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The effects of student organization participation on Chinese university students' non-cognitive skills: An empirical analysis based on CFPS data

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Abstract: Non-cognitive skills have become increasingly important in the digital era. Given the role of student organizations in facilitating social interaction and informal learning, they may contribute to the development of these skills among university students. However, empirical evidence remains limited. On this basis, the study uses data from the China Family Panel Studies (2018–2022) conducted by the Institute of Social Science Survey at Peking University. By constructing a baseline regression model, it systematically analyses the promotional effects of student organization participation on students' non-cognitive skills and potential heterogeneity issues. Results indicate that student organization participation significantly improves non-cognitive skills, and the findings remain robust across alternative specifications. After applying Propensity Score Matching to mitigate endogeneity, the promotional effect markedly increases, exhibiting heterogeneity across different household registration statuses and per capita family incomes. This study extends the research on the formation mechanisms of non-cognitive skills and deepens academic understanding of the educational functions of student organizations. The findings provide valuable implications for higher education institutions seeking to optimize talent cultivation strategies and improve the development of student organizations, while the heterogeneity analysis offers new insights into promoting educational equity.

Keywords: *Developmental effects, Non-cognitive skills, Student organization participation, University students.*

1. Introduction

With the advent of the intelligent era, digital technologies are evolving at an accelerating pace and becoming deeply integrated into the real economy, thereby reshaping the nature of work and the skills required for it [1] and profoundly transforming the supply–demand structure of the labor market. A large body of research shows that digital technologies can substitute for the cognitive abilities of skilled workers, particularly their conventional cognitive abilities, but cannot impact their non-cognitive abilities. Research also indicates that university students with higher levels of non-cognitive skills tend to perform better academically and obtain more employment opportunities [2-4]. Upon entering the labor market, higher levels of non-cognitive skills are associated with higher wages, more stable employment, and greater job satisfaction [5-8]. Non-cognitive skills have therefore become an effective means for skill-based groups to cope with the impact of artificial intelligence and improve their market performance. Consequently, focusing on the development and enhancement of non-cognitive skills holds significant practical importance for enriching college students' competencies and improving their employability.

Non-cognitive abilities are a core concept of new human capital. They refer to individual characteristics that are distinct from cognitive abilities (defined as the brain's capacity to process, store, and retrieve information) and that influence cognitive abilities [9]. These include self-esteem, achievement motivation, life attitudes, emotional stability, and communication and coordination skills and are also key components of 21st-century talent competencies [10]. The development of non-

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cognitive abilities has unique characteristics: on the one hand, compared to cognitive abilities, the period of plasticity for non-cognitive abilities is longer (cognitive abilities generally stabilize around the age of 10), and the critical period for their development is adolescence [11, 12]. In particular, an individual's emotional regulation and self-regulation abilities exhibit stable plasticity until the age of 20. Therefore, non-cognitive abilities can still be influenced through environmental interventions after entering college [13]. On the other hand, non-cognitive abilities result from the interaction between environment and genetics [14] and exhibit significant peer effects, meaning that social interaction plays an important role in fostering the development of non-cognitive skills [6]. These characteristics indicate that the cultivation of non-cognitive skills relies more heavily on unstructured environmental intervention and social interaction. As an extension of higher education institutions serving as a "second classroom", student organizations provide an ideal setting for cultivating university students' non-cognitive skills, offering distinct advantages.

Student organizations in higher education institutions are voluntary student groups formed by students based on shared interests and hobbies. They operate autonomously in accordance with their bylaws to realize the common vision of their members. These organizations serve multiple educational functions: they are key venues for ideological and political education, innovative platforms for academic exploration, and vital spaces and arenas for organizational and experiential learning [15]. Through knowledge application, teamwork, communication, and coordination, these spaces facilitate multidimensional social interaction. Although academic research has extensively examined the impact of such interactions on students' cognitive abilities, particularly academic performance, and has produced substantial findings [16, 17], research on the impact on non-cognitive skills remains insufficient.

