



An Empirical Study of Students' Entrepreneurship Analysis Based on Data Mining Technology

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Abstract. Entrepreneurship and innovation can effectively promote economic development and social progress, so it is widely concerned by all sectors of society. College students are important objects of entrepreneurship, but the success rate of entrepreneurship of college students is low at present. How to improve their entrepreneurial willingness is an important problem that needs to be solved urgently at present. The quantitative analysis and prediction of college graduates are rare, so the data mining technology is applied to the analysis of college entrepreneurship. This study analyzes the relationship between entrepreneurship education and entrepreneurial willingness of college students, and introduces variable family income to analyze its regulatory role in the relationship between the two. Firstly, a questionnaire survey was conducted on college students, and the data were sampled and preprocessed. Secondly, the regression analysis and adjustment analysis method of data mining are applied to explore the influencing factors of college students' entrepreneurship. The results show that entrepreneurship education and its four dimensions have a positive impact on college students' entrepreneurial willingness. Family income has a significant positive regulatory correlation with the four dimensions of the relationship between entrepreneurial willingness and entrepreneurial education.

Keywords: data mining · data analysis · entrepreneurial intention · Entrepreneurship education

1 Introduction

Economic development cannot be separated from innovation and entrepreneurship, and entrepreneurship and innovation are the keys to the transformation of economy from rapid development to high-quality development. Young people are the new hope of the Chinese nation and the backbone of China's economic and social development. Innovation is an important driving force for social and economic development and can effectively improve people's livelihood. In 2015, China launched the policy of "mass entrepreneurship and innovation" to encourage people from all walks of life to join the

entrepreneurial team, making entrepreneurship a common pursuit. College students play an important role in innovation and entrepreneurship. How to improve college students' entrepreneurial willingness and cultivate more high-quality talents with entrepreneurial ability is a problem that colleges and universities need to solve.

In recent years, computer, data mining and other related technologies have made great progress. At the same time, as colleges and universities pay more attention to data mining technology, China is gradually establishing a national demonstration employment information public service platform that covers college students nationwide and integrates functions such as two-way selection, information consultation and decision support. The establishment and improvement of data collection channels provide the foundation for the application of data mining. Through data mining and data analysis technology, the prediction target can be quantitatively measured.

Considering the quantitative analysis and prediction of our university graduate is still very little, in order to enhance the understanding of entrepreneurial behavior and process, and explore the important factors that affect entrepreneurship, this paper uses data mining and mathematical statistics to study the willingness of college students to start a business. Through this study, we hope to achieve the detailed classification of college students from the perspective of entrepreneurship education, explore the impact of various factors on entrepreneurial willingness, help colleges and universities improve the entrepreneurship education system, and cultivate college students' innovation and entrepreneurship.

2 Related Works

2.1 Entrepreneurship Education

As entrepreneurship plays an important role in promoting social development, the research on entrepreneurship education has also been the focus of scholars. The research on entrepreneurship education in China is still at an early stage of exploration. The main research directions include the content, influencing factors, development path and innovation of entrepreneurship education. Huang Zhaoxin (2013) and others defined the concepts of entrepreneurship education and professional education, pointed out the differences between the two, further divided the education content of entrepreneurship education, and pointed out that China's entrepreneurship education should be combined with professional knowledge to form a special education system according to the national conditions [1]. Professor Shao Defu (2018) argued that the key to entrepreneurship education is to shape people's personality and cultivate talented people with spirit. Entrepreneurship training should be carried out for the whole society, especially for those who are willing to start a business, focusing on cultivating their entrepreneurial ability [2]. Tang Xiaoming (2018), taking the Internet as the background, pointed out that entrepreneurship education is greatly affected by the Internet, and should make full use of the characteristics of the Internet to enrich the way and content of entrepreneurship education with the Internet as the knowledge carrier [3].

2.2 Entrepreneurship Willingness

Intention was originally used to describe people's psychological activities, which refers to certain requirements that people hope to meet, and later used as an objective indicator to measure and predict behavior [4]. Entrepreneurship intention was first put forward in 1988 [5] and defined as a psychological state of wanting to establish a new enterprise, which refers to the attitude towards entrepreneurial activities.

Domestic scholars usually analyze the influencing factors of entrepreneurial willingness based on theoretical models. Li Yong qiang (2008) used the Theory of Planned Behavior (TPB) to build a model of influencing factors of entrepreneurial willingness, proving that planning has a significant role in entrepreneurial willingness [6]. Lin Song (2012) expanded the TPB model on the basis of the original model and believed that entrepreneurial activities were affected by a variety of factors in the entrepreneurial process, such as psychological conditions, family relations, etc. [7]. Wang Wei qing (2018) used the factor model to analyze the influencing factors of entrepreneurial willingness, and took students from Beijing University of Science and Technology as experimental samples. Through empirical analysis, he proved that personal quality, education, schools, families and society have the greatest impact on entrepreneurial willingness, pointing out that personal quality is the most influential factor on entrepreneurial willingness, and provided suggestions for universities, governments and individuals to cultivate entrepreneurial willingness and improve entrepreneurial ability [8]. Domestic scholars' research on entrepreneurial willingness has expanded the application scope of the model and improved relevant models, which plays an important role in explaining entrepreneurial behavior and promoting entrepreneurial development.

