evaluate the relationship between SEI and SEB, as previous studies have predominantly focused on assessing the impact of the three TPB components on entrepreneurial intention (Waris, Farooq, Hameed, & Shahab, 2021; Yasir et al., 2022) while paying little attention to the intention-behavior relationship. Furthermore, we explored the moderating role of circular economy entrepreneurship (CEE) in this relationship.

2.2 The link between sustainable attitude and intention in entrepreneurship

In the theory of planned behavior (TPB), an attitude refers to an individual's overall positive or negative evaluation of a specific behavior, essentially reflecting how they feel about performing that action, based on their beliefs about the potential outcomes of doing it; a positive attitude indicates a favorable view of the behavior, while a negative attitude indicates an unfavorable view (Ajzen, 1991).

Using the Theory of Planned Behavior (TPB), numerous studies have demonstrated that entrepreneurial attitudes have a strong impact on both intention and behavior (e.g. Duong, 2022; Kautonen, Van Gelderen, & Tornikoski, 2013; Kong, Zhao, & Tsai, 2020). This suggests that entrepreneurship does not occur impulsively but requires a pre-existing attitude toward it. In the context of sustainable entrepreneurship, the relationship between sustainable entrepreneurial attitudes and intentions has also been established. Several other studies (e.g. Ashraf, Alam, & Alexa, 2021; Zaremohzzabieh et al., 2019) argue that among the three antecedents of TPB, attitude toward entrepreneurship is the most critical factor in shaping entrepreneurial intention. With a literature review approach, the study by Rosário, Raimundo, and Cruz (2022) identified

that a positive attitude toward sustainability serves as the primary driver of sustainable entrepreneurial spirit. This factor can be considered the foundation for subsequent intentions and behaviors. Additionally, the study pointed out that current institutions and legal frameworks do not sufficiently support sustainable entrepreneurial projects. Empirical studies surveying university students have revealed a positive relationship between attitudes and sustainable intentions (e.g. Koe, Omar, & Majid, 2014; Sher et al., 2020; Vuorio et al., 2018; Yasir et al., 2022).

In the present context, sustainable entrepreneurship should emphasize sustainable attitudes, as they are shaped by the values that individuals prioritize and further influence both intentions and behaviors (Fischer and Schwartz, 2011). Indeed, individuals who prioritize sustainability and environmental protection tend to act in accordance with their deeply held values and beliefs (Wagner, 2012). Furthermore, as resources become increasingly scarce, awareness of sustainability's significance enables entrepreneurs to seize various market and societal opportunities (Schaltegger & Wagner, 2011). Capitalizing on these opportunities allows entrepreneurs to generate profits while fostering a sustainable development environment for society. Therefore, based on both qualitative and empirical research, it can be concluded that attitudes toward sustainable entrepreneurship (ATSE) have a positive impact on sustainable entrepreneurial intention (SEI):

H1. Attitude toward sustainable entrepreneurship has a positive impact on sustainable entrepreneurship intention.

2.3 The link between sustainable intention and behavior in entrepreneurship

We recognize that entrepreneurial behavior has not been comprehensively evaluated by scholars in terms of both its definition and empirical examination. Indeed, there is no clear definition to precisely characterize this behavior. However, based on the concept of entrepreneurial behavior proposed by Gieure, del Mar Benavides-Espinosa, and Roig-Dobón (2020) and the concept of sustainable business behavior outlined by Lülfs and Hahn (2014), sustainable entrepreneurial behavior can be understood as the ability, competence, and knowledge of potential entrepreneurs regarding the key factors in establishing a business with a sustainability-oriented approach. In this approach, business goals and strategies consistently emphasize environmental, human, and social sustainability. However, entrepreneurial behaviors are inherently complex, as individuals exhibit different preferences, characteristics, personalities, and perceptions depending on their specific environmental conditions (Ajzen, 2020).

Moreover, while many studies focus on assessing entrepreneurial intention, there is a significant lack of research explaining entrepreneurial behavior, particularly within the context of sustainable development (St-Jean & Labelle, 2018). Accordingly, the study by St-Jean and Labelle (2018) sought to clarify the relationship between sustainability orientation and entrepreneurial behavior. The results indicated a negative relationship—meaning that an increased awareness of sustainability was associated with a decline in entrepreneurial behaviors—contrary to the study's expectations. Nonetheless, this finding is crucial in highlighting the uncertainty surrounding the understanding of intention and behavior in the sustainability context.

