



## Research article

# Exploring entrepreneurial intention: The roles of proactive personality, education, opportunity and Planned Behavior

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## ABSTRACT

Entrepreneurial intention is crucial in fostering an entrepreneurial culture and driving economic growth, especially among students from higher education institutions. Our study aims to examine the role of the Theory of Planned Behavior (TPB), specifically attitude towards entrepreneurship (ATE) and perceived behavioral control (PBC), in the relationships between proactive personality (PP), entrepreneurship education (EE), entrepreneurial opportunity (EO), and entrepreneurial intention (EI) among final-year students higher education institutions in China. The TPB framework provides a theoretical foundation to investigate how psychological factors, such as ATE and PBC, mediate an individual's intention to engage in entrepreneurial behavior. The research model was analyzed using PLS-SEM. The findings, derived from a sample of 250 final-year students from public universities in China, indicate that ATE and PBC mediate the relationships between PP, EO, and EI. However, only ATE was found to mediate the relationship between EE and EI. Our findings offer insights into the foundational mechanisms driving EI, significantly advancing the scholarly understanding of entrepreneurial behavior. By demonstrating the applicability of the TPB framework, our study sheds light on the psychological processes that underlie the connections between PP, EE, EO and EI.

## 1. Introduction

Entrepreneurship has gained significant attention as an important catalyst for economic growth and development in China [1]. Encouraging and nurturing an entrepreneurial culture among university students is crucial [2] for cultivating future entrepreneurs and driving socio-economic progress. The Chinese government has actively promoted entrepreneurship and innovation among its youth, including university students, to foster economic and sustainable development. Exploring the factors that shape entrepreneurial intention (EI) and behavior among university students in China has emerged as a topic of increasing interest. Entrepreneurship plays a role in the socio-economic advancement of nations, serving as the engine of growth, facilitating job creation and wealth generation, and mitigating income inequality [3,4]. As the number of available jobs decreases and the number of unemployed graduates rises, there is a greater focus on entrepreneurship and innovation to drive economic development and address the employment gap [3–7].

In China's current economic landscape, where the transition to an innovation-driven economy is evident, the importance of cultivating entrepreneurial talents, particularly among university or college students, becomes critical [8]. To fast-track the growth of entrepreneurs, create jobs, and reduce the unemployment rate, universities in China are urged to create structures and frameworks that

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enhance entrepreneurial activities, particularly at the tertiary level [9]. For example, both the Chinese government and higher education institutions have spearheaded entrepreneurship education (EE) courses and promoted participation in entrepreneurship competitions among university students. These initiatives aim to strengthen students' entrepreneurial knowledge, skills, and entrepreneurial intention (EI) [10], promoting a conducive environment for entrepreneurial behavior. EE surfaces as a strategic approach, offering university students the tools and skills needed to navigate the uncertainties and emotional demands inherent in entrepreneurial ventures [11–13]. This aligns with the broader initiatives of the Chinese government and higher education institutions, emphasizing the integration of innovative entrepreneurship ideas into the national curriculum [14]. The emphasis on EE highlights the economic potential of fostering entrepreneurs and also acknowledges the psychological transformation among entrepreneurs. Encouraging entrepreneurial activities among university and college students is viewed as important for driving innovation, job creation, and economic growth [11,15,16]. This approach aligns with the understanding that EI, as a precursor to entrepreneurial behavior, holds a position in shaping the path of individuals toward becoming job creators rather than job seekers [17].

It is important for policymakers and universities to focus on final-year university students and graduates, urging them to contemplate entrepreneurship as a potential career pathway [18] and become job creators rather than job seekers. Understanding the factors that influence EI, which serves as a critical precursor to entrepreneurial behavior, has become a subject of significant interest in entrepreneurship research. EI is an individual's propensity and drive to initiate and manage a business [19]. EI is also a key predictor of entrepreneurial activity [20]. Understanding the key drivers that shape EI among final-year university students in China is essential [14] for policymakers, universities, and researchers to effectively promote and support entrepreneurship.