The research achievements of foreign academic circles mostly focus on the construction of theoretical models. The existing models generally include three types: first, the theory of planned behavior, which advocates that people's economic activities are planned, and divides the factors that affect human behavior into three types: attitude, subjective norms, and perceptual behavior. The second is the entrepreneurial event theory (SEE), which analyzes the main influencing factors of entrepreneurs' behavior and points out that entrepreneurial willingness is mainly affected by the following two perceptions: first, the feasibility perception, that is, the entrepreneurs' assessment of whether their entrepreneurship is successful before entrepreneurship; The second is consensus perception, that is, the attraction of entrepreneurial success to oneself [9]. The third is the theory of self-efficacy (TES), that is, their own judgment of whether they can succeed in entrepreneurship, as well as entrepreneurial behavior and self-efficacy that affect each other [10]. Tsai et al. (2016) proved the applicability of TES model in the field of entrepreneurial intention research through empirical analysis of college students [11].

2.3 Family Background and Entrepreneurial Willingness

There are relatively few studies on the relationship between family income and entrepreneurial intention, and only a few literatures analyze it from one or more perspectives of family background. Professor Song Shuai hua (2020) and others focused on analyzing the impact of family education background, believing that parents' education level, family economic level, etc. will affect children's entrepreneurial willingness, and

proved that these two factors have a significantly positive correlation on entrepreneurial willingness through empirical analysis [12]. Ai Yu shan (2019) pointed out that some personal characteristics of college students will have an impact on their will, and proved this conclusion through empirical analysis [13].

3 Research Design

3.1 Theoretical Model Construction

This paper mainly analyzes the relationship between entrepreneurship education, family income and entrepreneurial intention, and the model is shown in Fig. 1. Entrepreneurial education is an independent variable, entrepreneurial intention is a dependent variable, and family income is a regulatory variable of the relationship between the two. Entrepreneurial education includes four dimensions, namely, psychological quality, awareness, knowledge and ability related to entrepreneurship. Through this model, we can find the relationship between entrepreneurial education and its dimensions, entrepreneurial willingness and family income, and make contributions to promoting research on entrepreneurial willingness.

3.2 Research Hypothesis

3.2.1 Assumptions Related to Entrepreneurship Education

Many studies have proved that entrepreneurship education has a significant impact on entrepreneurial willingness. Xiang Hui (2014)'s research shows that there is a positive correlation between the two, that is, students who have received relevant education have stronger entrepreneurial willingness and more self entrepreneurial ability than students who have not received education [14]. Bai Yu (2016) found in his research that

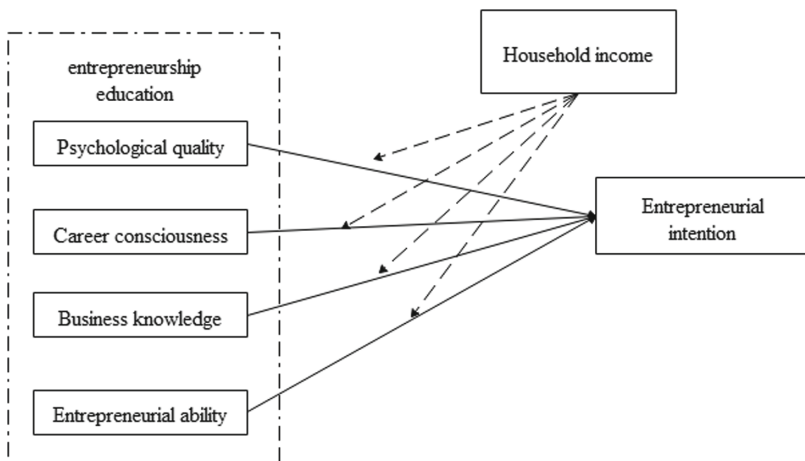


Fig. 1. The relationship between family income, entrepreneurship education and entrepreneurial willingness [self-painted]

entrepreneurship education can change my will. Although some college students have no intention of starting a business, they may have entrepreneurial intention after receiving entrepreneurship related education [15]. Hao Wanlin (2017) believes that education plays an important role in promoting the generation of entrepreneurial intentions. Through education, some knowledge about entrepreneurship can be provided to enable college students to generate entrepreneurial intentions [16]. Zhang Xiu'e (2018) and others believed that the entrepreneurial process was teachable, and systematically analyzed the influencing factors on the willingness of entrepreneurs using the theory of planned behavior. Experimental research shows that innovation and entrepreneurship education has a positive impact on the willingness of entrepreneurs [17]. Yan Qiaoqiao (2015) divided entrepreneurship education into four dimensions, namely, the psychological quality, entrepreneurial awareness, entrepreneurial knowledge and entrepreneurial ability of entrepreneurs. He studied the relationship between each dimension and entrepreneurial willingness. This paper uses this literature for reference to divide entrepreneurship education into the same four dimensions [18]. To sum up, we can make assumptions:

H1: Entrepreneurship education is positively correlated with entrepreneurial willingness. Entrepreneurship education has a positive and positive impact on entrepreneurial willingness, that is, entrepreneurship related education can promote the generation of entrepreneurial willingness.

Since entrepreneurship education can be divided into four dimensions, the following assumptions can be made for the breakdown of H1:

Hypothesis H1a: entrepreneurial psychological quality and entrepreneurial willingness show a significant positive correlation. The higher the score of entrepreneurial psychological quality, the stronger the entrepreneurial intention.

Hypothesis H1b: There is a significant positive correlation between entrepreneurial awareness and entrepreneurial willingness. The better the entrepreneurial awareness, the stronger the entrepreneurial will.

Hypothesis H1c: entrepreneurial knowledge and entrepreneurial willingness show an obvious positive correlation. The richer the entrepreneurial knowledge, the stronger the entrepreneurial willingness.

Hypothesis H1d: there is a significant positive correlation between entrepreneurial ability and entrepreneurial willingness. The higher the entrepreneurial ability, the stronger the entrepreneurial willingness.