Similarly, research on the relationship between entrepreneurial intention and behavior has shown that this relationship explains only approximately 30% of the variance, as reported by Kautonen, Van Gelderen, and Fink (2015) and Adam and Fayolle (2015). An even more

concerning figure is that only about 2% of surveyed university students actually started a business one year after graduation (Meoli, Fini, Sobrero, & Wiklund, 2020). The findings of this study also indicate that the relationship between entrepreneurial intention and behavior explains only about 20% of the variance. In summary, the literature review reveals that this relationship remains unclear across different geographical contexts. Additionally, very few studies have been conducted within the context of the circular economy and sustainable development. Therefore, we will continue to assess the relationship between sustainable entrepreneurial intention (SEI) and sustainable entrepreneurial behavior (SEB) to bridge the existing research gaps:

H2. Sustainable entrepreneurship intention has a positive impact on sustainable entrepreneurship behavior.

H3. Sustainable entrepreneurship intentions mediate the relation between attitude toward sustainable entrepreneurship and sustainable entrepreneurship behavior.

2.4 Moderating the role of circular economy entrepreneurship

In the study by Cullen and De Angelis (2021), circular economy entrepreneurship (CEE) is defined as an entrepreneurial approach that explores and identifies opportunities related to the circular economy. Accordingly, entrepreneurs' business activities focus on environmental sustainability and sustainable development. Seeking business opportunities within the circular economy framework helps generate long-term environmental and social value, including protecting and regenerating the finite resources that businesses rely on. Therefore, sustainability-oriented entrepreneurship contributes to efficient resource utilization, environmental protection, and sustainable profitability (Nikolaou et al., 2018).

The study by del Mar Alonso-Almeida, Rodriguez-Anton, Bagur-Femenías, and Perramon (2021) also highlights that a circular economy approach to entrepreneurship requires a multidimensional exploration of opportunities. This perspective encourages entrepreneurs to act responsibly toward society and the environment. CEE is associated with promoting circularity through innovative products, services, and business models (Le et al., 2024). Consequently, it demands individuals who are aware, willing to take risks, and capable of making breakthroughs in their entrepreneurial intentions and behaviors to capitalize on emerging opportunities. Considering the sustainability context, the study by Rok and Kulik (2021) found that the sustainable entrepreneurship process is influenced by entrepreneurs' awareness of environmental issues. Additionally, they observed that CEE in modern contexts could help address existing market limitations, management structures, or socio-cultural barriers (Suchek et al., 2022). From an educational perspective, the study by Del Vecchio, Secundo, Mele, and Passiante (2021) demonstrated that integrating circular economy awareness into entrepreneurial education significantly impacts students' future innovative entrepreneurial behavior. Importantly, CEE awareness education should follow the "why-what-who-how" principle to optimize resources. Using a literature review approach, the study by Panait et al. (2022) and Suchek et al. (2022) indicates that small and medium-sized enterprises (SMEs) tend to face more difficulties in transitioning to the circular economy model. This is due to various challenges such as financial limitations, lack of innovation, organizational inconsistency, and risk aversion. On the contrary, startups are inherently innovative and willing to take risks to develop new circular economy models. This suggests that startups play a crucial role in advancing a more circular economy.

Entrepreneurship is inherently complex as it involves multiple stages, including risk perception and uncertainty (Duong, 2022). Therefore, the gap between entrepreneurial intention and behavior in the circular economy context may face various challenges, making it more difficult to materialize. For instance, the COVID-19 pandemic has recently hindered the implementation of sustainable entrepreneurial ideas by causing economic downturns and widespread lockdowns (Wang et al., 2021). As a result, young entrepreneurs have become more hesitant to launch their startups (Doanh, Thang, Nga, Van, & Hoa, 2021; Duong, 2022). Furthermore, according to Meoli et al. (2020), nearly 70% of potential entrepreneurs do not pursue or limit their entrepreneurial actions in the years following the formulation of a complete idea. These examples raise the question: Why do potential entrepreneurs fail to translate their initial sustainable entrepreneurial ideas into actual ventures? This highlights the limited scientific understanding of the gap between entrepreneurial intention and behavior. Thus, our study focuses on the hypothesis of whether good entrepreneurs' spirit of circular economy (represented by the CEE variable in our research model) strengthens or weakens the relationship between sustainable entrepreneurial intention (SEI) and sustainable entrepreneurial behavior (SEB). Particularly, we explore the moderating role of CEE in the SEI-SEB relationship to bridge existing research gaps.

Indeed, the question of why potential entrepreneurs abandon their plans during the entrepreneurial process remains largely unanswered. In this study, we introduce CEE as a moderating variable, as it can alter the strength or even the direction of the relationship (Baron & Kenny, 1986). A moderating factor is incorporated into the research model when the correlation between the two other factors is weak or inconsistent (Song, Min, Lee, & Seo, 2017). Given that existing studies indicate the relationship between entrepreneurial intention and behavior remains unclear (e.g. Al-Mamary & Alraja, 2022; Castellano, Maalaoui, Safraou, & Reymond, 2014; Duong, 2022; Kautonen et al., 2015; Meoli et al., 2020; Ozaralli & Rivenburgh, 2016; Yasir et al., 2022), this uncertainty suggests the existence of moderating variables that can strengthen or refine this relationship. Logically, our study proposes the following hypothesis:

H4. Circular economy entrepreneurship positively moderates the link between sustainable entrepreneurship intention and sustainable entrepreneurship behavior.

