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How does perceived social support affect the career satisfaction of Chinese college graduates in their early careers? A chain mediation model

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Abstract

This study examines the associations between perceived social support, career adaptability, career decision-making self-efficacy, and career satisfaction among Chinese college graduates in their early careers. The research sample consisted of 571 Chinese college graduates who had job experience ranging from 6 months to 5 years. The sample included individuals with different educational backgrounds, including junior college graduates, bachelor's degrees, and postgraduates. There were no limitations imposed on the participants' field of major or work. The Chinese version of the Perceived Social Support Scale, the 12-item Career Adapt-Ability Scale-Short Form, the Career Decision-Making Self-Efficacy Scale, and the Career Satisfaction Scale were used for evaluating the study variables. Using Smart-PLS analysis, the findings suggest that perceived social support, career adaptability, career decision-making self-efficacy, and career satisfaction of Chinese college graduates at the beginning of their careers are positively correlated with each other. Moreover, career adaptability and career decision-making self-efficacy were found to play a mediating role, and a chain mediation effect exists. The results contribute to the development of a strategy to enhance the career adaptability of college students and individuals at the beginning of their working lives and to increase career satisfaction.

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Keywords Perceived social support · Career adaptability · Career decision-making self-efficacy · Career satisfaction

Résumé

Comment la perception du soutien social affecte-t-elle la satisfaction professionnelle des diplômés universitaires chinois en début de carrière ? Un modèle de médiation en chaîne Cette étude examine les associations entre le soutien social perçu, l'adaptabilité professionnelle, l'auto-efficacité dans la prise de décision professionnelle et la satisfaction professionnelle chez les diplômés universitaires chinois en début de carrière. L'échantillon de recherche comprenait 571 diplômés universitaires chinois ayant une expérience professionnelle allant de six mois à cinq ans. L'échantillon comprenait des individus avec différents niveaux d'éducation, y compris des diplômés de collège, des bacheliers et des postgradués. Aucune limitation n'a été imposée sur le domaine de spécialisation ou le travail des participants. La version chinoise de l'échelle de soutien social perçu, l'échelle d'adaptabilité professionnelle en 12 points - forme courte, l'échelle d'auto-efficacité dans la prise de décision professionnelle et l'échelle de satisfaction professionnelle ont été utilisées pour évaluer les variables de l'étude. En utilisant l'analyse Smart-PLS, les résultats suggèrent que le soutien social perçu, l'adaptabilité professionnelle, l'auto-efficacité dans la prise de décision professionnelle et la satisfaction professionnelle des diplômés universitaires chinois en début de carrière sont positivement corrélés entre eux. Et que l'adaptabilité professionnelle et l'auto-efficacité dans la prise de décision professionnelle jouent un rôle de médiation et qu'un modèle de médiation en chaîne existe. Les résultats contribuent au développement d'une stratégie pour améliorer l'adaptabilité professionnelle des étudiants universitaires et des individus en début de vie professionnelle et pour augmenter la satisfaction professionnelle.

Zusammenfassung

Wie beeinflusst die wahrgenommene soziale Unterstützung die Berufszufriedenheit von chinesischen Hochschulabsolventen in ihren frühen Berufsjahren? Ein Kettvermittlungsmodell Diese Studie untersucht die Zusammenhänge zwischen wahrgenommener sozialer Unterstützung, beruflicher Anpassungsfähigkeit, Selbstwirksamkeit bei der beruflichen Entscheidungsfindung und Berufszufriedenheit bei chinesischen Hochschulabsolventen in ihren frühen Berufsjahren. Die Forschungsstichprobe bestand aus 571 chinesischen Hochschulabsolventen, die Berufserfahrung im Bereich von sechs Monaten bis fünf Jahren hatten. Die Stichprobe umfasste Personen mit unterschiedlichen Bildungshintergründen, einschließlich Absolventen von Junior Colleges, Bachelor-Abschlüssen und Postgraduierten. Es wurden keine Einschränkungen hinsichtlich des Hauptfachs oder der Arbeit der Teilnehmer auferlegt. Die chinesische Version der Skala für wahrgenommene soziale Unterstützung, die 12-Punkte-Skala für berufliche Anpassungsfähigkeit - Kurzform, die Skala für Selbstwirksamkeit bei der beruflichen Entscheidungsfindung und die Skala für Berufszufriedenheit wurden zur Bewertung der Studienvariablen verwendet. Mit Hilfe der Smart-PLS-Analyse legen die Ergebnisse nahe, dass die wahrgenommene soziale Unterstützung, die berufliche Anpassungsfähigkeit, die Selbstwirksamkeit

bei der beruflichen Entscheidungsfindung und die Berufszufriedenheit von chinesischen Hochschulabsolventen zu Beginn ihrer Karriere positiv miteinander korreliert sind. Und dass die berufliche Anpassungsfähigkeit und die Selbstwirksamkeit bei der beruflichen Entscheidungsfindung eine vermittelnde Rolle spielen und dass ein Kettvermittlungsmodell existiert. Die Ergebnisse tragen zur Entwicklung einer Strategie bei, um die berufliche Anpassungsfähigkeit von Hochschulstudenten und Personen zu Beginn ihres Arbeitslebens zu verbessern und die Berufszufriedenheit zu erhöhen.