Based on this, this study intends to use data from the China Family Panel Studies (CFPS) conducted by the Institute of Social Science Survey at Peking University to conduct a systematic analysis of the effects of student organization activities in Chinese universities on the enhancement of college students' non-cognitive abilities. Specifically, this study seeks to address the following questions: Can student organizations, with their multidimensional social interaction characteristics, promote the development of university students' non-cognitive skills? If so, what is the marginal effect of such participation? Furthermore, does the effect of student organization participation exhibit heterogeneity across different student groups? Research on these issues holds significant academic value for addressing the challenges posed by emerging technologies such as artificial intelligence to higher education, optimizing the development of university student organizations, and improving talent cultivation quality and graduates' competitiveness in the labor market.

2. Literature Review and Research Hypotheses

Student organizations, serving as the university's second classroom, provide a natural arena for social interaction that effectively enhances students' non-cognitive skills. This is intrinsically linked to the educational function of participation in such organizations. The educational functions of student organizations primarily encompass three dimensions: firstly, value guidance; secondly, social interaction; and thirdly, academic enhancement. The value guidance and social interaction functions manifest in the holistic development of students' personalities, the expansion of their interpersonal networks, and the improvement in the quality of their relationships. The academic enhancement function is reflected in the cultivation of students' innovative thinking and their openness to embracing new ideas, all of which constitute vital components of non-cognitive skills.

A large body of research indicates that participation in student organizations has a significant effect on enhancing university students' non-cognitive skills. Active involvement in student organizations is considered crucial for developing communication skills, teamwork, critical thinking, leadership, and creativity among higher education students [18]. Participation in sports has been found to increase school engagement and academic confidence among Black high school students, while political participation is positively associated with self-esteem and self-efficacy [19, 20]. Volunteer service has also been shown to significantly improve agreeableness, extraversion, openness, and self-esteem among

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university students [21, 22]. Furthermore, research indicates that social participation in universities is positively correlated with interpersonal competence, sense of belonging, and life satisfaction [23]. Using a large sample of approximately 140,000 observations, another study examined the effects of research participation and interdisciplinary learning on university students' non-cognitive skills, finding that research participation significantly improves interpersonal and neurocognitive abilities, while interdisciplinary learning enhances interpersonal skills, neurocognitive abilities, and self-regulation [24]. In addition, a study of first-year students at a Hong Kong university found that participation in student organizations significantly promoted development in social competence, time management and leadership decision-making, openness and independent judgment, and self-confidence [25].

These studies examine the effects of student organization and social participation on university students' non-cognitive skills from different perspectives and provide useful insights into the causal relationship between participation and skill development. However, most existing studies focus on the impact of participation on only specific dimensions of non-cognitive skills, and comprehensive empirical tests of the causal relationship remain limited. Therefore, this study employs the Big Five personality scale to construct an overall indicator of non-cognitive skills. Ordinary least squares (OLS) regression is then used to examine the effect of student organization participation on non-cognitive skills, and a propensity score matching (PSM) model is applied to address potential endogeneity. Based on this analysis, the following hypothesis is proposed:

H_1: Participation in student organizations has a positive effect on the development of university students' non-cognitive skills.

Considering that skills also exhibit self-productivity, that is, skills acquired in one period increase the ability to acquire skills in subsequent periods [26]. Therefore, the promotional effects of student organization participation on university students' non-cognitive skills may exhibit significant heterogeneity due to innate endowment differences between genders and acquired resource disparities stemming from family backgrounds. Firstly, owing to biological foundations, cultural differences, and stereotypes, male and female university students show heterogeneity in their previously formed non-cognitive skills across different dimensions. For instance, women demonstrate superiority over men in interpersonal skills and emotional regulation, while men outperform women in risk-taking spirit and competitive awareness. Secondly, urban–rural household registration can be regarded as a form of social stratification [27]. On one hand, this distinction signifies disparities in family resources and access to public educational provision, representing differing self-identities and developmental expectations [28, 29], thereby generating disparities in cognitive and non-cognitive skills. On the other hand, according to the Mare Model, at each educational transition stage, selected individuals from lower socioeconomic backgrounds demonstrate superiority in unobservable abilities compared to those from higher-status backgrounds, with this selectivity becoming stronger at higher levels of education [30]. Thirdly, family economic capital advantages can shape children's cognitive and non-cognitive skills by directly purchasing educational resources and providing higher-quality living environments [31]. Relevant research indicates that university education does not place disadvantaged students at a significant disadvantage in measured indicators such as psychological stress, self-efficacy, and self-esteem. Indeed, they may outperform non-disadvantaged students in academic achievement, honors attainment, and participation in student organizations. This may stem from their leveraging of extracurricular engagement to enhance both cognitive and non-cognitive skills [32, 33]. Based on this, the paper proposes the second hypothesis:

H_2: The effect of participation in student organizations on non-cognitive skills is heterogeneous across individuals and family socioeconomic backgrounds.

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3. Research Methods and Variable Description

3.1. Research Methods

This study first constructs a baseline regression model. Since non-cognitive skill is a continuous variable, the Ordinary Least Squares (OLS) method is employed to examine the effect of student organization participation on university students' non-cognitive skill. Meanwhile, year and regional fixed effects are controlled. The baseline model is specified as follows:

$$Noncong_{ijt}=\beta_0+\beta_1 k_{ijt}+\beta_2 X_{ijt}+\mu_j+\sigma_t+\varepsilon_{ijt}$$

Where i denotes the individual, t represents the year (2018, 2020, and 2022), and j indicates the province in which the individual resides. The dependent variable $Noncong_{ijt}$ measures non-cognitive skill. The key independent variable k_{ijt} indicates whether a student participates in student organizations, while X_{ijt} represents the control variable. μ_j denotes the province fixed effects, controlling for time-invariant provincial characteristics. σ_t represents year fixed effects, capturing time trends unrelated to individual characteristics. ε_{ijt} denotes the error term.

3.2. Data Source and Variable Selection

The data used in this study were obtained from the China Family Panel Studies (CFPS) conducted by the Institute of Social Science Survey (ISSS) at Peking University from 2018 to 2022. The CFPS is a nationwide, large-scale longitudinal survey conducted by ISSS. It aims to collect comprehensive information on individuals, households, and communities to reflect changes in China's socio-economic, demographic, educational, and health domains, thereby providing an objective data foundation for academic research and social policy analysis. The CFPS sample covers 25 provinces, municipalities, and autonomous regions across China, with a target sample size of 16,000 households, encompassing all members within the sampled households. The survey consists of three main components: individual questionnaires (including adult and child questionnaires), household questionnaires, and community questionnaires. This study utilizes the individual questionnaire. In addition to basic individual characteristics, the individual questionnaire incorporates crucial information, including non-cognitive skills, university students' participation in organizations (including whether students participate, the number of organizations joined, and whether they hold leadership positions), as well as the ranking and geographic location of their universities. This comprehensively meets the research requirements of this paper. In accordance with the research objectives, this study selected samples at the junior college and undergraduate levels. After excluding samples with missing information, a final cohort of 1,637 valid samples was obtained.

3.2.1. Dependent Variable

At present, there is no consensus in the academic literature regarding the measurement of non-cognitive skills [34]. Three major scales are widely used in existing studies: the locus of control scale, the self-esteem scale, and the Big Five personality scale. Among them, the Big Five personality model originates from psychology and is favored by researchers because it can provide a relatively comprehensive description of personality traits [35-37]. This paper also adopts the Big Five personality scale to measure the non-cognitive skills of university students. The CFPS sample of 2018 included personality trait variables across the five dimensions of the Big Five Personality Scale: Conscientiousness, Openness, Extraversion, Agreeableness, and Emotional Stability. Each trait variable comprised three sub-items. Due to variations in question design across different waves of the CFPS, research on non-cognitive skills based on panel data remains relatively limited. This study follows the approaches of Li and Chen [38] and Wang and Zhang [6]. Based on the principle of selecting questions that are similar to those in the 2018 short-form questionnaire and ensuring maximum consistency across survey waves, corresponding items from the 2020 and 2022 CFPS questionnaires were selected to construct non-cognitive skill indicators for each year. The 2018 indicator was constructed using the Big Five Personality Scale items from CFPS 2018. The composite index was constructed as follows.