In this study, CEE is operationalized through a five-item scale adapted from Le et al. (2024), focusing on students' perceived awareness and readiness to identify, evaluate, and act upon business opportunities aligned with circular economy principles. These items capture their attitudes toward resource efficiency, waste reduction, product life extension, and closed-loop systems. Given that university students may have limited direct experience with circular economy startups, we framed CEE as a mindset rather than purely as behavior. Thus, in our model, CEE reflects students' proactive disposition toward environmental innovation and their openness to integrate circular thinking into future entrepreneurial ventures, even during early-stage idea development. This operationalization is suitable for capturing the role of cognitive and attitudinal factors in the entrepreneurial process among students.

The research model is represented below (see Figure 1).

3. Methodology

3.1 Data collection and sampling

Current research on the entrepreneurial process debates whether to use student or master's degree samples. Some studies consider students as common and accessible subjects with a

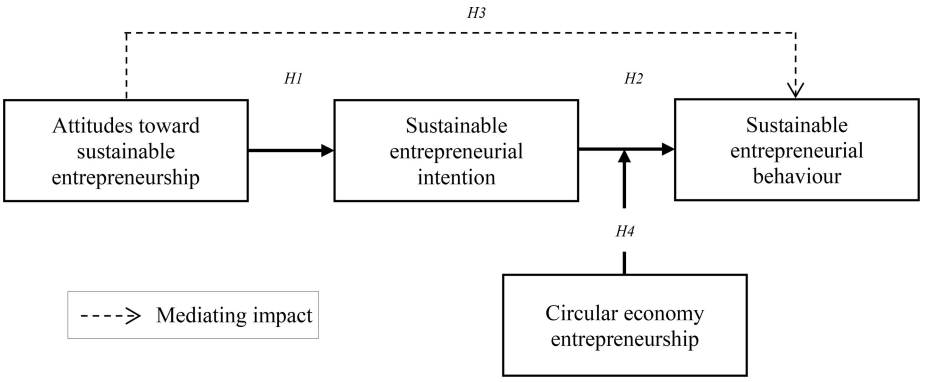

Figure 1. Proposed research model
Source: Authors own work

high tendency toward entrepreneurship (e.g., Gieure et al., 2020; Meoli et al., 2020; Cater, Young, Al-Shammari, & James, 2022). However, other studies argue that students have limited work experience (Duong, 2022; Kautonen et al., 2015), which may restrict their entrepreneurial behavior. Despite these debates chose university students as our survey participants for several reasons. First, students are identified as ambitious individuals who are willing to face challenges. Additionally, they quickly adapt to market development trends (Maheshwari & Kha, 2022). Second, most university students in Vietnam have already gained work experience at businesses early on. Accord a survey by VNexpress (2024), approximately 70% to 80% of students have had part-time jobs during their university years. This experience may help them accumulate knowledge for future entrepreneurial endeavors. Finally, students are a large and easily accessible population, which aligns with the limited resources of our research team. According to statistics from the Vietnamese Ministry of Education and Training, in 2024, there were more than two million university students enrolled in universities and academies (Anh, 2024).

This study was conducted in Vietnam, a country with impressive economic growth and a strongly promoted entrepreneurial spirit in recent years. Geographically, Vietnam is divided into three regions: North, Central, and South. Therefore, the study used a stratified sampling method. In each region, we selected the three largest universities based on their training quality rankings according to Viet Nam's University Rankings (VNUR) (2024). After selecting the appropriate universities, we randomly distributed online survey questionnaires to students through university lecturers. In the survey invitation letter, we informed participants that participation was entirely voluntary, their information would remain confidential, and the data would be used solely for research purposes. Additionally, we provided explanations of key concepts, such as the circular economy and sustainable entrepreneurship, to ensure that respondents could answer the questions accurately. Data collection took place from October 3, 2024, to January 17, 2025. Our target was to collect 200 survey responses from each university, totaling 1,200 responses. Ultimately, after the screening process, we obtained 782 valid survey responses, accounting for 65.12% of the total. The remaining responses were excluded due to incomplete information or suspected lack of seriousness in answering the survey. Table 1 presents the sample structureof this study.