Resumen

¿Cómo afecta el apoyo social percibido a la satisfacción laboral de los graduados universitarios chinos en sus primeros años de carrera? Un modelo de mediación en cadena Este estudio examina las asociaciones entre el apoyo social percibido, la adaptabilidad profesional, la autoeficacia en la toma de decisiones de carrera y la satisfacción laboral entre los graduados universitarios chinos en sus primeros años de carrera. La muestra de investigación consistió en 571 graduados universitarios chinos que tenían experiencia laboral que variaba de seis meses a cinco años. La muestra incluía individuos con diferentes antecedentes educativos, incluyendo graduados de colegios universitarios, licenciaturas y postgraduados. No se impusieron limitaciones en el campo de especialización o trabajo de los participantes. Se utilizó la versión china de la Escala de Apoyo Social Percibido, la Escala de Adaptabilidad Profesional de 12 ítems - Forma Corta, la Escala de Autoeficacia en la Toma de Decisiones de Carrera y la Escala de Satisfacción Laboral para evaluar las variables del estudio. Utilizando el análisis Smart-PLS, los hallazgos sugieren que el apoyo social percibido, la adaptabilidad profesional, la autoeficacia en la toma de decisiones de carrera y la satisfacción laboral de los graduados universitarios chinos al comienzo de sus carreras están positivamente correlacionados entre sí. Y que la adaptabilidad profesional y la autoeficacia en la toma de decisiones de carrera juegan un papel mediador y que existe un modelo de mediación en cadena. Los resultados contribuyen al desarrollo de una estrategia para mejorar la adaptabilidad profesional de los estudiantes universitarios y las personas al comienzo de sus vidas laborales y para aumentar la satisfacción laboral.

Introduction

Rapid technological advancement, turbulence caused by global economic integration, and the effects of the recent pandemic have combined to create a work environment that is unprecedented in its complexity and uncertainty. First, rapid technological development and innovation have not only altered the character and structure of work but also created opportunities for those who are adaptable to these new technologies, while simultaneously increasing the competitive pressures on graduates (Benanav, 2020). Second, the interconnectedness of global economies implies that an economic setback in one nation could have repercussions in other nations, thereby increasing market volatility (D'Aguanno et al., 2021). Lastly, the detrimental global effects of coronavirus disease 2019 (COVID-19) have exacerbated an already

difficult employment scenario, and the pandemic has significantly impacted daily lives and professions, casting alarming shadows over numerous career paths (Akkermans et al., 2020). Also, these effects have significantly influenced the labor market for Chinese graduates. As a result of the economic downturn, there has been a decrease in recruitment demand, an increase in employment supply, and an escalation in the challenges faced by Chinese graduates in securing employment (Mao et al., 2022).

For Chinese college graduates just entering the workforce, this sequence of challenges and changes presents an unprecedented dilemma. In this setting, perceived social support has emerged as a major factor in their career development. This social support, which may come from family, friends, or others, aids these graduates in enhancing their self-efficacy in career decision-making, that is, their confidence in their ability to execute career planning and decision-making duties successfully (Hou et al., 2019). Concurrently, this support may also aid in enhancing their career adaptability (CA), enabling them to navigate challenges and adjustments in their career trajectory more effectively (Öztemel & Yıldız-Akyol, 2021). This eventually contributes to an employee's employment satisfaction (Takawira & Coetzee, 2019).

Therefore, it is essential to examine this topic in depth in order to gain a deeper understanding of the intricate relationships between these factors and to elucidate how graduates respond to these new demands and challenges. In light of this, the purpose of the present study is to investigate these questions in order to gain a deeper understanding of how, within this particular cultural and economic context, PSS interacts with career decision-making self-efficacy (CDMSE), career adaptability (CA), and job satisfaction, particularly for university graduates who are new to society.

Perceived social support

Social support includes factors closely related with an individual's career development through his or her social connections, such as family members, relatives, colleagues, groups, and organizations (X. Wang et al., 1999). For individuals in the workplace, in addition to support from organizations, supervisors, and coworkers, it also includes relevant policies and measures. Even though college graduates in their early career stages have developed some career knowledge, they need more professional and social experience. They need to familiarize themselves with the professional world and life. Consequently, they will rely on the guidance of their social support system during the vocation selection, adaptation, and development processes. Two types of social support exist in the natural world. One is the support and assistance that exist in actuality and can be perceived through concrete and objective actions. Its existence manifests in both material and spiritual forms. The other is the individual's belief that they will receive assistance and support for their situational problems, namely PSS, which has a connection with his prior subjective experience and emotion (Fu, 2015).

Social support is not only closely associated with an individual's physical and mental health, but also with his or her career development (Fu, 2015). Wang (2014)

found that social support possessed a substantial negative predictive role in career choice difficulties. According to Sun and Liu (2019), social support has a substantial beneficial predictive effect on CA. According to research of Han and Rojewski (2015), for college students who have worked for one year after graduation, their perception of school support positively affected their job satisfaction through adaptability. Moreover, through an investigation and analysis of special post teachers, it was concluded that social support could negatively predict attrition intention via job satisfaction (Li et al., 2021).