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Firstly, all sub-items across the five dimensions were standardized using Z-score normalization, with negative questions reverse-scored, to approximate a standard normal distribution. Secondly, the scores for each dimension were calculated by categorizing and averaging the sub-items. Thirdly, the overall non-cognitive skill index was calculated by averaging the scores across all five dimensions. The specific dimensions and corresponding items are presented in Table 1.

Table 1.
Measurement of Non-Cognitive Skill Indicators.

Year	Dimension	Corresponding CFPS Items
2018	Conscientiousness	Works efficiently; works carefully and diligently; tends to be lazy
	Extraversion	Outgoing and sociable; talkative; reserved and conservative
	Agreeableness	Considerate of others; naturally tolerant; sometimes rude to others
	Openness	Creative and generates new ideas; values artistic and aesthetic experiences; rich imagination
	Emotional Stability	Feels depressed; feels sad and distressed; feels that life is unbearable
2020	Conscientiousness	Degree of cooperation in completing the survey; level of trust in strangers
	Extraversion	Feels lonely; feels happy with life; frequency of sharing on social media
	Agreeableness	Tendency to trust or doubt others; quality of interpersonal relationships
	Openness	Importance of the Internet for learning; confidence in the future
	Emotional Stability	Feels depressed; feels sad and distressed; feels that life is unbearable
2022	Conscientiousness	Degree of cooperation in completing the survey; level of trust in strangers
	Extraversion	Feels lonely; feels happy with life; frequency of sharing on social media
	Agreeableness	Tendency to trust or doubt others; quality of interpersonal relationships
	Openness	Importance of the Internet for learning; confidence in the future
	Emotional Stability	Feels depressed; feels sad and distressed; feels that life is unbearable

3.2.2. Core Explanatory Variable

The core independent variable is whether a university student participates in student organizations. Participation is coded as 1, and non-participation is coded as 0.

3.2.3. Control Variables

This model incorporates relevant variables influencing university students' non-cognitive skills at the individual, family, and university levels as control variables. Firstly, extensive research indicates that parental educational attainment and household cultural capital are significant variables influencing individual non-cognitive skills. As the personal sample lacked variables for parental educational attainment and household cultural capital, this study obtains information on parents' educational attainment and total educational expenditure by matching family member subsamples and uses total educational expenditure as a proxy variable for family cultural capital. Secondly, university ranking and geographical location exert substantial influence on university students' non-cognitive skills. Therefore, this study controls for university type and location, including whether the university belongs to the "985 Project" or "211 Project" (two major national initiatives supporting top-tier universities in China's higher education system) and whether the university is located in a provincial capital city. Thirdly, individual-level characteristics, including gender, household registration status, and health condition, are incorporated as control variables. Table 2 reports the definitions of all variables.

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Table 2.
Variable Definitions and Descriptive Statistics.

Variable	Definition	Observations	Mean	Std. Dev.	Min.	Max.
Non-cognitive skill	Composite index score of non-cognitive skill	1637	-0.006	0.383	-1.573	1.151
Student organization participation	Participated = 1, Not participated = 0	1637	0.439	0.496	0	1
Father's education	Years of formal schooling (years)	1637	10.781	4.686	0	19
Mother's education	Years of formal schooling (years)	1637	9.319	5.863	0	19
Monthly education expenditure	Total education expenditure / 12 (10,000 RMB)	1637	1.363	1.362	0.01	15.5
University tier	"985" or "211" university = 1, Other institutions = 0	1637	0.062	0.242	0	1
Institutional location	Provincial capital city = 1, Other cities = 0	1637	0.392	0.611	0	1
Health conditions	Self-rated good health = 1, Poor health = 0	1637	0.681	0.223	0	1
Gender	Male = 1, Female = 0	1637	0.475	0.500	0	1
Household registration status	Non-agricultural = 1, Agricultural = 0	1637	0.290	0.454	0	1
Weekend study time	Actual weekend study time (hours)	1637	3.237	2.450	0	24