Table 1. Sample structure (n = 782)

Region	No.	Ranking	Name of university	No. (n^0)	% (n^0/200)
Northern Vietnam	1	1	Vietnam National University, Hanoi	111	55.5
	2	3	Hanoi University of Science and Technology	105	52.5
	3	7	University of Science and Technology of Hanoi	98	49.0
Central Vietnam	4	6	Duy Tan University	126	63.0
	5	9	The University of Da Nang	65	32.5
	6	11	Hue University	84	42.0
Southern Vietnam	7	2	Vietnam National University, Ho Chi Minh City	67	33.5
	8	4	University of Economics Ho Chi Minh City	45	22.5
	9	5	Ton Duc Thang University	81	40.5

Note(s): n^0 refers to the number of students collected from each university; 200 is the target sample size per university. University ranking according to Viet Nam's University Rankings (VNUR) (2024)
Source(s): Authors' own work

3.2 Scales development

The study primarily employs a quantitative approach to assess the entrepreneurial process within the context of sustainability and the circular economy. To ensure reliability, the measurement scales are adapted from previous studies with minor modifications to suit the study's context and objectives (see Table A1). The "attitude toward sustainable entrepreneurship" scale consists of six items and the "sustainable entrepreneurship intention" scale includes six items, both adopted from Yasir et al. (2022). The "sustainable entrepreneurship behavior" scale includes seven items which is based on Gieure et al. (2020) and Cullen and De Angelis (2021). Finally, the "circular economy entrepreneurship" scale includes five items, adopted from Le et al. (2024). The scales are designed using a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." Additionally, all observed variables in the measurement scales were translated from English to Vietnamese by two professional translators to ensure consistency and accuracy. Additionally, we conducted a pilot survey with a small group of students to ensure linguistic appropriateness. The feedback results indicated that the questionnaire was fully suitable for use on a larger scale.

3.3 Common method bias

Before conducting data analysis, we performed a common method bias test. First, we informed all respondents through a cover letter that their information would be kept confidential and used solely for research purposes. Additionally, we randomized the order of the questions to ensure that respondents could not perceive any direct relationships between them. To assess common method bias, we applied Harman's one-factor test, in which an exploratory factor analysis (EFA) without rotation was conducted to extract factors. The results indicated that a single factor accounted for only 23.9% of the total variance, suggesting that common method bias was not a significant issue in this study.

3.4 Data analysis

According to the recommendations of research models with complex relationships such as mediation and moderation are well-suited for analysis using SmartPLS software. Therefore, in this study, we employed SmartPLS 3 software to analyze the collected data.

First, we assessed indicator reliability using the outer loading coefficient. Hair et al. (2021) found that outer loading must be greater or equal to 0.708. However, for easier memorization, some researchers consider an outer loading of above 0.7 to be acceptable. Next, we evaluated the reliability of the measurement scales using Cronbach's Alpha and Composite Reliability (CR). According to Hair, Risher, Sarstedt, and Ringle (2019) both Cronbach's Alpha and CR should exceed 0.7. To assess convergent validity, we relied on the average variance extracted (AVE) index, which should be greater than 0.5. To assess discriminant validity, we used the square root of the Average Variance Extracted (AVE) as recommended by Fornell and Larcker (1981). Discriminant validity is confirmed when the square root of the AVE for each latent variable exceeds the correlation coefficients between that variable and others, indicating that each construct is distinct.

Next, we evaluated the structural model using the VIF, f^2, and R^2 coefficients. According to Hair et al. (2019), a VIF value between 3 and 5 indicates no multicollinearity issues. Additionally, to assess the impact of dependent variables on independent variables, f^2 values should be greater than 0.15. To determine the significance of relationships, we examined path coefficients ($\boldsymbol{\beta}$) and p-values, where a p-value of less than 0.05 indicates statistical significance (Hair et al., 2019).

4. Results

4.1 Demographic characteristics

From Table 2, the data collection results indicate that 40.7% of students were female, while 59.3% were male. Students aged 18 to 20 account for 4.5%, whereas those aged 21 to 23 form the majority at 52.7%. The results also showed that most students were enrolled in economics and business management programs, making up 22.1% and 62.5%, respectively. The remaining students come from fields such as information technology, mechanical engineering, and communications, etc… Finally, the majority of students did

Table 2. Demographic characteristics of the sample

Variables	Item	Frequency	%
Gender	Male	318	40.7
	Female	464	59.3
Age	18 to 20	35	4.5
	21 to 23	412	52.7
	Above 23	336	43.0
Major	Economics	173	22.1
	Business management	489	62.5
	Other	120	15.3
Family business background	Yes	214	27.4
	No	568	72.6
Entrepreneurial experience	Yes	133	17.0
	No	649	83.0

Note(s): $n = 782$
Source(s): Authors' own work

not have a family business background or entrepreneurial experience, with 72.6% and 83%, respectively.

4.2 Reliability and converge validity

Table 3 indicates that the reliability of the measurement scales is highly satisfactory. Both Cronbach's alpha and composite reliability (CR) exceed the threshold of 0.7, confirming internal consistency. Additionally, the AVE values range from 0.634 to 0.676, all surpassing the recommended threshold of 0.5, ensuring convergent validity. Discriminant validity is also well-supported, as all outer loadings exceed 0.7, ranging from 0.706 to 0.923.