3.2.2 Assumptions Related to Household Income

People's family environment has an impact on their own characteristics and ideas, and people's behavior is driven by their own characteristics or ideas. Ge Baoshan (2010) pointed out that personal characteristics will have an impact on entrepreneurial willingness, for example, innovation ability will have a positive impact on entrepreneurial willingness, while network skills have a negative impact [19]. Xie Liren (2011) studied the relationship between college students' entrepreneurial personality and entrepreneurial willingness by constructing a structural equation. The study proved that personal personality, such as pursuing progress and change, and having autonomy, is conducive to improving the growth of entrepreneurial willingness. At the same time, the study also showed that achievement motivation has a small impact on entrepreneurial willingness

[20]. Ai Yushan (2019) pointed out that some personal characteristics of college students will have an impact on their will, and proved this conclusion through empirical analysis [13]. Song Shuaihua (2020) and others mainly analyzed the influence of family background, believed that family economic level would affect children's entrepreneurial willingness, and proved that these two factors had a significant positive correlation on entrepreneurial willingness through empirical analysis [12]. Based on the above analysis, we make the following assumptions:

Hypothesis H2: Family income has a positive moderating effect on the relationship between entrepreneurship education and entrepreneurial willingness. The higher the family income level is, the stronger the relationship between entrepreneurship education and entrepreneurship willingness is.

Since entrepreneurship education can be divided into four dimensions, it can correspond to four sub assumptions:

H2a: Family income has a positive regulatory effect on the relationship between entrepreneurial psychological quality and entrepreneurial willingness: the higher the family income level, the stronger the positive relationship between entrepreneurial psychological quality and entrepreneurial willingness.

H2b: Family income has a positive regulatory effect on the relationship between entrepreneurial awareness and entrepreneurial willingness: the higher the family income level, the stronger the positive relationship between entrepreneurial awareness and entrepreneurial willingness.

H2c: Family income has a positive moderating effect on the relationship between entrepreneurial knowledge and entrepreneurial willingness: the higher the family income level, the stronger the positive relationship between entrepreneurial knowledge and entrepreneurial willingness.

H2d: Family income has a positive moderating effect on the relationship between entrepreneurial ability and entrepreneurial willingness: the higher the family income level, the stronger the positive relationship between entrepreneurial ability and entrepreneurial willingness.

3.3 Questionnaire Design and Survey

3.3.1 Questionnaire Design

The questionnaire contains specific contents of the following four components. The first part is about the information of the respondents, involving three items: gender, age and monthly income. The second part is family income, with 1 item in total. The third part is entrepreneurship education, including four dimensions and 21 topics. The fourth part is entrepreneurial intention, which has five topics. 3. The four parts are all in the form of Likert's scale. Each question has five choices (1, 2, 3, 4, 5), representing five levels, namely, the degree of approval of the options.

3.3.2 Respondents

This research mainly studies the entrepreneurship education and entrepreneurship willingness of college students. In the process of research, it is found that: the entrepreneurship willingness of college students in the first two years of college has not been finalized,

which may be affected by personal growth experience and entrepreneurship education in college, and there is still a large possibility of change. Therefore, only the data of fresh graduates are studied. The survey data were summarized and 711 questionnaires were obtained. Male and female accounted for 54.24% and 45.76% of the total respectively, and female samples were more than male samples. As the investigated samples are school students, the proportion of samples between the ages of 18 and 25 years old is large, which has exceeded 50%. The samples under the age of 18 and over 30 years old do not exceed 20% of the total samples. In terms of personal income, 45.76% of the samples were below 1000 yuan, 19.07% and 19.92% of the samples were between 2000 yuan and 3000 yuan and 4000 yuan respectively, and 45.25% of the samples were above 4000 yuan.

3.3.3 Questionnaire Distribution

The questionnaire was distributed in various forms, such as online distribution, paper questionnaire, WeChat questionnaire, etc., in an attempt to obtain more effective questionnaires through various forms. Considering the actual needs, the distribution objects are mainly college students from different families. In order to make the questionnaire more reasonable and effective, the gender, age and monthly income of the research objects are controlled. A total of 750 questionnaires were sent out, including 250 paper-based surveys and 500 online surveys. 238 effective paper-based surveys were received and 473 effective online surveys were received, totaling 711, with an effective rate of 94.8%.

3.4 Research Scale

The questionnaire is in the form of Likert Scale. The measurement tools of entrepreneurship education, entrepreneurial willingness and family income are as follows:

3.4.1 Entrepreneurial Education Scale

This scale is based on the measurement of entrepreneurship education by the scholar Professor Yan Qiaoqiao (2015) [18]. It divides entrepreneurship education into four dimensions, each involving 4–6 questions. At the same time, the reliability and validity of the scale were tested, which showed that the setting of the scale met the requirements of reliability and effectiveness.

3.4.2 Entrepreneurial Willingness Scale

Taking the measurement tool [21] adopted by Liang Yuanxi (2017) as a reference, the scale set five questions, namely: 1) I believe I will start a business in the future; 2) Entrepreneurship is more attractive to me than ordinary work; 3) If there is an appropriate opportunity, I will choose to start a business; 4) I think that even if we encounter difficulties, we will still choose to start a business; 5) I think it is more likely that I will start a business successfully in the next five years. At the same time, the reliability and validity of the scale were tested, and its value was greater than 0.8, KMO value was

greater than 0.8, indicating that the items in the scale were set reasonably and could be used for subsequent analysis.