4. Empirical Results and Analysis

4.1. Baseline Regression Results

Based on the model specification presented above, Table 3 presents regression results concerning the impact of student organization participation on university students' non-cognitive skills. To further refine the effects of student organization involvement, the table additionally incorporates regression results where the number of student organizations participated in and whether one held a leadership role within the organization serve as core explanatory variables. Findings indicate that, compared to students not participating in student organizations, organization involvement significantly enhances non-cognitive skills at the 5% significance level. The number of organizations joined also promotes the enhancement of non-cognitive skills. Specifically, each additional student organization participation increases non-cognitive skills by 0.028 units. Holding a leadership role within a student organization elevates non-cognitive skills by 0.056 units. This indicates that the marginal effect of serving as a student organization leader on non-cognitive skills is significantly higher than the marginal effects of student organization participation and the number of organizations joined.

Regarding other control variables, when student organization participation is treated as the core explanatory variable, university students with better health conditions tend to exhibit higher levels of non-cognitive skills. No significant difference in non-cognitive skills is observed between male and female students. In addition, increased study time at weekends significantly enhanced students' non-cognitive skills, which may stem from the mutual reinforcement between cognitive and non-cognitive skills. Generally, the more time devoted to study correlates with higher cognitive skills among university students. Compared to students with agricultural household registration, those with non-agricultural household registration exhibit significantly diminished non-cognitive skills, providing empirical support for the Meir model.

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Table 3.
Regression Results of Student Organization Participation on Non-Cognitive Abilities

Variables	(1) Coef.	(1) S.E.	(2) Coef.	(2) S.E.	(3) Coef.	(3) S.E.
Participation in Student Organizations	0.028	(0.014**)				
Number of Organizations Joined			0.028	(0.016*)		
Organization Leadership					0.056	(0.025**)
Father's Education	-0.008	(0.023)	0.001	(0.016*)	0.001	(0.002)
Mother's Education	0.007	(0.016)	0.003	(0.002)	0.003	(0.002)
Total Educational Expenditure	0.009	(0.009)	0.005	(0.002)	0.005	(0.010)
985/211 University	0.036	(0.041)	0.001	(0.010)	-0.004	(0.511)
Provincial Capital City	-0.015	(0.013)	-0.042	(0.051)	-0.046	(0.015***)
Health Conditions	0.336	(0.047***)	0.388	(0.015)	0.386	(0.046***)
Gender	0.003	(0.167)	-0.007	(0.049***)	0.003	(0.167)
Household registration status	-0.046	(0.022**)	-0.032	(0.027)	-0.033	(0.026)
Weekend Study Time	0.008	(0.003**)	0.001	(0.025***)	-0.001	(0.048)
Constant	-0.250	(0.050***)	-0.267	(0.005)	-0.222	(0.047***)
Year Fixed Effects	Yes		Yes		Yes	
Region Fixed Effects	Yes		Yes		Yes	
R^2	0.058		0.090		0.091	
Observations	1637		1029		1033	

Note: * p < 0.10, ** p < 0.05, *** p < 0.01.

4.2. Robustness Checks

4.2.1. Alternative Sample

Since the CFPS 2018 survey includes the Big Five Personality Scale, this study excluded data from 2020 and 2022, conducting robustness checks solely on the 2018 sample. The robustness results are presented in Table 4. Compared with the baseline regression, the direction of the impact of student organization participation on non-cognitive skills remained unchanged, while the significance markedly increased. These findings indicate that the regression results are highly robust.