In our research, we employed the Theory of Planned Behavior (TPB) as the underlying framework. TPB has emerged as a prominent model for understanding human behavior, including EI. According to TPB [21], an individual's attitude towards entrepreneurship (ATE), subjective norms (social pressures as well as expectations), and perceived behavioral control (PBC) (perceptions of personal ability and resources) collectively influence their intention to engage in EI [22]. We excluded subjective norms in our study due to previous research findings indicating a lack of statistical significance when using subjective norms to predict intention [23,24]. It is important to emphasize that the exclusion of subjective norms in this study does not undermine its significance in understanding EI. Instead, previous studies have highlighted limitations in the predictive power of subjective norms, and we opted to investigate other influential factors within the TPB framework. By extending the existing literature and examining alternative components of the TPB, our study aims to explore the potential role played by TPB constructs in shaping the key factors influencing EI. The findings of our study can inform EE programs, policy development, and support mechanisms aimed at fostering a vibrant entrepreneurial ecosystem, ultimately contributing to sustainable economic development in the region.

Our study extends beyond traditional analyses by incorporating psychosocial factors, examining the roles of ATE and PBC on proactive personality (PP), EE, entrepreneurial opportunities (EO), and EI among university students. Specifically, we explore if TPB can be a missing link in predicting the likelihood of starting a business upon graduation. There is a scarcity of studies that have examined the impact of PP on the antecedents of EI among students [1,25,26], and there exists limited understanding regarding strategies to augment the level of EI among graduates [14]. Therefore, our study focuses on TPB as a potential mediator.

- (1) Do ATE and PBC mediate the relationship between PP and EI?
- (2) Do ATE and PBC mediate the relationship between EE and EI?
- (3) Do ATE and PBC mediate the relationship between EO and EI?

These research questions aim to investigate the role of TPB (specifically, ATE and PBC) in the relationships between PP, EE, EO, and EI. Drawing on empirical evidence, our study aims to offer insights for higher education institutions in fostering an entrepreneurial ecosystem that nurtures and harnesses the entrepreneurial potential of final-year university students in China. Our study, therefore, seeks to examine the significance of the TPB in shaping EI among final-year university students in China. The following section outlines the TPB, offers a literature review and establishes hypotheses. This is followed by an outline of our paper's structure, encompassing the research methodology, results, discussion, and implications. Lastly, our paper will conclude with a discussion of the study's limitations, future directions, and conclusion.

## 2. Literature and hypothesis development

### 2.1. TPB

The TPB [21] is widely used to give explanations and predict EI, thereby predicting engagement in entrepreneurial behavior. According to TPB, EI engages in entrepreneurial behavior and serves as both the immediate determinant and the most reliable predictor of said behavior. EI, as a function of ATE and PBC, is well supported by research in the field of entrepreneurship and psychology. ATE represents an individual's positive or negative appraisal of involvement in entrepreneurial activities. Studies have identified a positive link between positive ATE and EI [22–24]. These studies indicate that individuals with favorable ATE are more inclined to possess a stronger intention to pursue EI. PBC refers to an individual's perception of their capability to execute a specific behavior. In the context of entrepreneurship, PBC represents an individual's belief in their capacity to initiate and effectively manage a business. Research has consistently shown that PBC significantly predicts EI [25–27]. Individuals who perceive themselves as having greater control over their entrepreneurial behavior are more inclined to harbor a stronger intention to participate in entrepreneurial activities.

The TPB provides a theoretical framework that supports ATE and PBC as potential determinants of EI. Based on TPB [21], ATE and PBC directly affect one's intention to engage in a specific behavior, subsequently predicting actual behavior. This study proposes that

both ATE and PBC are the potential mediators between PP, entrepreneurial education, EO, and EI. By considering PP, EE, and EO as antecedents, and ATE and PBC as mediators, our proposed model offers insights into the key factors contributing to EI development. Our study contributes to the field by exploring a mediating model and proposing that ATE and PBC play significant roles in explaining the relationship between the antecedents (PP, EE, and EO) and EI.

## 2.2. PP, ATE, PBC and EI

EI, the inclination and motivation to engage in entrepreneurial activities [28], has garnered significant attention in entrepreneurship research. EI is influenced by various individual characteristics. One such individual characteristic is PP, which represents an individual's propensity to take initiative [29], demonstrate proactive behaviors, and exert control over their environment. Studies consistently show a positive link between PP and EI [1,30–32]. In addition, PP has been associated with higher job performance [33–35], highlighting its relevance in entrepreneurial settings. Another factor that plays a role in EI is ATE. Positive ATE has been found to positively influence EI [21]. Individuals with a positive ATE are more inclined to perceive entrepreneurship as an appealing and feasible career path, consequently fostering a greater propensity to engage in entrepreneurial activities. PBC is another factor that influences EI. PBC signifies an individual's confidence in overcoming challenges and effectively participating in entrepreneurial activities [36]. Research has shown a positive link between PBC and EI [37]. We propose that Individuals with elevated levels of PBC exhibit greater confidence in their capacity to navigate the challenges of entrepreneurship, thus fostering an intention to pursue EI. While previous studies have reported the individual relationships between PP, ATE, PBC, and EI, the specific mechanisms through which PP influences EI remain unclear. Based on the above, we hypothesize.