Career adaptability

The first to formulate the concept of CA based on job maturation and career maturity were Super and Knasel in 1981 (Song et al., 2023). Numerous academic researchers, including Pratzner, Goodman, Savickas, Ployhart and Bliese, and Johnston, have been interested in the concept of CA owing to its complex content and dimensions (Song et al., 2023). Currently, the definition proposed and refined by Savickas based on years of research is widely accepted: CA acts as a psychological asset that makes it possible for individuals to manage as well as activate their mental energy as they deal with career projects, difficulties, or shifts and when they experience career crises during career development (Savickas, 1997, 2005). Moreover, between 2008 and 2012, Savickas collaborated with experts from 18 countries and regions to develop operational definitions and measurement instruments for CA. Both qualitative and quantitative concepts were adopted to promote the operational process of CA (Savickas & Porfeli, 2012), and this international research demonstrates that experts and scholars from different countries accept and agree on the CA of the four-dimensional structure despite their different cultural backgrounds. These include concern, control, curiosity, and confidence.

Individual and situational factors influence CA (Rudolph et al., 2017), which is a form of social-psychological capital that accompanies individual career development to adapt to internal motivation and external environment changes (Savickas, 1997, 2005), and it is believed that there will be adaptive behaviors and outcomes (Zhou & Xie, 2022). Different demographic variables, such as age, gender, and level of education, influence the research outcomes of various academics. According to Rottinghaus et al. (2005) and Hirschi (2009), gender has no bearing on the development of CA. Jiang (2015) discovered that male students exhibited greater CA than female students. Using the Career Futures Inventory (CFI) in 2005, it was found that the level of CA among seniors was greater than the level of juniors, and this conclusion was confirmed (Rottinghaus et al., 2005). The research of Zhao and Xue (2010) and others demonstrates, however, that this was only sometimes the case. More studies have shown that personality traits such as the Big Five personality types (Rudolph et al., 2017), initiative, along with core self-evaluation, mental capability (Ohme & Zacher, 2015), individual emotion (Neureiter & Traut-Mattausch, 2017), and other could indicate the level of CA. Similarly, parenting style, social support, future time orientation (Öztemel & Yıldız-Akyol, 2021), and other factors may affect CA. Moreover, in studies on the effect of adaptive readiness in the

psychological capital on life satisfaction (Pajic et al., 2018), the effect of parental autonomous support on academic engagement (Jiang et al., 2022), the effect of flexibility on workers' life satisfaction (Topino et al., 2022), and others, adaptability in the workplace serves as a mediator.

Career decision-making self-efficacy

Taylor and Betz (1983) conceptualized career decision-making self-efficacy (CDMSE), which implements self-efficacy in making career choices, based on Bandura's self-efficacy structure, cognitive behavior theory, and social learning theory. They believed that CSE is the decision-maker's self-evaluation or belief in their capacity to fulfill their responsibilities as they make career decisions. It consists of the following five components: accurately evaluating one's ability (including self-evaluation of one's ability, professional interest, professional value, and self-concept), searching for professional information, correctly screening out jobs that match one's characteristics with work characteristics, correctly planning the specific implementation of career decision-making, and having faith in one's capacity to overcome obstacles. Over the years, scholars from various regions have conducted various studies on self-efficacy in career decision-making. Numerous studies have demonstrated a positive correlation between career-related familial support along with career selection self-efficacy (Lent et al., 2016).

In addition, recent research indicates that social support has a strong connection with CDMSE. Liu (2013) discovered a beneficial relationship between college students' CDMSE and objective support, affective support, and utilization of support. Both objective and subjective social support can positively predict the CDMSE of college students. Other researchers have found similar results, with significant implications for individual career development. Social support and professional self-efficacy are significantly correlated in Chinese college students (Z. Wang & Fu, 2015); perceived support from educators had a positive association with self-confidence in making career choices and promotes individual adaptive career development (Di Fabio & Kenny, 2015). Moreover, the higher a person's CDMSE, the greater his/her career maturity (Zhu & Miao, 2016).

Additionally, CDMSE has served as a mediator variable in a number of research relationships. Follow-up studies have shown that support from parents and teachers can predict job optimism one year later, in which the positive prediction is entirely mediated by CDMSE (Garcia et al., 2015). In addition, CDMSE acts as a mediator between career exploration and personality (Qu et al., 2015), as well as between familial support and adolescent career choice (Ginevra et al., 2015), among other variables.

Career satisfaction

The concept of career satisfaction (CS) is derived from the concept of job satisfaction, which cannot encompass CS. CS is a subjective indicator to measure career achievements, comprehensively reflecting employees' satisfaction with their work

achievements, salary, benefits, promotion opportunities, etc. It is closely related to employees' guidance for career development, so it is more defined as the overall happiness people experience when choosing a career (Z. Wang & Long, 2009).