4.3 Discriminant validity

To evaluate whether the constructs were adequately distinct from one another, we examined discriminant validity using the Fornell and Larcker criterion. This approach requires that the square root of the AVE for each construct exceeds the highest correlation it shares with any other construct (Table 4). Additionally, we assessed discriminant validity through the HTMT ratio, with all values remaining below 0.85 (Table 5). These findings confirm that the constructs demonstrate strong reliability, as well as factorial, convergent, and discriminant validity, making them suitable and dependable for further analysis.

Table 3. Reliability and converge validity

Variables	Items	Mean	SD	Outer Loadings	Cronbach's Alpha	CR	AVE
Attitudes toward sustainable entrepreneurship (ATSE)	ATSE1	3.980	0.909	0.847	0.884	0.912	0.634
	ATSE2	3.517	0.918	0.746			
	ATSE3	3.578	0.854	0.825			
	ATSE4	3.476	0.941	0.821			
	ATSE5	2.882	1.079	0.757			
	ATSE6	3.706	0.847	0.775			
Sustainable entrepreneurial intention (SEI)	SEI1	4.086	0.981	0.826	0.902	0.925	0.672
	SEI2	3.958	0.987	0.771			
	SEI3	3.936	0.887	0.794			
	SEI4	3.894	0.978	0.803			
	SEI5	3.882	0.988	0.811			
	SEI6	3.858	0.897	0.907			
Sustainable entrepreneurial behavior (SEB)	SEB1	3.326	0.753	0.706	0.908	0.928	0.649
	SEB2	3.981	0.909	0.713			
	SEB3	3.550	0.676	0.854			
	SEB4	3.519	0.680	0.835			
	SEB5	3.529	0.679	0.858			
	SEB6	3.435	0.736	0.923			
	SEB7	3.574	0.743	0.724			
Circular economy entrepreneurship (CEE)	CEE1	4.101	0.933	0.881	0.881	0.912	0.676
	CEE2	3.693	0.901	0.762			
	CEE3	3.645	0.936	0.803			
	CEE4	4.026	0.881	0.771			
	CEE5	3.881	0.769	0.887			

Source(s): Authors' own work

Table 4. Fornell-Larcker criterion

Construct	ATSE	CEE	SEB	SEI
ATSE	0.796			
CEE	0.169	0.822		
SEB	0.629	0.225	0.806	
SEI	0.461	0.221	0.575	0.820

Source(s): Authors' own work

Table 5. Heterotrait-Monotrait ratio (HTMT)

Construct	ATSE	CEE	SEB	SEI
ATSE				
CEE	0.184			
SEB	0.694	0.234		
SEI	0.512	0.234	0.624	

Source(s): Authors' own work

4.4 Direction relationship testing

We use the bootstrapping technique to test the direct relationships under the influence of demographic variables such as gender, age, major, entrepreneurial experience, and family background on sustainable entrepreneurship intention (SEI) and sustainable entrepreneurship behavior (SEB). Multicollinearity indices were checked first, and the results in Table 6 show that all VIF values are below 4, indicating that multicollinearity is not an issue in the model.

Models 1 and 3 examine the impact of demographic factors on SEI and SEB, while Model 2 adds the sustainable entrepreneurial attitude as a factor influencing SEI. Model 4, in turn, includes the relationship between attitude, intention, and behavior in sustainable entrepreneurship. Therefore, it can be observed that the model fit in Models 2 and 4 significantly improved compared to Models 1 and 3 (R^2 and Adjusted R^2). (see Table 6)

Model 1 shows that entrepreneurial experience has a significant impact on SEI ($\boldsymbol{\beta} = -0.217$, $t = 2.039$, $p < 0.05$). Furthermore, Model 3 shows that sustainable entrepreneurial behavior is influenced by gender ($\boldsymbol{\beta} = -0.190$, $t = 2.403$, $p < 0.05$), age ($\boldsymbol{\beta} = 0.202$, $t = 4.645$, $p < 0.05$), and entrepreneurial experience ($\boldsymbol{\beta} = -0.228$, $t = 2.696$, $p < 0.05$).

Model 2 shows the direct impact of sustainable toward sustainable entrepreneurship (ATSE) on SEI ($\boldsymbol{\beta} = 0.460$, $t = 16.318$, $p < 0.05$). However, this relationship is not influenced by control variables such as gender, age, major, etc. In additional, Model 4 shows the direct impact of attitude on sustainable entrepreneurship behavior ($\boldsymbol{\beta} = 0.448$, $t = 15.962$, $p < 0.05$) and intention on sustainable entrepreneurship behavior ($\boldsymbol{\beta} = 0.355$, $t = 10.423$, $p < 0.05$), both of which are controlled for gender ($\boldsymbol{\beta} = -0.110$, $t = 2.054$, $p < 0.05$), age ($\boldsymbol{\beta} = 0.100$, $t = 3.168$, $p < 0.05$), and entrepreneurial experience ($\boldsymbol{\beta} = -0.228$, $t = 15.062$, $p < 0.05$). Based on the above arguments, hypotheses H1, H2, H3 are supported.