4.2.2. Additional Control Variables

In the baseline regression, although this study controlled for university students' health conditions, the self-assessment method employed may be subject to reporting bias. Respondents may either overestimate or underestimate their actual health status. To address this concern, two additional variables, the frequency of weekly physical exercise and sleep quality over the past year, were incorporated into the baseline regression to better control for health-related factors and to test the robustness of the baseline results. As shown in Table 4, the coefficient for participation in student organizations is significantly positive at the 5% level, indicating that the results are highly robust. Therefore, Hypothesis 1 is further supported.

Table 4.
Robustness Check Results.

Variables	2018 Sample		Additional Controls	
	Coefficient	Std. Error	Coefficient	Std. Error
Student Organization Participation	0.079	(0.025***)	0.027	(0.013**)
Weekly Exercise Frequency			0.068	(0.010***)
Sleep Quality			0.011	(0.006*)
Control Variables	Yes		Yes	
Year Fixed Effects	Yes		Yes	
Regional Fixed Effects	Yes		Yes	
R^2	0.083		0.062	
Observations	620		1637	

Note: * p < 0.10, ** p < 0.05, *** p < 0.01.

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4.3. Endogeneity Adjustment

Given that university students with higher levels of non-cognitive skills are more likely to participate in student organizations, a self-selection may exist, which could lead to biased estimation results. To address this issue, this study employs the Propensity Score Matching (PSM) method for regression analysis. Before conducting the PSM analysis, a balance test is performed. As shown in Table 5, the balance of most covariates is significantly improved after matching. Moreover, the sample loss is relatively limited, as illustrated in Figure 1.

Table 5.
Balance Test Results.

Variables		Mean		Standard Error		t-test	
		Treated Group	Control Group	%	%	t-value	p-value
Educational Expenditure	Before	1.769	1.527	17.7	93.3	3.59	0.000
	After	1.753	1.769	-1.2		-0.22	0.823
Mother's Education	Before	9.675	9.027	11.1	43.5	2.22	0.027
	After	9.666	10.031	-6.3		-1.21	0.226
Father's Education	Before	10.863	10.730	2.8	91.6	0.57	0.569
	After	10.866	10.877	-0.2		-0.05	0.963
985/211 University	Before	0.059	0.065	-2.7	57.8	-0.55	0.583
	After	0.059	0.061	-1.2		-0.22	0.824
Provincial Capital	Before	1.557	1.571	-2.3	85.0	-0.46	0.646
	After	1.557	1.559	-1.2		-0.06	0.949
Health Conditions	Before	0.681	0.683	-0.9	-3.9	-0.18	0.856
	After	0.680	0.678	0.9		0.18	0.857
Gender	Before	0.473	0.477	-0.6	-278.4	-0.13	0.900
	After	0.474	0.462	2.4		0.45	0.653
Household Registration	Before	0.293	0.288	1.1	-169.0	0.22	0.827
	After	0.292	0.306	-2.9		-0.55	0.583
Weekend Study Time	Before	6.987	6.507	16.0	31.5	3.18	0.001
	After	6.983	6.654	11.0		2.17	0.030

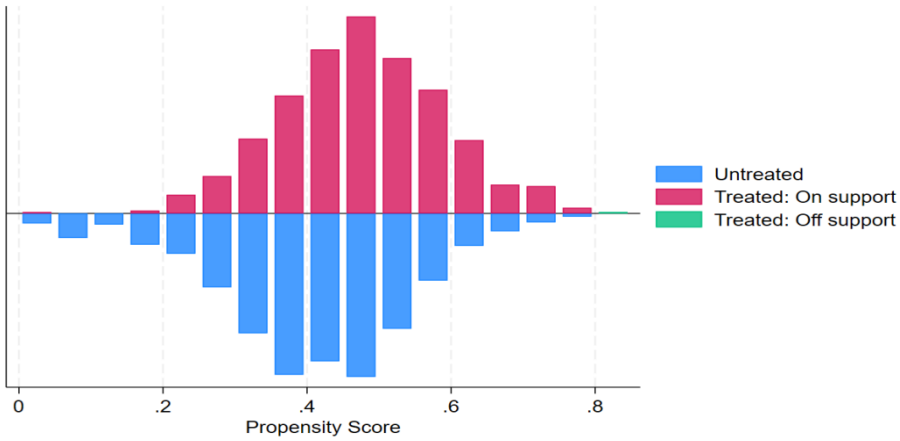

Figure 1.
Common Support of Propensity Scores.