According to previous studies, primary factors influencing CS are concentrated on three levels: the individual, the vocation, and the organization. First, the perspective of the individual includes social population demographics, personality traits, and other factors. Demographic differences (Gattiker & Larwood, 1988; Pfeffer, 1991), gender, age, and marital status as well as individual personality characteristics (Frank et al., 1999) and positive psychological characteristics, including psychological capital and core self-evaluation, can have a substantial impact on the level of individual job satisfaction. Second, from a professional standpoint, working hours, tenure, work experience, work and career development pressure, and perception of excess qualifications negatively affect CS (Cheng et al., 2019).Third, from an organizational perspective, organizational support (Ng et al., 2005), employees' perceived fairness in organizational career management, and organizations' attention to employees' career discovery (Herriot et al., 1994) can positively predict or influence employees' CS. Rhoades and Eisenberger (2002) found that the support and attention of the organization can make employees more willing to work and take positive actions for their career development, thereby increasing their CS. Additionally, Hosseinkhanzadeh et al. (2013) discovered a significant correlation between organizational culture and satisfaction with work, and supportive organizational culture is essential for enhancing job satisfaction.

Research hypothesis

According to a summary of previous research, there is a strong connection across the four variables. Nonetheless, we can also find that previous researchers have paid insufficient attention to the relationship between these four factors, concentrating instead on the relationships between the two factors or one of the factors as an intermediary variable. Consequently, based on the analysis of previous related studies, this study is founded on Savickas's career construction theory, and Rudolph et al.'s (2017) meta-analysis research results construct a chain intermediary hypothesis model between PSS, CA, CDMSE, and CS (Figure 1).

Hypothesis 1: PSS, CA, CDMSE, and CS of college graduates in China are significantly correlated with each other;

H1a: There is a significant association between PSS and CA of college graduates in China at the early stage of their careers.

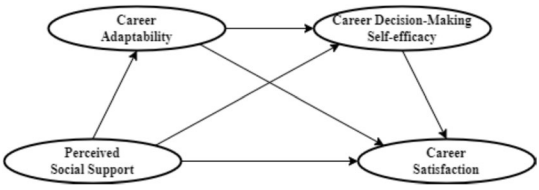

Figure 1 The chained mediation of CA and career decision-making self-efficacy in the relationship between perceived social support and career satisfaction

H1b: There is a significant association between PSS and CDMSE of college graduates in China at the early stage of their careers.
H1c: There is a significant association between PSS and CS of college graduates in China at the early stage of their careers.
H1d: There is a significant association between CA and CDMSE of college graduates in China at the early stage of their careers.
H1e: There is a significant association between CA and CS of college graduates in China at the early stage of their careers.
H1f: There is a significant association between CDMSE and CS of college graduates in China at the early stage of their careers.
Hypothesis 2: The CA of early-career Chinese college graduates mediates the connection with PSS and CDMSE.
Hypothesis 3: The CA of early-career Chinese college graduates mediates the connection with PSS and CS.
Hypothesis 4: The CDMSE of early-career Chinese college graduates mediates the connection with PSS and CS.
Hypothesis 5: The CDMSE of early-career Chinese college graduates mediates the connection with CA and CS.
Hypothesis 6: There is a chain mediation effect between PSS, CA, CDMSE, and CS among Chinese college graduates at the early stage of their careers.

Methods

Participants

This study's sample collection was authorized by the Scientific Research Office of Communication University of China, Nanjing. At the outset of the questionnaire, it is made abundantly clear that the survey is anonymous, that participation is voluntary, and that respondents may disengage and exit at any time. The data will be used exclusively for academic research and for no other purpose. After completing the questionnaire, there will be a random incentive drawing from 1 to 3 yuan.

Convenient sampling and snowball sampling were used to conduct online surveys. The sample is composed of college graduates from China who have worked for a minimum of 6 months, yet no more than 5 years after completing their initial studies, with no restrictions on the college type, major, or unit category. In November 2021, respondents participated in an online survey, and 700 questionnaires were distributed and recovered. Taking into account the consistency and completeness of the questionnaire responses and excluding outliers, 571 valid questionnaires (81.75%) were used for analysis. The sample consisted of 214 males (37.50%) employed in various regions of China, including 78 cities and various occupations. The participants' essential information is displayed in Table 1.

Table 1 Summary of basic characteristics

Variable	Variable content	Number	Proportion (%)
Gender	Female	357	62.52
	Male	214	37.48
Household registration	Rural	266	46.58
	City	305	53.42
Education level	Associate degree	101	17.69
	Bachelor's degree	384	67.25
	Postgraduate degree	86	15.06
School category	Public undergraduate	235	41.16
	Private undergraduate	249	43.61
	Public junior college	55	9.63
	Private junior college	42	7.36
Major	Liberal Arts	197	34.50
	Science and engineering	204	35.73
	Art and physical	170	29.77
Graduation year	2021	179	31.35
	2020	132	23.12
	2019	74	12.96
	2018	65	11.38
	2017	121	21.19
Years of work experience	3–6 months	170	29.77
	7–12 months	64	11.21
	No less than 1 year, no more than 2 years	114	19.96
	More than or equal to 2 years, less than 3 years	68	11.91
	No less than 3 years, no more than 5 years	155	27.15
Turnover experience	0	299	52.36
	1–3 times	261	45.71
	4–6 times	10	1.75
	7–9 times	1	0.18

Data source Collated through this study

Measures

Perceive social support

The Perceived Social Support Scale (PSSS) devised by Zimet (1987) and translated by China scholar Jiang (X. Wang et al., 1999) was utilized to assess PSS. The scale emphasizes the self-understanding and sentiments of individuals regarding their social support, which is composed of three measurements: family, friend, and other support. There are 12 items in the scale, with 4 items in each measurement. Examples include "My family is willing to help me make decisions" and "I can discuss my problems with my friends." In addition, it is a Likert 7 scale, ranging from

1 to 7, with higher scores indicating a higher level of support. Furthermore, this scale has obtained high levels of reliability and validity in Chinese research (Zeng & Huang, 2021).