3.4.3 Household Income Scale

The scale divides household income into four levels: below 50000, 50000–150000, 150000–300000, 300000–800000 and above 800000. Similarly, the reliability and validity of the collected data of the scale shall be tested, and the next step of measurement and analysis shall be carried out after meeting the requirements.

4 Research Process and Result Analysis

4.1 Reliability Analysis

Likert scale is the form of the questionnaire designed in this paper, so it can use reliability to judge the reliability of the scale. Reliability is generally one of the important indicators to evaluate the reliability of the questionnaire, and Cronbach is usually used α The coefficient is between 0 and 1. The larger the value, the higher the reliability of the questionnaire. Calculate the whole of each variable separately α Coefficient and α The results are shown in Table 1.

It can be found from this table that the Cronbach coefficient of the questionnaire as a whole is 0.968, which is far greater than 0.9, indicating that the reliability is quite high and can be used for further analysis and research. In the four dimensions of independent variable entrepreneurship education, the Cronbach coefficient of all dimensions is not less than 0.9, and the Cronbach coefficient of the dependent variable is 0.95 (>0.9), which shows that the scale designed in the questionnaire is very reasonable and can truly and comprehensively reflect the impact of variables, that is, the analysis of the variables in this questionnaire is reliable.

Table 1. Reliability Statistics of Each Variable [self-painted]

variable	Cronbach coefficient α	Number of items
Entrepreneurship psychological quality	0.905	4
Entrepreneurship knowledge	0.900	5
Entrepreneurship	0.935	6
Entrepreneurship awareness	0.926	6
Entrepreneurship education	0.955	21
Entrepreneurship willingness	0.950	5
Overall questions of the questionnaire	0.968	26

Table 2. KMO and Bartlett Test Results [self-painted]

Variables	Cronbach coefficient	Number of questions
Psychological traits	0.905	4
Business knowledge	0.900	5
Entrepreneurial ability	0.935	6
Career consciousness	0.926	6
Entrepreneurial education	0.955	21
Entrepreneurial intention	0.950	5
Total questions	0.968	26

4.2 Validity Analysis

4.2.1 Exploratory Factor Analysis

First of all, KMO and Bartlett's spherical test are conducted on the scale data. When the KMO value is greater than 0.5 and the significance level is less than 0.05, factor analysis can be used. KMO and Bartlett test results are shown in Table 2. It can be found that the KMO values of psychological quality, entrepreneurial awareness, entrepreneurial knowledge and entrepreneurial ability are 0.634, 0.665, 0.828 and 0.883 respectively, which are greater than 0.5, and the significance level is less than 0.05, meeting the requirements of factor analysis; The overall KMO value of entrepreneurship education is 0.852, and the KMO value of entrepreneurial willingness is 0.912. The significance level of both is less than 0.05, which meets the conditions of factor analysis. To sum up, the overall validity of the survey sample is relatively ideal, which can be used for further factor analysis.

SPSS was used for factor analysis, and the rotated factor load matrix of each dimension was obtained. The factor load of all items was greater than 0.4, indicating that the questionnaire had good structural validity. After getting the rotation component matrix of each dimension, factor analysis is carried out on the variables, and the maximum variance method and principal component analysis are used to rotate the factors of each dimension to extract the factors with large load. Through SPSS analysis, a total of 4 common factors were extracted, which can explain 77.983% of the cumulative rate of the initial eigenvalues of the total variance. To sum up, the extracted factors can well represent variables, and their overlapping information is less, which indicates that the table setting is very reasonable and the validity is ideal.

4.2.2 Confirmatory Factor Analysis

Confirmatory factor analysis is conducted by Amos to determine the degree of fitting of the model. The test results are shown in Table 3. Model 1 is a model of entrepreneurship education and entrepreneurship willingness, model 2 is a model of entrepreneurship education and family income, and model 3 is a model of entrepreneurship education, entrepreneurship willingness and family income.

Table 3. Results of goodness of fit test for variables [self-painted]

Model	χ^2/DF	AIC	GFI	NNFI	CFI	RMSEA
Model 1	1.968	711.183	0.725	0.874	0.887	0.084
Model 2	2.192	696.028	0.742	0.889	0.912	0.078
Model 3	2.452	592.251	0.835	0.916	0.926	0.063

Table 4. Pearson Correlation Analysis Results between Variable Dimensions [self-painted]

	psychological quality 1	Knowledge 2	Entrepreneurship 3	Awareness 4	Intention 5	Family income 6
1	1					
2	0.321**	1				
3	0.598**	0.592**	1			
4	0.587**	0.593**	0.760**	1		
5	0.667**	0.675**	0.787**	0.848**	1	
6	0.605**	0.619**	0.560**	0.563**	0.717**	1

**Indicates significant correlation at 0.01 level (bilateral); *Indicates significant correlation at 0.05 level (bilateral), N = 711

It can be seen from the above table that all indicators of model 3 meet the requirements, indicating that the model has a better fitting effect. Model 3 has the lowest AIC value and is the optimal model. All models χ^2/DF are between 1–3. The GFI of model 3 is greater than 0.8, NNFI is greater than 0.9, CFI is greater than 0.9, and RMSEA is less than 0.08, indicating that the theoretical model has a good fit.

To sum up, the questionnaire design conforms to exploratory and confirmatory factor analysis tests, indicating that the questionnaire data is valid and reliable and can be used for the next step of investigation and processing.

4.3 Correlation Analysis and Common Method Variance Test

4.3.1 Correlation Analysis

In order to analyze the covariant trend among variables, calculate the Pearson coefficient of entrepreneurial willingness on all dimensions of entrepreneurial education. The results are shown in Table 4. Among them, entrepreneurial willingness is positively correlated with entrepreneurial psychological quality, entrepreneurial knowledge, entrepreneurial ability and entrepreneurial willingness. The correlation is consistent with the theoretical expectation, which provides preliminary support for hypothesis testing.