Table 6 presents the average treatment effects using PSM. The Nearest Neighbor 1:1 Matching method is applied, yielding an Average Treatment Effect on the Treated (ATT) of 0.035, which is statistically significant at the 10% level. Compared with the OLS regression results, the positive effect of student organization participation on non-cognitive skills is further strengthened after correcting for sample selection bias. Table 6 also reports results based on Radius Matching and Kernel Matching. The

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estimated treatment effects are consistently positive (significant at the 10% level for radius matching and at the 5% level for kernel matching), with markedly enhanced marginal effects, indicating that the results are highly robust.

Table 6.
Average Treatment Effects of Student Organization Participation on Non-Cognitive Skills.

Matching Method	ATT	Standard Error	t-value
Nearest Neighbor Matching (k = 1)	0.035	(0.018*)	1.94
Radius Matching	0.024	(0.014*)	1.80
Kernel Matching	0.029	(0.013**)	2.21

Note: * p < 0.10, ** p < 0.05.

4.4. Heterogeneity Analysis

Considering that the impact of student organization participation on non-cognitive skills may vary due to individual characteristics or family background, Table 7 presents regression results disaggregated by gender, urban-rural location, and per capita household income to examine heterogeneity. The results indicate that student organization participation exerts a positive effect on enhancing non-cognitive skills for both male and female university students. However, the regression coefficients for both samples are not significant. This may stem from reduced sample sizes after subsample division, which limits the statistical power to detect significant effects. Nevertheless, in terms of marginal effects, no substantial gender differences are observed, suggesting that the promoting effect of student organization participation is inclusive. In contrast, student organization participation significantly enhances non-cognitive skills among students with agricultural household registration at the 10% significance level, while the effect for students with non-agricultural household registration is positive but statistically insignificant. Furthermore, the regression coefficient for students from households in the top 50% of per capita income is insignificant, while that for those in the bottom 50% is positive and significant at the 10% level, with a larger marginal effect. These findings suggest that students from less advantaged family backgrounds benefit more from participation in student organizations in terms of non-cognitive skill development. Therefore, Hypothesis 2 is supported.

Table 7.
Heterogeneous Effects of Student Organization Participation on Non-Cognitive Skills.

Variables	Gender Heterogeneity		Household Registration Status Heterogeneity		Per Capita Household Income Heterogeneity	
	Male	Female	Non-agricultural	Agricultural	Top 50%	Bottom 50%
Organization Participation	0.022	0.028	0.036	0.027*	0.004	0.043*
	(0.030)	(0.030)	(0.040)	(0.014)	(0.030)	(0.025)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.080	0.078	0.119	0.053	0.082	0.070
Observations	779	858	475	1162	758	876

Note: * p < 0.10.

5. Conclusions and Policy Implications

5.1. Main Findings and Discussion

Based on the above analyses, the main findings of this study can be summarized as follows:

5.1.1. Student Organization Participation Significantly Enhances Non-Cognitive Skills

After controlling for relevant variables at the family, university, and regional level in the model, the results show that university students who participate in student organizations demonstrate a significant enhancement of their non-cognitive skills compared to those who do not. At the same time, the effects of the number of student organizations joined and holding leadership positions in student organizations on

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the improvement of non-cognitive skills are also examined, and the regression coefficients are significantly positive. In terms of marginal effects, serving as a student leader has a substantially stronger impact (with a coefficient of 0.056) than general participation and the number of organizations joined (both with coefficients of 0.028). This may be attributed to the fact that holding a leadership role involves a large amount of management coordination, resource allocation, and social interaction. These experiences are closely related to key dimensions of non-cognitive skills, including extraversion, agreeableness, and openness.