Career adaptability

For the measurement of CA, the 12-item CAAS-SF scale revised by the team of Maggiori et al. was employed (Maggiori et al., 2017), and the expression was modified on the basis of the regional context. The gauge consists of four components: concern, control, curiosity, and confidence. There are three test questions for each dimension and a total of 12 elements. Examples include "I think about what my future will be like" (concern), "I count on myself" (control), "I look for opportunities to grow" (curiosity), and "I take care to do things well" (confidence). Adopting the Likert five-level assessment method, the greater the number, the greater the degree of conformity. Since its development in 2015, researchers in numerous regions have validated the reliability and validity of this scale (Song et al., 2023).

Career decision-making self-efficacy

The revised CDMSE-SF by Betz et al. (2005) was utilized to assess CDMSE. There were 25 questions covering five categories: self-evaluation, information-gathering, target-selecting, planning, and problem-solving. The scale employs a 5-point Likert scale, with higher scores indicating greater levels of CDMSE. Example queries include "Being able to identify what you value most in an occupation" and "You can find information about the school you graduated from." This questionnaire's reliability for homogeneity was 0.73. The reliability of retests was 0.80. The scale's construct validity and reliability are high (H. Wang, 2021).

Career satisfaction

This study employed the Career Satisfaction Inventory (CSI) created by Greenhaus et al. (1990) and translated by Wang and Long (2009). The 5-item scale reflects satisfaction with career accomplishment, advancement, treatment, development, and abilities such as "I am satisfied with my progress in meeting my income target" and "I am satisfied with the success of my career." On a Likert scale with 5 points, every item is scored; the higher the result, the greater the level of CS. The tool has received a great deal of backing for its reliability and validity and has been utilized by academics worldwide. This scale's coefficient of internal coherence was greater than 0.80, indicating a high degree of dependability (Cheng et al., 2019).

Data analysis

Partial least squares (PLS) is a multivariate analysis method that incorporates the characteristics of principal component analysis and regression analysis. The primary purpose of PLS is to determine the relationship between two data sets. Particularly

in structural equation modeling (SEM), PLS functions as an estimation method and is referred to as PLS-SEM; it is primarily employed for model estimation and forecasting. In this investigation, the model was constructed using PLS-SEM, and Smart-PLS version 3.3.7 was used to validate measurement and structural models. This is due to the fact that Smart-PLS is the most well-known statistical analysis instrument for PLS-SEM (Zhang, 2021).Moreover, as noted by Chin et al. (2003), PLS has less stringent sample condition requirements and does not require analysis data to adhere to a multivariate normal distribution, and investigation studies are generally not normally distributed.

Results

Typically, with PLS-SEM, both the measurement and structural models must be evaluated, and subsequent analysis can only be conducted if both models satisfy the conditions (Anderson & Gerbing, 1988).

Measurement model evaluation

When evaluating the measurement model in PLS-SEM, indicator reliability and internal consistency are typically evaluated using factor loadings, Cronbach α coefficient, and composite reliability (CR) values. In addition, convergent validity is determined by the value of average variance extracted (AVE), whereas discriminant validity is determined by the value of the heterotrait–monotrait ratio (HTMT) (Zhang, 2021). According to Zhang's explanation of PLS-SEM, factor loadings must be more than 0.7 and significant at the 0.05 level, and Cronbach α and CR values of 0.7 or greater indicate higher internal consistency and reliability. When the AVE value of a construct exceeds 0.5, sufficient convergent validity is indicated. Moreover, examining the correlations between constructs and factor loadings allows for the evaluation of discriminant validity. It demonstrates discriminant validity between the constructs when the square root of the AVE for each latent variable (LV) is greater than the correlation coefficient between that LV and any other LV. In addition, an HTMT value less than 0.85 indicates excellent discriminant validity (Zhang, 2021).

Tables 2 and 3 display each item's factor loading, reliability, and the convergence validity in this study's measurement model, indicating that all items have adequate reliability, convergence, and differentiation effectiveness. In this study, PSS, CA, and CDMSE are second-order factors with three low-order dimensions (family, friend, and other), four low-order dimensions (concern, control, curiosity, and confidence), and five low-order dimensions (self-evaluation, information-gathering, target-selecting, planning, and problem-solving), respectively. As shown in Table 4, the second-order structure's dependability and validity were also evaluated. The measurement of the second-order structure is also reliable and effective.