4.5 Indirection relationship testing

By using the bootstrapping technique with 5,000 samples (see Table 7), we examine the mediating role of SEI in the relationship between ATSE. Additionally, the moderating role of

Table 6. Direction relationship testing

	Sustainable entrepreneurship intention (SEI)				Sustainable entrepreneurship behavior (SEB)				
	Model 1		Model 2		Model 3		Model 4		
Variables	**β**	t	**β**	t	**β**	t	**β**	t	VIF
Gender	− 0.145	1.752	− 0.121	1.717	− 0.190*	2.403	− 0.110*	2.054	1.254
Age	0.086	1.838	0.017	0.468	0.202*	4.645	0.100*	3.168	1.428
Major	− 0.064	1.453	− 0.044	1.228	− 0.034	0.804	0.006	0.198	1.390
Family business background	0.033	0.315	− 0.006	0.068	0.168	1.519	0.120	1.547	1.605
Entrepreneurial experience	− 0.217*	2.039	− 0.150	1.690	− 0.359*	3.085	− 0.228*	2.696	1.498
Attitude toward sustainable entrepreneurship (ATSE)			0.460*	16.318			0.448*	15.962	1.402
Sustainable entrepreneurship intention (SEI)							0.355*	10.423	1.396
R^2	0.049		0.289		0.103		0.575		
Adjust R^2	0.042		0.280		0.097		0.571		

Note(s): $^*p < 0.05$
Source(s): Authors' own work

Table 7. Indirection relationship testing

Relationship	**β**	SD	t	*p*	f^2	VAF (%)
ATSE → SEI → SEB	0.163	0.021	7.827	0.000	0.322	36.38
CEE * SEI → SEB	0.090	0.024	3.203	0.001	0.022	n/a

Source(s): Authors' own work

CEE is also explored. Intern of the mediating effect (H3), VAF value was tested to estimate the mediating roles of SEI. From the results, the hypothesis H3 are supported due to VAF = 36.38, which is larger than 20%. Therefore, ATSE strongly influences SEB through SEI ($\beta = 0.448$, $p = 0.000$, $f^2 = 0.322$, VAF = 36.38). Finally (H4), CEE demonstrates a significant moderating role in the relationship between SEI and SEB ($\beta = 0.090$, $p = 0.001$, $f^2 = 0.022$). Therefore, the hypothesis H4 is supported.

5. Discussion

This study focuses on assessing the role of circular economic entrepreneurship (CEE) in the relationship between sustainable entrepreneurial intention (SEI) and sustainable entrepreneurial behavior (SEB). We argue that the entrepreneurial process is complex and requires careful planning and consideration. Therefore, the application of the Theory of Planned Behavior (TPB) is entirely appropriate in this context. This theory has demonstrated that sustainable attitude and sustainable entrepreneurial intention play a crucial role in driving actual sustainable entrepreneurial behavior.

However, as discussed in the literature review, not all attitudes or intentions translate into actual behavior (Adam & Fayolle, 2015). This highlights the necessity of research exploring the role of moderating variables that can strengthen this relationship (Duong, 2022). In the context where sustainable development goals (SDGs) are increasingly emphasized (Griggs et al., 2017), we investigate the role of circular economic entrepreneurship (CEE) in this relationship. This study utilizes a sample of university students from major universities in Vietnam, as we consider students to be a highly potential group for engaging in sustainable entrepreneurial activities.

Although other studies primarily focus on the context of developing countries, our research provides empirical evidence from a developing country like Vietnam. This offers valuable insights into the potential of entrepreneurship within the framework of sustainability. Vietnam, with its rapidly growing economy and increasing environmental challenges, presents a unique context for studying sustainable entrepreneurship. Our study emphasizes the importance of promoting circular economy entrepreneurship (CEE) by raising awareness and educating university students.

Our findings indicate that sustainable entrepreneurial intention (SEI) influences sustainable entrepreneurial behavior (SEB), yet the strength of this relationship is relatively weak. This suggests that while students may express strong intentions toward sustainable entrepreneurship, various barriers hinder their ability to translate these intentions into action. This result is consistent with previous studies (e.g. Koe et al., 2014; Kimuli, Orobia, Sabi, & Tsuma, 2020; Yasir et al., 2022; Alferaih, 2017; Cui & Bell, 2022; Al-Mamary & Alraja, 2022), which also indicate that intention alone is not always a sufficient predictor of behavior.