**Hypothesis 1.** ATE mediates the relationship between PP and EI.

**Hypothesis 2.** PBC mediates the relationship between PP and EI.

## 2.3. EE, ATE, PBC and EI

EE plays a role in shaping individuals' EI by preparing them with the requisite knowledge, skills, and mindset to recognize and pursue EO [33]. Research has investigated the relationship between EE and EI [11,38,39], finding a positive link between the two. These studies suggest that individuals who have undergone EE are more inclined to harbor a stronger intention to engage in EI. The literature suggests that ATE influences EI [21], as individuals with a favorable ATE are more predisposed to EI. We hypothesize that ATE acts as a potential mediator in the link between EE and EI. EE exposes individuals to entrepreneurial knowledge, experiences, and role models, consequently fostering a more positive ATE. As individuals cultivate a stronger ATE, their intention to engage in EI is likely to increase. We also propose that PBC may serve as another mediator between EE and EI. We hypothesize that EE enhances individuals' perception of their ability to control their entrepreneurial behavior, which in turn leads to heightened levels of EI. As individuals feel more confident in their ability to navigate the challenges of entrepreneurship due to their EE exposure, their EI is expected to increase. This dual-mediation model suggests that both ATE and PBC play roles in translating the effects of EE into individuals' EI, thereby providing an understanding of the mechanisms underlying the relationship between EE and EI.

**Hypothesis 3.** ATE mediates the relationship between EE and EI.

**Hypothesis 4.** PBC mediates the relationship between EE and EI.

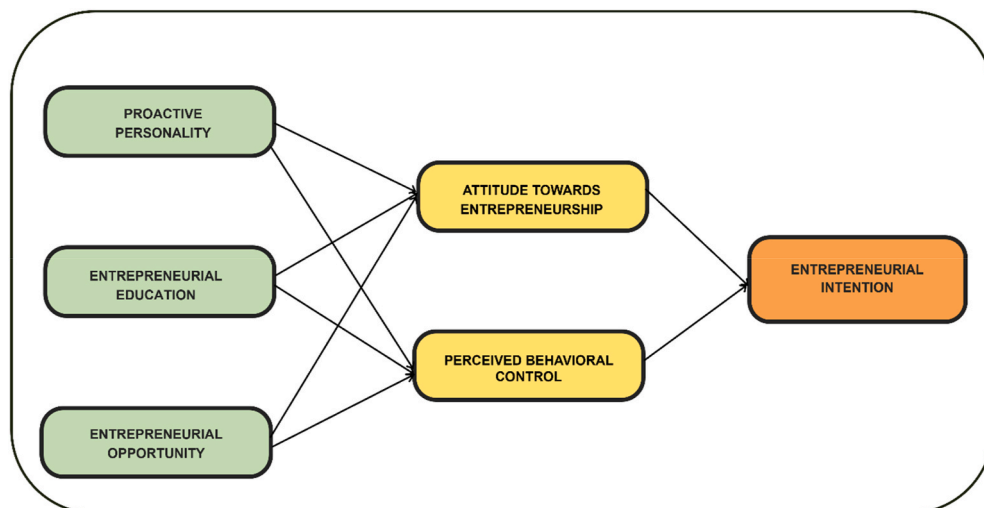


Fig. 1. Our research framework.

## 2.4. EO, ATE, PBC and EI

EO refers to favorable market circumstances that can be leveraged to create new ventures or innovative solutions, constituting a cornerstone of entrepreneurship. Research indicates that EO influences individuals' EI [40–42]. In this study, we propose that EO positively impacts ATE, subsequently leading to heightened levels of EI among individuals. We also hypothesize that PBC mediates the relationship between EO and EI. This supposition stems from the notion that exposure to EO equips individuals with valuable experiences and resources, strengthening their belief in their capability to engage in EI. As individuals perceive greater control over entrepreneurial activities, their intention to pursue entrepreneurship is anticipated to intensify.

**Hypothesis 5.** ATE mediates the relationship between EO and EI.

**Hypothesis 6.** PBC mediates the relationship between EO and EI.

Based on the above literature review, our research model is presented in [Fig. 1](#) below.