Table 2 Measurement model for the first-order constructs

First-order construct	Item	Factor loading	Cronbach α	CR	AVE
Family support	PSS01	0.858	0.894	0.926	0.759
	PSS02	0.901			
	PSS03	0.874			
	PSS04	0.851			
Friend support	PSS05	0.906	0.920	0.944	0.807
	PSS06	0.912			
	PSS07	0.892			
	PSS08	0.883			
Other support	PSS09	0.851	0.894	0.927	0.759
	PSS10	0.863			
	PSS11	0.885			
	PSS12	0.885			
Concern	CA01	0.879	0.869	0.920	0.793
	CA02	0.907			
	CA03	0.885			
Control	CA04	0.864	0.850	0.909	0.769
	CA05	0.891			
	CA06	0.876			
Curiosity	CA07	0.895	0.867	0.919	0.791
	CA08	0.906			
	CA09	0.866			
Confidence	CA10	0.880	0.887	0.930	0.816
	CA11	0.928			
	CA12	0.901			
Self-evaluation ability	CDMSE01	0.799	0.871	0.907	0.662
	CDMSE02	0.830			
	CDMSE03	0.885			
	CDMSE04	0.808			
	CDMSE05	0.738			
Information-gathering ability	CDMSE06	0.798	0.832	0.882	0.598
	CDMSE07	0.770			
	CDMSE08	0.762			
	CDMSE09	0.751			
	CDMSE10	0.785			
Target-selecting ability	CDMSE11	0.842	0.883	0.915	0.683
	CDMSE12	0.838			
	CDMSE13	0.843			
	CDMSE14	0.757			
	CDMSE15	0.846			

Table 2 (continued)

First-order construct	Item	Factor loading	Cronbach α	CR	AVE
Planning ability	CDMSE16	0.753	0.868	0.905	0.655
	CDMSE17	0.809			
	CDMSE18	0.809			
	CDMSE19	0.849			
	CDMSE20	0.824			
Problem-solving ability	CDMSE21	0.819	0.877	0.910	0.670
	CDMSE22	0.833			
	CDMSE23	0.778			
	CDMSE24	0.838			
	CDMSE25	0.825			
Career satisfaction	CS01	0.846	0.933	0.949	0.789
	CS02	0.885			
	CS03	0.889			
	CS04	0.922			
	CS05	0.900			

Data source Collated through this study

Table 3 Discriminant validity

Variable	Correlation of constructs and average variance extracted				HTMT			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) PSS	**0.882**							
(2) CA	0.571	**0.887**			0.647			
(3) CDMSE	0.545	0.634	**0.888**		0.610	0.688		
(4) CS	0.455	0.564	0.504	**0.889**	0.507	0.606	0.536	

The bold data are the AVE arithmetic square root of the corresponding construct.

Structural model evaluation

After demonstrating the validity and dependability of the measurement model, the structural model can be evaluated to test hypotheses and address pertinent research questions and objectives. In PLS-SEM, the structural model is evaluated on the basis of various criteria, such as model fit, collinearity evaluation, path coefficients, coefficient of determinant (R^2), effect size (f^2), and predictive relevance (Q^2).

Table 4 Measurement model for the second-order constructs

Second-order construct	Indicator	Factor loading	Cronbach α	CR	AVE
PSS	Family support	0.864	0.856	0.913	0.777
	Friend support	0.867			
	Other support	0.912			
CA	Concern	0.862	0.909	0.936	0.786
	Control	0.876			
	Curiosity	0.905			
	Confidence	0.902			
CDMSE	Self-evaluation ability	0.845	0.932	0.949	0.788
	Information-gathering ability	0.894			
	Target-selecting ability	0.912			
	Planning ability	0.908			
	Problem-solving ability	0.877			

Data source Collated through this study

Model fit

Model fit in Smart-PLS refers to the degree of fit between the model and observed data, i.e., how well the model corresponds with the actual data. Model fit indices evaluate the model's quality by determining whether it adequately explains and predicts the observed data's variability. Generally, square residual mean root (SRMR) is utilized for this evaluation. In general, an SRMR less than 0.08 or 0.1 indicates a decent fit of the model (Zhang, 2021). The SRMR value in this investigation is 0.059, meaning that it meets the criteria for fit.

Collinearity evaluation

Since the data were collected from a single source, the prevalence of multicollinearity among constructs can result in a common method bias issue. This can be determined by investigating multicollinearity in its entirety. In this technique, all variables are regressed on a common variable, and then the variance inflation factor (VIF) values are employed to determine the degree of multicollinearity. If VIF is less than 5, there is no significant multicollinearity between the constructs (Zhang, 2021). As shown in Table 5, the analysis revealed that the VIF is less than 5, indicating that single-source bias is not a significant concern for our data.

Path coefficients

It is essential to consider the standardized path coefficients (β-values) and their significance levels (t-statistics) when evaluating the structural model. The direct

Table 5 The values of VIF, R^2, f^2, and Q^2

Construct	VIF			R^2	f^2			Q^2
	CA	CDMSE	CS		CA	CDMSE	CS	
PSS	1.000	1.490	1.622		0.490 (strong)	0.088 (weak)	0.020 (weak)	
CA		1.490	1.922	0.329 (weak)		0.289 (moderate)	0.104 (weak)	0.251
CDMSE			1.836	0.455 (moderate)			0.035 (weak)	0.353
CS				0.367 (moderate)				0.282

95% confidence interval

path loadings are regression coefficients with values ranging from −1 to 1 and represent the strength of the relationship between constructs. A value closer to +1 denotes a strong positive relationship, a value closer to −1 denotes a strong negative relationship, and a value closer to 0 denotes a feeble relationship, often not reaching statistical significance (Zhang, 2021). In addition, it is crucial to ensure that the path coefficients are statistically significant at the 0.05 level (Zhang, 2021).