5.1.2. Heterogeneity in the Effects of Student Organization Participation across Household Registration Status and Family Economic Conditions

The promoting effect of student organization participation on enhancing university students' non-cognitive skills is found to be gender-inclusive, yielding positive impacts for both male and female students without significant difference. However, significant heterogeneity exists in terms of household registration status and family economic conditions. Specifically, student organization participation has a significantly positive effect on the improvement of non-cognitive skills among students with agricultural household registration and those whose per capita family income is in the bottom 50%. Existing studies suggest that the intergenerational transmission of cognitive and non-cognitive skills caused by family background and unequal educational quality may constitute a key mechanism underlying intergenerational poverty and social stratification [39]. The conclusions of this study indicate that student organization participation can generate a "catch-up effect" by enhancing human capital accumulation through the continuous development of non-cognitive skills, thereby helping to mitigate intergenerational persistence of social inequality to some extent. These conclusions provide important references for universities to optimize talent cultivation programs and improve the development of student organizations.

This study examines, from the perspective of higher education, the impact of student organization participation on the enhancement of university students' non-cognitive skills. It extends the research on the formation mechanisms of non-cognitive skills and deepens academic understanding of the educational functions of student organizations. The findings provide valuable implications for higher education institutions seeking to optimize talent cultivation strategies and improve the development of student organizations. In addition, the heterogeneity analysis in this study offers new insights for higher education authorities aiming to alleviate educational inequality and promote educational equity.

5.2. Policy Implications

Student organization participation can effectively promote the development of university students' non-cognitive skills and shows significant heterogeneity in terms of household registration status and family economic conditions. Based on this, this study proposes the following policy recommendations: Firstly, universities should prioritize the development of student organizations as part of the "second classroom", enriching their content. This requires universities to demonstrate innovative thinking in setting objectives, designing activity content, and selecting operational models. In particular, the cultivation of students' non-cognitive skills should be fully integrated into student organizations, and organizational effectiveness should be enhanced to maximize their role in promoting students' non-cognitive skills. Secondly, greater emphasis should be placed on evaluating the process of student organization activities while refining outcome assessment metrics. While an increasing number of universities now incorporate student organization performance into students' comprehensive quality evaluations, this approach often prioritizes outcomes over processes and relies on overly simplistic metrics. Unlike cognitive skills, the development of non-cognitive skills is an implicit, context-embedded process. Establishing reasonable and effective performance evaluation indicators is therefore crucial to harnessing the full potential of student organization activities. Thirdly, establish dedicated student organization activity funds to enhance participation rates among economically disadvantaged groups. Although student organizations are open to all with no prerequisites for membership, their

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activities often involve certain expenses. On this basis, special subsidy programs for student organization participation can be established for students from economically disadvantaged families to cover all or part of the basic expenses, such as transportation and necessary equipment. For students with agricultural household registrations, particularly those from remote regions, "adaptive" support could be provided to lower the psychological barriers to initial participation, thereby increasing their engagement rates. Although the above conclusions are based on Chinese samples, they also provide valuable references for the development of student organizations in higher education institutions in other countries.

5.3. Research Limitations

Despite the above research findings, this study still has some limitations: Firstly, whilst utilizing CFPS data from 2018 to 2022, substantial information gaps within the sample resulted in only 1,637 valid cases. Constrained by sample size, the heterogeneity analysis of the effect of student organization participation on non-cognitive skills is not sufficiently comprehensive, necessitating further longitudinal investigations in future research. Secondly, different types of student organizations possess distinct educational functions; thus, their effects on promoting university students' non-cognitive skills may vary. For example, research-oriented organizations emphasize innovation cultivation, while volunteer associations emphasize social public welfare. However, the absence of detailed information on organization types within the sample precluded exploration of this aspect in the present study. Thirdly, although this study adopts the PSM method to alleviate endogeneity problems, estimation bias caused by reverse causality and measurement errors may still exist, which needs to be further addressed in subsequent research.

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Data Availability:

The study used data from the China Family Panel Studies (CFPS, 2018–2022) conducted by the Institute of Social Science Survey at Peking University. A compiled dataset can be shared upon request.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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