## 3. Research methodology

### 3.1. Ethical review

We submitted an application for waiver of ethical review to the university, and it has been approved. A verified copy of the university waiver consent form was submitted to the journal as supplementary evidence of this approval. Before participating in the survey, all participants provided informed consent. Our study employed a cross-sectional research design, which enabled us to examine the interrelationships between PP, ATE, PBC, EE, EO and EI among final-year university students in China.

### 3.2. Respondents

The respondents involved in our study comprised final-year university students who had enrolled at public universities in Shaanxi province, China. Shaanxi province, located in Northwestern China, is home to several reputable public universities. Public universities are often considered the backbone of higher education in China. By focusing on public universities, this study may aim to capture a better view of final-year students in business programs, reflecting the broader population. Public universities often have larger student populations and may be more representative of the overall student demographic in China. In addition, focusing solely on public universities may have provided a more manageable scope for our study. Private universities often vary widely in size, focus, and curriculum offerings, which could introduce additional complexities and heterogeneity to the research design of our study. Employing a purposive sampling technique, we deliberately focused on public universities' final-year students. They were selected because they were likely to plan their career paths and consider EO as a viable option. The final useable sample size for our study comprised 250 participants who met the criteria for inclusion.

### 3.3. Measures

We employed a questionnaire for our data collection. The questionnaire was formulated to encompass pertinent variables associated with EI, including ATE, PBC, PP, EE, and EO. To operationalize these variables, we utilized previously validated scales with established construct validity and reliability. All items, except demographic characteristics, were evaluated using a 5-point Likert scale, where 1 denoted *Strongly Disagree* and 5 indicated *Strongly Agree*. These measurement items are outlined in [Appendix A](#), with the Mandarin version provided in [Appendix B](#).

Attitude Toward Entrepreneurship (ATE): Four items, derived from Liñán and Chen [43], were utilized to measure ATE, with a reported Cronbach's alpha of 0.897.

Perceived Behavioral Control (PBC): We employed six items, adapted from Liñán adapted from Liñán and Chen [43], yielding a Cronbach's alpha of 0.89.

Proactive Personality (PP): Participants' PP was evaluated using five items adapted from Claes et al. [42], with a Cronbach's alpha of 0.79.

Entrepreneurship Education (EE): We included six items sourced from Díaz-Casero, Hernández-Mogollón, and Roldán [44] to assess the impact of entrepreneurship education. The items showed good reliability (Cronbach's alpha = 0.93).

Entrepreneurial Opportunities (EO): The construct was assessed using six items adapted from Chandler and Jansen [45], yielding a Cronbach's alpha coefficient of 0.88.

Entrepreneurial Intention (EI): We employed six items adapted from Liñán and Chen [43] to gauge participants' EI. The reported Cronbach's alpha was 0.943.

### 3.4. Back translation

Our questionnaire was initially written and validated in English. Most of the relevant literature is researched and documented in English. Due to China's cultural context, a bilingual survey questionnaire was developed, including versions in both English and Mandarin (See [Appendices A and B](#) for the measurement items). The translation process followed the recommended back-to-back

translation method [46], ensuring linguistic equivalence and maintaining the validity and reliability of the instrument. Professional translators, proficient in both English and Mandarin, were appointed to carry out the translations, ensuring accurate and culturally appropriate language adaptation. This approach aimed to facilitate better understanding and participation among the final-year students in China's public universities.

### 3.5. Pre-test

As recommended by Douglas and Craig [46], the back translation process should be accompanied by pre-testing to address issues concerning respondent comprehension and the intended meaning of the questions. The pre-test allows researchers to identify and rectify any potential issues related to comprehension and meaning that may arise in the translated version of the survey. Therefore, prior to the actual data collection, a pre-test was conducted. Ten surveys were distributed to final-year students from China's public universities. The respondents were requested to provide feedback by writing down their comments or suggestions on the questionnaires. Only five out of the ten respondents provided the requested feedback. The survey was then refined to address any identified areas for improvement or clarification.

### 3.6. Data collection

The data collection process involved distributing a self-administered survey to the participants, who were given approximately 15–20 min to complete it. Respondents were provided with clear instructions and informed about the study's purpose and significance before completing the survey. A small honorarium was provided to each respondent who completed the survey to encourage participation and ensure a satisfactory response rate. The collection of data took place between January and April 2023. Out of 400 questionnaires distributed, 261 were returned. Upon screening for completeness and accuracy, only 250 questionnaires with a useable response rate of 62.50 %. The data were subsequently analyzed using PLS-SEM.