Table 6 demonstrates that both t values (>1.96) and p values (0.05) satisfy the criteria, confirming that all hypotheses are accepted. Furthermore, the lower and upper limits of bias-corrected confidence intervals do not contain zero. Consequently, each of these direct associations is statistically significant. The variables can be ranked in terms of the strength and significance of their correlations as follows, in descending order: PSS has the strongest link with CA ($\beta = 0.571$), followed by CA with CDMSE ($\beta = 0.477$), CA with CS ($\beta = 0.356$), PSS with CDMSE ($\beta = 0.273$), CDMSE with CS ($\beta = 0.201$), and PSS with CS ($\beta = 0.142$). They are all positively correlated with one another. Therefore, support is provided for hypotheses H1a through H1f, establishing the groundwork for future investigations of hypotheses.

Table 6 Path coefficients and hypothesis testing direct effects

Hypothesis	Path	Std Beta	t value	p value	BCI LL	BCI UL	Decision
H1a	PSS → CA	0.571	14.874	0.000	0.486	0.639	Supported
H1b	PSS → CDMSE	0.273	6.549	0.000	0.185	0.351	Supported
H1c	PSS → CS	0.142	3.090	0.002	0.052	0.230	Supported
H1d	CA → CDMSE	0.477	11.584	0.000	0.396	0.560	Supported
H1e	CA → CS	0.356	7.192	0.000	0.259	0.452	Supported
H1f	CDMSE → CS	0.201	4.332	0.000	0.109	0.293	Supported

95% confidence interval with a bootstrapping of 5000.

Coefficient of determinant and effect size

In PLS-SEM, the coefficient of determination, also referred to as the multivariate correlation square (R^2), and the effect size (f^2) are common statistical indicators used to assess the model fit (Zhang, 2021).

R^2 indicates the proportion of the variance in the dependent variable that can be explained by the independent variables and measures the model's explanatory and predictive power. Chin (1998) established the threshold values of 0.19, 0.33, and 0.67 to categorize the effects as mild, moderate, and substantial, respectively (Zhang, 2021). As shown in Table 5, this study found that R^2 for CA is 0.329 (weak), R^2 for CDMSE is 0.455 (moderate), and R^2 for CS is 0.367 (moderate). This indicates that PSS explains 32.9% of the variance in CA, 45.5% of the variance in CSE, and 36.7% of the variance in CS.

f^2 is used to evaluate the extent to which exogenous variables influence particular endogenous variables. Typically, values of 0.02, 0.15, and 0.35 indicate mild, moderate, and strong effects of exogenous variables on endogenous variables, respectively (Zhang, 2021). In this model, the effect sizes of PSS, CA, and CDMSE on CS are 0.020, 0.104, and 0.035, indicating that their respective impacts are relatively weak (Table 5). PSS ($f^2 = 0.088$) has a minimal effect on CDMSE, whereas CA ($f^2 = 0.289$) has a moderate effect (Table 5). However, PSS ($f^2 = 0.490$) has a substantial impact on CA.

Predictive relevance

In this study, the predictive relevance of the model was also assessed by calculating the cross-validated redundancy (Q^2) values using blindfolding. Typically, when Q^2 is greater than 0, it indicates that the model has effective predictive relevance for the provided latent variables, and a higher Q^2 value suggests stronger predictive relevance (Zhang, 2021). As shown in Table 5, the Q^2 values for the endogenous variables CA, CDMSE, and CS are 0.251, 0.353, and 0.282, respectively. These values all meet the criterion of being greater than 0, indicating that the model is predictive and effective.

Mediation effect

Exploring the mediating functions of CA and CDMSE in the relationship between PSS and CS is one of the objectives of this study. In the process of evaluating the mediation hypothesis, we followed the recommendations of Preacher and Hayes (2008) by using bootstrapping to test indirect effects. If the confidence intervals do not cross zero, we can conclude that there is a significant mediating effect. Table 7 shows that the indirect effects of each mediating relationship are significant, indicating the presence of mediating effects. Therefore, H2, H3, H4, H5, and H6 are supported. Consequently, the mediation analysis suggests that there is a significant

Table 7 Hypothesis testing indirect effects

Hypothesis	Path	Std Beta	*t* value	*p* value	BCI LL	BCI UL	Decision
H2	PSS → CA → CDMSE	0.273	9.745	0.000	0.221	0.333	Supported
H3	PSS → CA → CS	0.203	6.253	0.000	0.143	0.271	Supported
H4	PSS → CDMSE → CS	0.055	3.679	0.000	0.030	0.088	Supported
H5	CA → CDMSE → CS	0.096	3.944	0.000	0.051	0.148	Supported
H6	PSS → CA → CDMSE → CS	0.055	3.817	0.000	0.029	0.086	Supported

95% confidence interval with a bootstrapping of 5000

chained mediation model between PSS and CS, with career adaptability and career decision-making self-efficacy mediating the positive relationship between PSS and CS.