4.3.2 Common Method Variance Test

Harman single factor test was used for CMV test [22]. The results showed that there were 4 factors (more than 1) with characteristic roots greater than 1 extracted from the results of exploratory factor analysis without rotation, the cumulative total explained variance of the 4 factors was 77.983%, and the maximum explained variance of a single factor was 20.968% (less than 40%). There was no case that a single factor could explain most of the covariance of all variables. Therefore, there is no serious common methodological bias in this study.

4.4 Regression Analysis

In order to study the impact of each dimension of entrepreneurship education on entrepreneurial willingness, four dimensions are taken as independent variables to establish a model:

$$Y = \alpha_1x_1 + \alpha_2x_2 + \alpha_3x_3 + \alpha_4x_4 + b$$

Y is the entrepreneurial intention, $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ respectively represent the coefficients of each variable, b Is a constant, x_1, x_2, x_3, x_4 are dimensions of entrepreneurship education, Carry out regression analysis, and the results are as shown in Table 5.

It can be seen from Table 5 that the adjusted R square is 0.653, and the F value is 111.320, with the significance less than 0.05, indicating that the model is significant as a whole. For the independent variable entrepreneurial psychological quality, the standardized beta value is 0.354, which is less than 0.05, indicating a significant positive correlation with entrepreneurial intention. The better the psychological quality, the higher the entrepreneurial intention. Therefore, the original assumption H1a is accepted. For entrepreneurial knowledge, the standardized beta value is 0.336, which is less than 0.05, indicating that it is significantly positively correlated with entrepreneurial willingness. The more entrepreneurial knowledge and self-efficacy, the higher their entrepreneurial

Table 5. Regression Results of Each Dimension on Entrepreneurship Intention [self-painted]

Model	Non standardized coefficient Beta		Standardization Beta	t	Significance	Adjust R ²	F
	B	Standard error					
(constant)	0.285	0.148		1.920	0.056	0.653	111.320
Psychological quality	0.314	0.041	0.354	7.672	0.000		
Knowledge	0.299	0.041	0.336	7.307	0.000		
Entrepreneurship	0.114	0.052	0.122	2.195	0.029		
Awareness	0.253	0.048	0.255	5.210	0.000		

a. Dependent variable: entrepreneurial willingness

willingness. Therefore, the original assumption H1b is accepted. For entrepreneurial ability, the standardized beta value is 0.122, which is less than 0.05, indicating that it is significantly positively correlated with entrepreneurial willingness. The stronger the entrepreneurial ability is, the stronger their awareness of the feasibility of entrepreneurship is. Multiple successful experiences will also make such people judge their own entrepreneurial success more highly, and the more likely they are to start a business. Therefore, the original assumption H1c is accepted. For entrepreneurial awareness, the standardized beta value is 0.255, which is less than 0.05, indicating that it is significantly positively correlated with entrepreneurial willingness. With a strong sense of entrepreneurship, the higher his entrepreneurial desirability is, the more satisfied his entrepreneurship is. Therefore, he accepts the original hypothesis H1d. To sum up, it is assumed that H1a, H1b, H1c and H1d are established.

Because the dimensions of entrepreneurship education play a significant role in entrepreneurial willingness, we draw a conclusion that receiving education can improve entrepreneurial willingness, that is, education has a significant role in entrepreneurial willingness. Through the above analysis, the original hypothesis H1 is established.

4.5 Analysis on the Adjustment of Family Income

In order to better analyze the regulatory role of family income and reduce the multicollinearity problem, first, standardize each item of entrepreneurial psychological quality and calculate the average value; Then, calculate the interaction term between entrepreneurial psychological quality and family income, and decentralize.

4.5.1 The Moderating Effect on the Relationship Between Psychological Quality and Entrepreneurial Intention

Establish the model. The model is as follows (where x_1 represents gender, x_2 represents age, x_3 represents entrepreneurial psychological quality, and x_4 represents family income): (1) Model 1, entrepreneurial intention = $a_{00} + a_{01} * x_1 + a_{02} * x_2$, that is, to study the relationship between entrepreneurial intention and control variables (gender, age); (2) In model 2, entrepreneurial intention = $\beta_{00} + \beta_{01} * x_1 + \beta_{02} * x_2 + \beta_{03} * x_3$, that is, on the basis of model 1, variables of entrepreneurial psychological quality are introduced to explore the relationship between entrepreneurial intention and control variables and entrepreneurial psychological quality; (3) In model 3, entrepreneurial willingness = $\gamma_{00} + \gamma_{01} * x_1 + \gamma_{02} * x_2 + \gamma_{03} * x_3 + \gamma_{04} * x_4$, that is, on the basis of model 2, the regulatory variable family income is introduced to explore the relationship between entrepreneurial willingness and entrepreneurial psychological quality, control variables and family income; (4) Entrepreneurial willingness = $\delta_{00} + \delta_{01} * x_1 + \delta_{02} * x_2 + \delta_{03} * x_3 + \delta_{04} * x_4 + \delta_{05} * x_3 * x_4$. On the basis of model 3, the interactive term of entrepreneurial psychological quality and family income is introduced, that is, entrepreneurial psychological quality * family income.

Next, carry out regression analysis on the above models, and the analysis results are shown in Table 6.