## 4. Results

Table 1 summarizes the respondents' profiles. Over half of the respondents were male (58 %). All of the respondents fall within the 21–22 age group. About one-third were majoring in management (32 %), followed by economics and education, accounting for 17 % and 13 % of the respondents, respectively. When it comes to entrepreneurial ideas, over four-fifths (81 %) reported having such ideas, indicating a relatively high level of EI among final-year university students in China. When asked about their entrepreneurial experience, about one quarter (24 %) reported having previous entrepreneurial experience, suggesting that a significant portion of the final-year university students in China have already gained practical exposure to entrepreneurship.

### 4.1. Common method variance

The hypotheses were tested using PLS-SEM, a commonly employed analytical technique in research. To ensure the accuracy and reliability of the results, the issue of common method variance (CMV) must be addressed. To mitigate this concern, the approach suggested by Hair et al. [47] was followed by randomly ordering the questionnaire items to minimize potential CMV effects. In addition, we employed Harman's single-factor test, a widely used technique for statistically controlling CMV. This involved subjecting

**Table 1**  
Respondents' demographic profile (N = 250).

Demographic Characteristic	Frequency	Percentage (%)
Gender		
Male	145	58.0
Female	105	42.0
Age		
21-22	250	100.0
Academic Major		
Management	81	32.4
Economics	42	16.8
Education	32	12.8
Engineering	30	12.0
Art	22	8.8
Science	20	8.0
Medicine	18	7.2
Others	5	2.0
Had Entrepreneurial Ideas		
Yes	203	81.2
No	47	18.8
Had Entrepreneurial Experience		
Yes	59	23.6
No	191	76.4

all indicators to exploratory factor analysis and examining the unrotated component matrix to identify influential factors explaining the variability in the variable. Our findings suggest that CMV was not a significant concern in our study. The analysis revealed that the first component explained 23 % of the total variation out of the 61 % observed in the data. This indicates that CMV did not exert a dominant influence on the results, affirming the validity and reliability of our findings.

#### 4.2. Measurement model

Data analysis was conducted using PLS-SEM. Construct validity, which encompasses convergent validity (CV) and discriminant validity (DV), was examined. In order to assess CV, it is necessary for the factor loadings of the indicators to exceed 0.71 [47], indicating a strong relationship between the indicators and their respective constructs. The average variance extracted (AVE) score should surpass 0.50 [47], indicating that a substantial amount of variance is explained by the indicators while taking into account the variance explained by measurement errors [47]. The loadings of the items exceeded the recommended value of 0.70. The AVE of all constructs was higher than the recommended threshold of 0.50. The composite reliability (CR) values ranged from 0.82 to 0.95, surpassing the recommended cut-off value of 0.70 as proposed by Hair et al. [47]. This indicates that the measurement model demonstrated satisfactory reliability, suggesting strong internal consistency among the items within each construct. The CV for these constructs has been achieved. Table 2 below shows our measurement model results.

The Heterotrait-Monotrait (HTMT) ratio was employed to confirm the DV in this study. This approach, as proposed by Henseler et al. [48], is widely acknowledged for assessing the distinctiveness of constructs. Henseler et al. [48] suggested two threshold values for the HTMT ratio: 0.85 and 0.90. They argued that the HTMT ratio offers more precise and significant results compared to the commonly used Fornell-Larcker criterion [49]. Table 3 presents the values, all within the specified threshold, further supporting the DV of the measures employed.

According to Ringle et al. [50],  $R^2$  values falling between 0.02 and 0.12 are categorized as weak, those ranging from 0.13 to 0.25 are considered moderate, and values exceeding 0.26 indicate substantial explanatory power. However, it is crucial to interpret these figures within the specific context of the research [47]. The  $R^2$  values reported for ATE (0.34), PBC (0.36), and EI (0.58) were substantial in this study. All three endogenous variables demonstrated significant explanatory power.