Additionally, we examined the indirect relationship between sustainable entrepreneurial attitude (ATSE) and sustainable entrepreneurial behavior (SEB). The results reveal that

ATSE has a strong impact on SEB through entrepreneurial intention (SEI), reaffirming the importance of fostering a sustainability-driven mindset from an early stage. This finding highlight that beyond mere intention, an ingrained sustainable entrepreneurial attitude serves as a reliable predictor of actual behavior. These findings align with previous research (e.g. Yasir et al., 2022; Duong, 2022), further strengthening the argument that educational interventions aimed at enhancing sustainability awareness and values could play a pivotal role in bridging the intention-action gap.

More importantly, our study identifies the moderating role of CEE in the relationship between sustainable entrepreneurial intention and behavior. This finding is that although the relationship between SEI and SEB is weak, CEE has significantly helped bridge this gap. Previous research has emphasized the need to examine moderating variables in the intention-behavior relationship (Koe et al., 2014; Meoli et al., 2020). However, few studies have specifically focused on the role of the circular economy model. Our study provides empirical insights into how students with a strong awareness and spirit of the circular economy model are more likely to translate their sustainable entrepreneurial intention into actual behavior. When individuals perceive greater opportunities within the circular economy, they are more inclined to take concrete steps toward sustainable business development.

This aligns with prior research suggesting that the opportunities created by the circular economy model provide significant value for entrepreneurs and society (Cullen & De Angelis, 2021; del Mar Alonso-Almeida et al., 2021; Del Vecchio et al., 2021; Nikolaou et al., 2018). Our findings reinforce the notion that fostering an entrepreneurial ecosystem that supports circular economy initiatives—such as access to green financing, mentorship, and regulatory incentives—can effectively enhance the transition from intention to sustainable entrepreneurial action. These insights have crucial implications for educators, policymakers, and entrepreneurs, emphasizing the need to develop targeted strategies that bridge the existing gaps in sustainable entrepreneurial practices.

Regarding the impact of demographic variables on the hypotheses, our results show that entrepreneurial experience has a negative correlation with sustainable entrepreneurial intention (SEI). This indicates that students with prior entrepreneurial experience are more likely to form sustainable entrepreneurial intentions compared to those without such experience. This finding is supported by several studies (Bignotti & le Roux, 2020). Additionally, factors such as age, gender, field of study, and family background do not affect sustainable entrepreneurial intention. For behavior, the results show that gender has an opposite effect on sustainable entrepreneurial behavior, suggesting that males exhibit stronger entrepreneurial behavior. This finding is consistent with that of Duong et al. (2022) in the Vietnamese context and in some developing countries (Romero-Colmenares & Reyes-Rodríguez, 2022). Next, age has a positive effect on sustainable entrepreneurial behavior, with the beta coefficient for entrepreneurial behavior being more clearly formed in senior-year students. Finally, entrepreneurial experience has a reverse effect on behavior, indicating that students with business experience have better sustainable entrepreneurial behavior. These findings are supported by studies by Doanh et al. (2021), and Bignotti and le Roux (2020).

5.1 Theoretical contributions

This study makes significant contributions to the literature on sustainable entrepreneurship. First, our model provides a deeper understanding of the transition process from attitude to intention and sustainable entrepreneurial behavior, highlighting the inherent gap in this process. Previous studies have often paid little attention to this relationship. Second, we introduce a novel approach by applying the theory of planned behavior (TPB), emphasizing

the critical role of attitude in the context of sustainable entrepreneurship. Attitude is considered the starting point of the entrepreneurial process, students with a positive attitude toward sustainability are more likely to engage in sustainable entrepreneurial behavior, as attitude partially reflects individuals' values and beliefs on the subject. Third, our findings emphasize the crucial role of circular economic entrepreneurship (CEE) in the transition from intention to behavior. This suggests that the benefits of the circular economy model can facilitate the emergence of new businesses.

5.2 Practical contributions

The findings of this study have practical implications for promoting sustainable entrepreneurial behavior among university students within the context of the circular economy. First, universities must actively integrate entrepreneurship education with a focus on the circular economy and sustainability into their curriculum. This not only requires the provision of theoretical knowledge but also the introduction of practice training programs, case studies, and collaboration with businesses that have already successfully applied circular economy principles. This kind of content embedding equips students with the skill set and mindset for sustainable entrepreneurship. In addition, universities should have mentoring programs that will bring students into contact with successful green entrepreneurs, therefore closing the gap between theory and practice, and increasing the likelihood that entrepreneurial intentions are translated into actual behavior.

Secondly, policymakers need to offer a more supportive institutional context for sustainable entrepreneurship. Specifically, governments must bring in stable policies that encourage businesses to adopt circular economy models, including tax deductions, financing facilitation mechanisms, and green financing for startups focusing on resource efficiency and waste reduction. Also, enabling public–private partnerships to establish startup incubators and sustainability innovation hubs is crucial. These platforms will ensure that young entrepreneurs receive access to basic resources, expert mentorship, and investment. International practice demonstrates that a number of developed nations have already introduced analogous initiatives like green investment funds and tax breaks schemes resulting in the establishment of dynamic and efficient circular startup ecosystems.