It can be seen from Table 6 that the adjusted R² in models 1, 2, 3 and 4 are 0.005, 0.448, 0.585 and 0.598 respectively, which can prove that the interpretation strength of

Table 6. Adjustment Analysis of Family Income on Psychological Quality and Entrepreneurship Intention [self-painted]

variable	Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE
Control variables								
Gender	-0.114	0.317	-0.046	0.238	-0.002	0.205	-0.010	0.164
Age	0.039	0.245	0.089	0.197	0.044	0.175	0.033	0.105
independent variable								
Psychological quality			0.669**	0.166	0.376***	0.143	0.391***	0.098
Regulating variable								
Family income					0.488***	0.135	0.477***	0.096
Interactive items								
Psychological quality*								
Family income							0.068***	0.057
F	1.648		64.462***		70.793***		87.302***	
Adjusted R ²	0.005		0.448		0.585		0.598	

Note: N = 236, *P < 0.5 **P < 0.1 ***P < 0.01, B is the standardization coefficient, SE is the standard error

the four models is increasing. The p values of F values of models 2, 3 and 4 were all less than 0.001, indicating that the three models passed the significance test. The standardized coefficient of the interactive entrepreneurial psychological quality * family income is 0.068 ($p < 0.001$), which indicates that the interactive item has a significant regulatory role, that is, family income has a more significant regulatory role in the relationship between entrepreneurial psychological quality and entrepreneurial willingness.

In order to further explore the regulatory relationship, the entrepreneurial psychological quality of the regulatory variables are grouped (the value of the high group is $> \text{mean} + \text{standard deviation}$, and the value of the low group is $< \text{mean} - \text{standard deviation}$), and the regulatory effect diagram is drawn, as shown in Fig. 2.

According to Fig. 2, family income plays a positive role in regulating the relationship between entrepreneurial psychological quality and entrepreneurial willingness: compared with the low group, the high group enhances the relationship between entrepreneurial psychological quality and entrepreneurial willingness. Therefore, H2a is assumed to hold.

4.5.2 Regulating the Relationship Between Entrepreneurial Knowledge and Entrepreneurial Willingness

Similar to the model constructed in the previous section, the following models have been formed: Model 1 only considers the relationship between the dependent variable of entrepreneurial willingness and the control variables such as age and gender, while Model

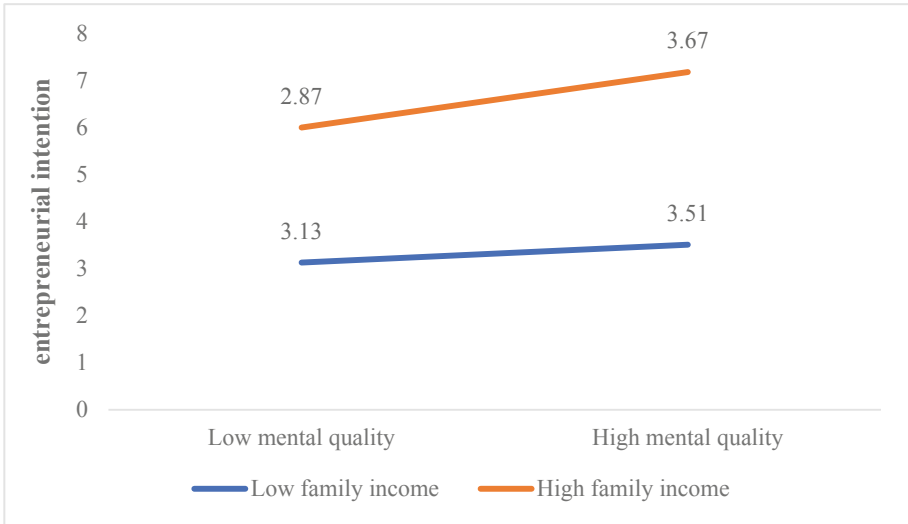


Fig. 2. Adjustment Effect of Family Income on Psychological Quality and Entrepreneurship Intention [self-painted]

2 considers the relationship between the dependent variable and the independent variable and control variable of entrepreneurial knowledge; On the basis of model 2, model 3 adds the family income as an adjusting variable to explore the relationship between the four; Based on model 3, model 4 introduces the interactive term of entrepreneurial knowledge and family income, namely entrepreneurial knowledge * family income. Next, regression analysis is conducted for the above models. Table 7 shows the analysis results.

It can be seen from Table 7 that the adjusted R2 in models 1, 2, 3 and 4 are 0.005, 0.178, 0.305 and 0.428 respectively, which can prove that the interpretation strength of the four models is increasing. The p values of F values of models 2, 3 and 4 are all less than 0.001, which indicates that the three models have passed the significance test. The standardized coefficient of interactive entrepreneurial knowledge * family income is 0.054 ($p < 0.001$), which indicates that the interactive item has a significant regulatory role, that is, family income has a significant regulatory role in the relationship between entrepreneurial psychological quality and entrepreneurial willingness.

Furthermore, the family income of the adjustment variable is grouped and the adjustment effect diagram is drawn, as shown in Fig. 3. The results show that family income plays a positive role in regulating the relationship between entrepreneurial knowledge and entrepreneurial willingness: compared with the low group, the high group family income enhances the relationship between entrepreneurial knowledge and entrepreneurial willingness. Therefore, H2b is assumed to hold.