Hair, Hult, Ringle, and Sarstedt [51] suggested that when testing mediating effects, researchers should follow the methods proposed by Preacher and Hayes [52], which involve bootstrapping the sampling distribution. The bootstrapping was employed to investigate the mediating effects, which is particularly suitable for PLS-SEM due to its flexibility regarding distribution assumptions. This method allows examination of the indirect effects between variables and assessment of their significance. Bootstrapping was

**Table 2**  
Results of the measurement model.

Construct	Measurement item	Loadings	CR	AVE
Attitude Towards Entrepreneurship	ATE1	0.78	0.86	0.61
	ATE2	0.88		
	ATE3	0.87		
	ATE4	0.76		
Perceived Behavioral Control	PBC1	0.74	0.91	0.64
	PBC2	0.84		
	PBC3	0.87		
	PBC4	0.79		
	PBC5	0.84		
	PBC6	0.70		
Proactive Personality	PP1	0.76	0.84	0.52
	PP2	0.79		
	PP3	0.74		
	PP4	0.71		
	PP5	0.78		
Entrepreneurial Education	EE1	0.79	0.91	0.62
	EE2	0.75		
	EE3	0.79		
	EE4	0.79		
	EE5	0.85		
	EE6	0.77		
Entrepreneurial Opportunity	EO1	0.81	0.90	0.64
	EO2	0.80		
	EO3	0.74		
	EO4	0.82		
	EO5	0.83		
Entrepreneurial Intention	EI1	0.85	0.95	0.75
	EI2	0.85		
	EI3	0.88		
	EI4	0.87		
	EI5	0.90		
	EI6	0.84		

**Table 3**  
HTMT criterion for discriminant validity assessment.

	ATE	PBC	PP	EE	EO	EI
Attitude Towards Entrepreneurship (ATE)						
Perceived Behavioral Control (PBC)	0.65					
Proactive Personality (PP)	0.55	0.54				
Entrepreneurial Education (EE)	0.51	0.41	0.35			
Entrepreneurial Opportunity (EO)	0.60	0.61	0.58	0.51		
Entrepreneurial Intention (EI)	0.77	0.74	0.54	0.40	0.50	

performed on 250 cases with 1000 samples. Our findings demonstrated that five out of six mediation effects were statistically significant. Table 4 summarizes a structural model analysis examining the indirect effects of PP, EE, and EO on EI.

We observed significant mediating effects in our study, as illustrated in Fig. 2. To answer the first research question, we investigated if ATE and PBC mediate the relationship between PP and EI among final-year university students in China. Our findings indicate that both ATE and PBC serve as significant mediators in this relationship. Specifically, ATE acts as a mediator between PP and EI ( $\beta = 0.10$ ), supporting H1. PBC was found to mediate between PP and EI ( $\beta = 0.10$ ), supporting H2. These results provide support for the mediation hypothesis in the context of final-year university students in China.

For the second research question, we examined if ATE and PBC mediate the relationship between EE and EI among final-year university students in China. Our analysis revealed mixed results. Only ATE served as a mediator in this relationship ( $\beta = 0.09$ ), supporting H3. No evidence to support PBC as a mediator between EE and EI ( $\beta = 0.05$ ), leading to the non-support of H4. These findings suggest that while ATE plays a mediator between EE and EI, PBC does not exhibit a significant mediating effect in this context.

Lastly, we investigated whether ATE and PBC mediate EO and EI among final-year university students in China. Our results demonstrate that both ATE and PBC act as significant mediators in this context. Specifically, ATE was found to mediate the relationship between EO and EI ( $\beta = 0.13$ ), further supporting H5. Similarly, PBC was identified as a mediator between EO and EI, with a significant beta coefficient ( $\beta = 0.16$ ), confirming H6. These findings provide evidence for both ATE and PBC as mediators in the EO-EI relationship among final-year university students in China.

## 5. Discussion

The findings of our study offer insights into the mechanisms underlying EI. By examining the TPB construct (ATE and PBC) as mediators in different contexts, we contribute to a broader understanding of how individual characteristics, educational experiences, and perceived opportunities influence EI. Our study sheds light on the specific context of Chinese university students and also adds to the growing body of literature on EI. PP has long been recognized as a significant predictor of entrepreneurial outcomes [1,24,42,53]. Our study extends this understanding by demonstrating that PP partially influences EI through its effects on ATE and PBC. This aligns with existing research highlighting the importance of psychological factors in shaping EI [6,11,24,25,35]. By explaining the mediating roles of ATE and PBC, our study contributes to the understanding of how individual traits contribute to EI and emphasizes the need to address psychological factors in EE and intervention programs.