Third, it is important to stress the key position of students and their awareness of the circular economy in the transition from entrepreneurial intention to behavior. Being the central players of entrepreneurial behavior, students must be equipped with a solid foundation of circular economy and sustainability principles early in their university education. A clearer understanding of such opportunities provided by the circular economy can enhance students' confidence and determination to turn their intentions into concrete entrepreneurial activities. In fact, this study demonstrates that students with a stronger circular economy orientation are more likely to achieve their sustainable entrepreneurial intentions. As a result, the incorporation of circular economy principles in entrepreneurship education not only reinforces the competences of students but also provides a strong motivational nudge to trigger sustainable entrepreneurial behavior after graduation.

Consequently, when the above recommendations are carried out in a synchronized way, they will help create a robust sustainable entrepreneurship ecosystem—one where universities, the government, and students collaborate to promote circular economy-based enterprises. Furthermore, this project will not only bridge the intention–behavior gap for young entrepreneurs but also help develop the economy in alignment with environmental sustainability and long-term social welfare.

6. Conclusion and further research

Sustainable entrepreneurship, unlike traditional entrepreneurship, faces both significant challenges and unique opportunities. By examining the role of circular economic entrepreneurship (CEE), this study provides valuable insights into bridging the gap between entrepreneurial intention and actual sustainable entrepreneurial behavior. These findings contribute to the literature on sustainable entrepreneurship, an area that has historically received limited scholarly attention. Furthermore, our research highlights the importance of integrating circular economy principles into entrepreneurial initiatives to enhance long-term business sustainability and environmental impact.

However, this study has some limitations. First, our approach only allows for the collection of data on attitudes, intentions, and behaviors at a single point in time. In other words, we were unable to observe the real-time transition from entrepreneurial intention to behavior over a longer period. Second, we did not apply all components of the theory of planned behavior (TPB). While this represents a novel approach, it may also be a limitation, as other TPB components could potentially be relevant in the context of sustainable entrepreneurship. Third, the concept of the circular economy may be somewhat complex for university students, which could affect the reliability of the data. However, we implemented the necessary measures to mitigate this limitation. These limitations open new avenues for future research on entrepreneurship within the context of the circular economy and sustainable development.

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Appendix

Table A1. Items of scales

Construct	Code	Measurement items	Source
Attitude toward sustainable entrepreneurship (ATSE)	ATSE1	I see more advantages to becoming a sustainable entrepreneur than negatives	Yasir et al. (2022)
	ATSE2	I am interested in pursuing a career in sustainable entrepreneurship	
	ATSE3	In the event I had the opportunity and resources, I would like to create a long-term business	
	ATSE4	I believe that being a socially responsible entrepreneur would bring me enormous joy	
	ATSE5	Instead of working for someone else, I would prefer to work for myself as a sustainable entrepreneur	
	ATSE6	As a sole proprietor, I would be able to make a significant dent in environmental issues	
Sustainable entrepreneurship intention (SEI)	SEI1	Sustainable entrepreneurship is the ultimate goal of my profession	Yasir et al. (2022)
	SEI2	In the next five years, I plan to develop a company that will focus on environmental issues	
	SEI3	As a result of your entrepreneurial endeavors, we will work to promote environmentally friendly practices	
	SEI4	As a business owner, I am conscious of how I use natural resources	
	SEI5	As an entrepreneur, I use natural resources in a responsible way	
	SEI6	If I decide to start a firm of my own, I intend to prioritize social benefits over financial ones	
Sustainable entrepreneurship behavior	SEB1	I have experience in starting new sustainable projects or business	Gieure et al. (2020) and Cullen and De Angelis (2021)
	SEB2	I am capable of developing a sustainable business plan	
	SEB3	I know how to start a new sustainable business	
	SEB4	I know how to do market research	

(*continued*)

Table A1. Continued

Construct	Code	Measurement items	Source
	SEB5	I have invested in an informal manner in some sustainable business	
	SEB6	I can save money to invest in a sustainable business	
	SEB7	I belong to a social network that can promote my sustainable business	
Circular economic entrepreneurship (CEE)	CEE1	We explore and exploit new opportunities in the domain of circular economy in a continuous manner	Le et al. (2024)
	CEE2	We have always thought that finding and exploiting new business opportunities in the circular economy will enhance our ability to make the environment and society better	
	CEE3	We always think that proactively innovating business models in accordance with the circular economy is the responsibility of businesses to stakeholders	
	CEE4	We always think that sharing resources with supply chain partners to improve the performance of communities involved in the supply chain is the responsibility of the business	
	CEE5	We always believe that proactively embracing and implementing alternative initiatives that are more resource-efficient, economic, environmental and social efficiency will make a significant contribution to the achievement of national and global sustainable development goals	

Source(s): Authors' own work

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