Table 7. Adjustment Analysis of Family Income on Entrepreneurship Knowledge and Entrepreneurship Intention [self-painted]

variable	Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE
Control variable								
Gender	-0.114	0.317	-0.065	0.247	-0.072	0.068	-0.010	0.085
Age	0.039	0.245	0.037	0.207	0.041	0.168	0.027	0.112
Independent variable								
Knowledge			0.458**	0.201	0.423***	0.163	0.395***	0.065
Regulating variable								
Family income					0.328***	0.095	0.277***	0.096
Interactive items								
Knowledge * family income							0.054***	0.049
F	1.648		16.375***		50.239***		87.302***	
Adjusted R ²	0.005		0.178		0.305		0.428	

Note: N = 236, *P < 0.5 **P < . 0.1 ***P < . 0.01, B is the standardization coefficient, SE is the standard error

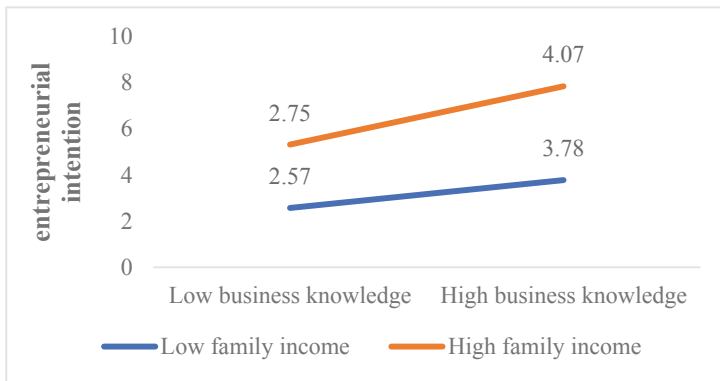


Fig. 3. Adjustment Effect of Family Income on Entrepreneurship Knowledge and Entrepreneurship Willingness [self-painted]

4.5.3 The Moderating Effect of the Relationship Between Entrepreneurial Ability and Entrepreneurial Willingness

Similar to the model constructed in the previous section, Model 1 only considers the relationship between the dependent variable of entrepreneurial willingness and the control variables such as age and gender, while Model 2 considers the relationship between the dependent variable and the independent variable of entrepreneurial ability and the

Table 8. Adjustment Analysis of Family Income on Entrepreneurship Ability and Entrepreneurship Willingness [self-painted]

variable	Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE
Control variable								
Gender	-0.114	0.317	-0.121	0.091	-0.097	0.062	-0.073	0.054
Age	0.0392	0.245	0.281	0.073	0.269	0.053	0.211	0.044
Independent variable								
Entrepreneurship			0.462***	0.06	0.379***	0.051	0.359***	0.042
Regulating variable								
Family income					0.122***	0.067	0.082***	0.064
Interactive items								
Entrepreneurship * family income							0.031***	0.072
F	1.648		31.447***		39.784***		43.587***	
Adjusted R ²	0.005		0.227		0.249		0.377	

Note: N = 236, *P < 0.5 **P < .0.1 ***P < .0.01, B is the standardization coefficient, SE is the standard error

control variable; Model 3 introduces the family income as an adjusting variable on the basis of model 2 to explore the relationship between the four; On the basis of model 3, model 4 introduces the interactive term of entrepreneurial ability and family income, namely entrepreneurial ability * family income. Next, regression analysis is carried out for the above four models, and the analysis results are shown in Table 8.

It can be seen from Table 8 that the adjusted R2 in models 1, 2, 3 and 4 are 0.005, 0.237, 0.249 and 0.377 respectively. Therefore, the increasing explanatory power of these four models can be seen from the top. The p values of F values of models 2, 3 and 4 were all less than 0.001, indicating that the three models passed the significance test. The standardized coefficient of family income * entrepreneurial ability of the interaction item is 0.031 (p < 0.001), indicating that the interaction item has a significant regulatory effect, indicating that the family income has a significant regulatory effect in the relationship between entrepreneurial ability and entrepreneurial willingness.

Similarly, the adjustment variable family income is grouped and the adjustment effect chart is drawn, as shown in Fig. 4.

It can be seen from Fig. 4 that family income plays a positive role in the relationship between entrepreneurial ability and entrepreneurial willingness: compared with the low group, the high group family income enhances the relationship between entrepreneurial awareness and entrepreneurial willingness. Therefore, H2c is assumed to hold.

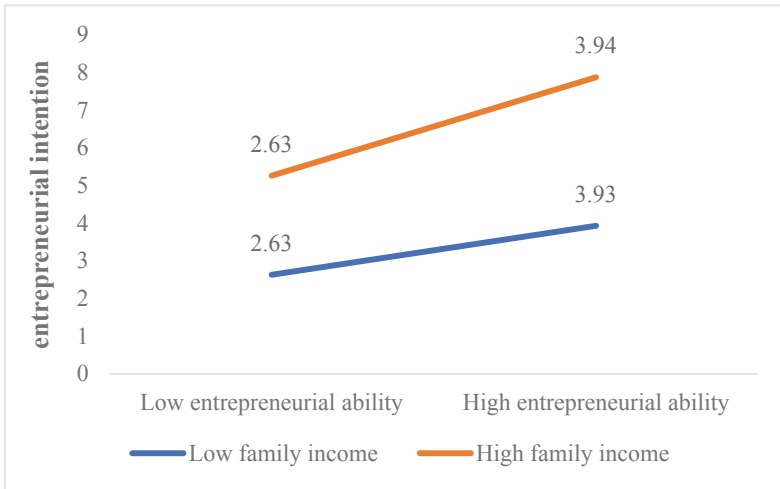


Fig. 4. Adjustment Effect of Family Income on Entrepreneurship Ability and Entrepreneurship Willingness [self-painted]

4.5.4 Regulating the Relationship Between Entrepreneurial Awareness and Entrepreneurial Willingness

Similar to the previous section, four models are also constructed: model 1 only considers the relationship between the dependent variable of entrepreneurial intention and the control variables such as age and gender; model 2 considers the relationship between the dependent variable and the independent variable of entrepreneurial awareness and the control variable; Model 3 introduces the family income as an adjusting variable on the basis of model 2 to explore the relationship between the four; On the basis of model 3, model 4 introduces the interactive term of entrepreneurial awareness and family income, namely entrepreneurial awareness * family income. Next, regression analysis is conducted for the above four models. Table 9 shows the analysis results.