In examining the TPB construct (ATE and PBC) in the EE-EI relationship, our findings reveal mixed insights. While ATE significantly mediated this relationship, PBC did not exhibit a significant mediating effect. This suggests that while fostering a positive ATE through education programs can enhance EI, PBC may not play as significant a role in translating EE into intentions among Chinese university students. This finding reveals the importance of cultivating a favorable ATE in educational interventions aimed at fostering EI among students. This finding suggests a need for further exploration of the mechanisms through which EE influences EI. It is possible that EE in

**Table 4**  
Structural model indirect effect.

Hypothesis	Indirect Path	Std. Beta	Std. Error	t-value	LL (95 %)	UL (95 %)	p-values	Decision
H1	Proactive Personality > ATE > Entrepreneurial Intention	0.10	0.04	2.71 <sup>b</sup>	0.03	0.18	0.01	Supported
H2	Proactive Personality > PBC > Entrepreneurial Intention	0.10	0.04	2.65 <sup>b</sup>	0.03	0.18	0.01	Supported
H3	Entrepreneurial Education > ATE > Entrepreneurial Intention	0.09	0.04	2.24 <sup>a</sup>	0.02	0.17	0.03	Supported
H4	Entrepreneurial Education > PBC > Entrepreneurial Intention	0.05	0.03	1.52	-0.01	0.11	0.13	Not supported
H5	Entrepreneurial Opportunity > ATE > Entrepreneurial Intention	0.13	0.04	3.52 <sup>b</sup>	0.05	0.20	0.00	Supported
H6	Entrepreneurial Opportunity > PBC > Entrepreneurial Intention	0.16	0.03	4.73 <sup>b</sup>	0.10	0.24	0.00	Supported

Note.

<sup>a</sup>  $p < 0.05$ .

<sup>b</sup>  $p < 0.01$  (based on a two-tailed test with 1000 bootstrapping).

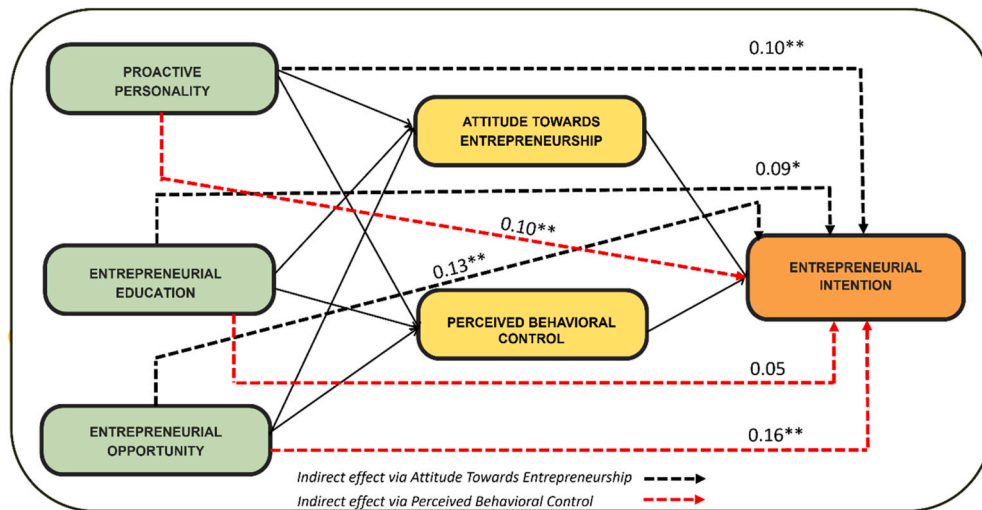


Fig. 2. Our structural model.

public universities in China may primarily focus on theoretical knowledge rather than practical experiences. As a result, students may gain knowledge about entrepreneurship and develop a sense of PBC. However, despite acquiring knowledge through EE, individuals may face challenges in applying this knowledge in real-world scenarios. This concern is supported by Luo, Huang, and Gao [53], who highlight weaknesses in EE within Chinese universities. These weaknesses include a shortage of qualified academic staff, inadequate curriculum design, educational models, and supporting mechanisms. Such shortcomings in EE programs may hinder students' ability to translate theoretical knowledge into practical entrepreneurial activities. Li et al. [54] also added that the deficiencies in EE within Chinese higher education institutions are primarily in curriculum design, qualified entrepreneurship educators, EE and support systems for EE. This finding reveals the need for tailored approaches in entrepreneurship education, considering cultural and contextual factors. Furthermore, our study highlights the importance of addressing attitudinal factors in educational interventions aimed at fostering EI among students.