It can be found from Table 8 that the adjusted R2 in models 1, 2, 3 and 4 are 0.005, 0.332, 0.417 and 0.525 respectively, which can prove that the interpretation strength of the four models is increasing. The p values of models 2, 3 and 4 were all less than 0.001, indicating that the three models passed the significance test. The standardized coefficient of family income * entrepreneurial awareness of the interaction item is 0.088 ($p < 0.001$), indicating that the interaction item has a significant regulatory role, that is, family income has a significant regulatory role in the relationship between entrepreneurial awareness and entrepreneurial willingness.

Similarly, the adjustment variable family income is grouped and the adjustment effect chart is drawn, as shown in Fig. 5.

According to Fig. 5, family income plays a positive role in regulating the relationship between entrepreneurial awareness and entrepreneurial willingness: compared with the low group, the high group family income enhances the relationship between entrepreneurial awareness and entrepreneurial willingness. Therefore, H2c is assumed to hold.

Table 9. Adjustment Analysis of Family Income on Entrepreneurship Consciousness and Willingness [self-painted]

variable	Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE
Control variable								
Gender	-0.114	0.317	-0.161	0.213	-0.132	0.182	-0.108	0.167
Age	0.0392	0.245	0.228	0.105	0.121	0.096	0.119	0.083
Independent variable								
Awareness			0.375***	0.065	0.352***	0.056	0.348***	0.051
Regulating variable								
Family income					0.346***	0.088	0.323***	0.050
Interactive items								
Awareness * family income							0.088***	0.042
F	1.648		34.419***		42.013***		67.913***	
Adjusted R ²	0.005		0.332		0.417		0.525	

Note: N = 236, *P < 0.5 **P < . 0.1 ***P < . 0.01, B is the standardization coefficient, SE is the standard error

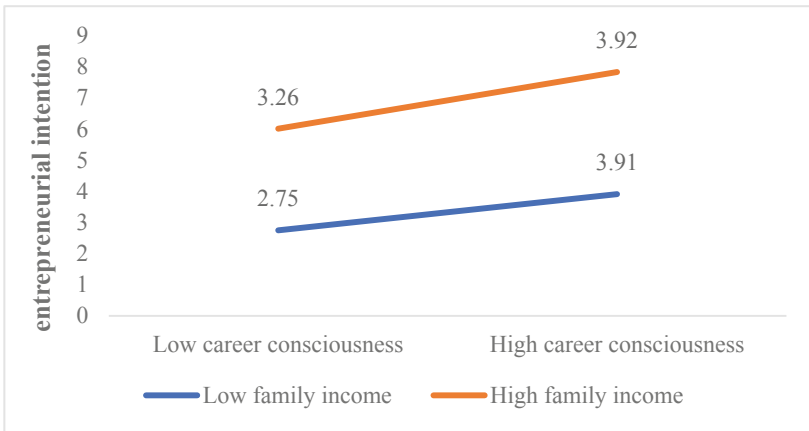


Fig. 5. The regulatory effect of family income on entrepreneurial awareness and willingness [self-painted]

4.5.5 Summary of Regulatory Effects

Through the above analysis, it can be found that, for the relationship between the four dimensions of entrepreneurship education and entrepreneurial willingness, family income has a significant regulatory role. Therefore, for the relationship between entrepreneurship education as a whole and entrepreneurial willingness, family income

has a significant regulatory role, which indicates that Hypothesis H2 is valid. The higher the family income, the higher the entrepreneurship education level, the more the students have the capital and material resources needed for entrepreneurship, the stronger the ability to bear risks, and the more likely they are to have entrepreneurial ideas. On the contrary, the lower the family income is, even though the student has received a higher level of entrepreneurship education, he or she needs to consider his or her family background and dare not take the risk of entrepreneurship, so his or her entrepreneurial willingness is not high.

5 Conclusion and Discussion

This paper uses data mining technology to explore the impact of entrepreneurial education on college students' entrepreneurial willingness, and systematically analyzes the regulatory role of family income on the relationship between the two. The results show that entrepreneurship education and its four dimensions have a positive impact on college students' entrepreneurial willingness. The higher the level of entrepreneurship education, the higher the possibility of generating entrepreneurial willingness. Family income has a significant positive regulatory correlation with the four dimensions of the relationship between entrepreneurial willingness and entrepreneurial education. The higher the family income, the more likely students with higher entrepreneurial education level are to have entrepreneurial willingness. Through this study, we have a clearer understanding of entrepreneurship education and the relationship between family income and entrepreneurial willingness, which can provide a theoretical basis for colleges and universities to improve the entrepreneurial education system, improve students' entrepreneurial willingness, and then promote the stable development of social economy.

However, there are still shortcomings in this paper: the scale design in the questionnaire only selects four dimensions of entrepreneurship education with strong representativeness. However, in real life, entrepreneurship education is far more than these four dimensions. Therefore, there may be a certain gap between the results of this paper and real life. In the future research, we will expand the sample size, adopt a variety of survey methods, and conduct a questionnaire survey on students in different universities, so that the model established is more representative. At the same time, we will also consider more factors and more comprehensively analyze the influencing factors of entrepreneurial willingness, making the results more rigorous and scientific.

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