In addition, our findings demonstrate that the TPB constructs (both ATE and PBC) significantly mediate the EO-EI relationship. This reveals the importance of addressing attitudinal and perceived control factors in promoting EI, especially in the presence of perceived EO [25]. Our findings add an understanding of how perceived EO translates into EI and emphasize psychological factors in entrepreneurial activities. Our findings offer valuable insights for higher education institutions and educators seeking to stimulate entrepreneurial activities among university students in China by emphasizing the importance of fostering positive attitudes and enhancing PBC towards entrepreneurship, especially when entrepreneurial opportunities arise.

Overall, our discussion reveals the importance of psychological factors, particularly ATE and PBC, in shaping EI. While both ATE and PBC are psychological factors that influence EI, they operate through different mechanisms. ATE primarily reflects individuals' attitudes and beliefs related to entrepreneurship, whereas PBC focuses on individuals' perceptions of their ability to enact entrepreneurial behaviors and control the outcomes of those behaviors. Together, these psychological factors play important roles in shaping individuals' tendencies to engage in EI. Recognizing the influential role of attitudes and perceptions towards entrepreneurship, as well as individuals' beliefs in their ability to succeed as entrepreneurs, is important for devising effective interventions and policies aimed at fostering EI. By addressing psychological factors through targeted interventions, policymakers and educators can empower individuals to pursue entrepreneurial opportunities and contribute to fostering a culture of innovation and entrepreneurship.

### 5.1. Implications

Our findings shed light on how ATE and PBC mediate the relationship between various factors and EI, providing insights into the relationship between individual psychological traits and EI within the Chinese context. By integrating insights from TPB [21], our study offers a framework for understanding EI among university students in China and contributes to the broader literature on entrepreneurial behavior. Our study highlights the importance of these psychological factors in explaining the relationships between PP, EE, EO, and EI.

In terms of practical implications, universities can utilize the insights provided to develop more effective and targeted EE programs. By focusing on cultivating PP traits, fostering positive ATE, and enhancing PBC, universities have the potential to enhance students' readiness for EI by providing them with essential knowledge, skills, and a proactive mindset. For example, universities develop initiatives to foster positive ATE among students such as organizing guest lectures, networking events, and mentorship programs featuring successful entrepreneurs to inspire and motivate students to pursue entrepreneurship. Besides, policymakers and universities can use the identified weak links in the EE system to enhance the quality and relevance of EE. Revising curriculum designs, enhancing teacher qualifications, exploring innovative educational models, and strengthening supporting mechanisms are examples of improving



EE. In addition, EE should focus on enhancing students' perceived control over their entrepreneurial activities. Providing training in problem-solving, decision-making, and resources (such as offering mentorship and support) to help students overcome obstacles and challenges are key components of EE aimed at equipping students with the practical skills and resilience necessary for entrepreneurial success.

## 5.2. Limitations and future direction

Our study has its limitations. Firstly, reliance on data from public universities in Shaanxi Province, China, may restrict the generalizability of our results. More samples from another context can gain a better understanding of EI among students across different contexts. Secondly, self-report measures are susceptible to social desirability biases, and future research could incorporate social desirability scales to mitigate the impact of biases on EI measures and related constructs. Thirdly, the cross-sectional nature of our study design presents limitations in establishing causal relationships between variables. Longitudinal studies can be employed to overcome this constraint. Lastly, future research should consider expanding the proposed model by examining the effects of other relevant variables such as well-being, sustainability factors, course quality, and other potential determinants of EI. Exploring the relationship between well-being, sustainability, and EI can offer insights into the psychological and environmental factors influencing students' entrepreneurial aspirations. This broader perspective can aid in the development of strategies and interventions to promote entrepreneurship and cultivate sustainable entrepreneurial ecosystems.

## 6. Conclusion

In conclusion, our study has provided insights into the psychological mechanisms underlying EI. By applying the TPB framework and examining the mediating roles of ATE and PBC, we have advanced our understanding of the factors influencing EI. Our findings highlight the significance of PP, entrepreneurship education, and EO in shaping individuals' ATE and PBC, ultimately influencing EI. By understanding the roles of ATE and PBC as underlying mechanisms and addressing the identified weak links, educators and policymakers can collaborate to cultivate a supportive environment for the development of EI and ultimately promote entrepreneurship among university students.

### Data availability statement

Data will be made available on request.

### Additional information

No additional information is available for this paper.

### Ethics declarations

By completing the questionnaire provided, participants are indicating their consent to participate in the study.

### CRedit authorship contribution statement

**Zhecheng Huang:** Writing – review & editing, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Daisy Mui Hung Kee:** Writing – review & editing, Writing – original draft, Visualization, Validation, Formal analysis, Conceptualization.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e31714>.

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