Control variables and effects

In PLS-SEM, for controlling variables involving categorical data, multiple-group analysis is typically conducted for analysis and discussion (Zhang, 2021). In this study, the control variables include gender (female/male), household registration (rural/city), educational background (associate degree/bachelor's degree), school category (public/private; undergraduate/junior college), major, years of work experience (less than 1 year/more than 1 year), and turnover experience (no turnover experience/turnover experience). These variables were all categorized as categorical data. In PLS-SEM, prior to analyzing the moderating effects of categorical variables on the model, it is necessary to evaluate the invariance of the between-group measurement model, which is a prerequisite for undertaking multiple-group analysis (Zhang, 2021).

By using the measurement invariance of composite models (MICOM) to assess the model, it was found that educational level (associate degree/bachelor's degree), school type (public/private; undergraduate/junior college), major, and job turnover experience (no job turnover experience/job turnover experience) exhibited complete measurement invariance across the variables in terms of form, configuration, and variances. Gender (female/male), hometown (rural/city), and years of work experience (less than 1 year/more than 1 year) exhibited invariance in form and configuration, but they displayed variance differences. Specifically, gender had differential effects on CDMSE, while hometown and years of work experience had diverse impacts on PSS, with all other variables remaining invariant.

However, it is important to observe that full measurement invariance is a stringent and conservative requirement that is rarely completely met in empirical research. Some researchers consider that when at least two indicators for a construct have equal loadings and intercepts across groups, it demonstrates sufficient scalar invariance (Zhang, 2021). Overall, the control variables involved in this study did not substantially affect the between-group measurement model, indicating model invariance. Therefore, multiple-group analysis can be conducted.

Table 8 Control variable effects

Path	Gender		Household registration		Education level		School category			
	PCD	*p* value	PCD	*p* value	PCD	*p* value	PCD	*p* value	PCD	*p* value
	Female–male	Female versus male	Rural–city	Rural versus city	College–undergraduate	College versus undergraduate	Public–private	Public versus private	College–undergraduate	College versus undergraduate
PSS → CS	−0.091	0.362	−0.078	0.389	−0.209	0.135	−0.087	0.337	−0.192	0.159
PSS → CDMSE	0.022	0.794	0.116	0.161	0.082	0.491	0.057	0.487	0.105	0.351
PSS → CA	−0.225	0.001**	−0.004	0.948	0.100	0.183	0.041	0.579	0.117	0.105
CDMSE → CS	−0.012	0.895	0.048	0.606	−0.030	0.836	0.019	0.833	−0.080	0.556
CA → CS	0.062	0.585	−0.035	0.731	0.324	0.006**	0.034	0.723	0.297	0.014*
CA → CDMSE	−0.098	0.233	−0.208	0.010*	−0.205	0.069	−0.158	0.050	−0.124	0.255
Path	Major category						Working years		Resignation situation	
	PCD	*p* value	PCD	*p* value	PCD	*p* value	PCD	*p* value	PCD	*p* value
	MG 1–MG 2	MG 1 versus MG 2	MG 1–MG 3	MG 1 versus MG 3	MG 2–MG 3	MG 2 versus MG 3	WYG A–WYG B	WYG A versus WYG B	RSG A–RSG B	RSG A versus RSG B
PSS → CS	−0.097	0.368	−0.001	0.989	0.096	0.401	−0.030	0.803	0.003	0.971
PSS → CDMSE	−0.068	0.498	0.094	0.353	0.162	0.121	−0.079	0.438	0.085	0.295
PSS → CA	0.028	0.756	0.036	0.685	0.007	0.940	−0.003	0.991	−0.005	0.954
CDMSE → CS	0.072	0.525	0.014	0.902	−0.058	0.594	−0.211	0.024*	−0.066	0.459
CA → CS	0.112	0.320	−0.044	0.723	−0.156	0.182	0.187	0.064	0.040	0.673
CA → CDMSE	0.070	0.519	−0.118	0.155	−0.188	0.075	−0.002	0.973	−0.064	0.431

*$p < 0.05$; **$p < 0.01$

PCD path coefficient difference, *MG* major group, *WYG* working years group, *RSG* resignation situation group

Table 8 presents the results of multiple-group analysis for various control variables. Gender had a significant moderating effect on the path from PSS to CA. Educational background and school type had significant moderating effects on the path from CA to CS. Household registration had a significant moderating effect on the path from CA to CDMSE. Finally, years of work experience after graduation had a significant moderating influence on the path from CDMSE to CS. The other direct relationships were not affected by all control variables.

Discussion

This study introduced CA and CDMSE to investigate the mechanism through which PSS influences CS. Based on the analysis of the collected data, a series of significant empirical results were obtained, confirming the hypotheses of this study and providing strong support for understanding the mechanisms underlying these relationships. The research findings indicate that PSS, CA, CDMSE, and CS have close and direct relationships. Furthermore, complex indirect relationships exist between them. Specifically, PSS not only has a direct impact on CS but also influences CS indirectly through CA and CDMSE. In addition, CA and CDMSE perform a mediating role in the relationship between PSS and CS, transmitting the influence of PSS to CS. Moreover, this study reveals that some control variables play moderating roles in these relationships.

Direct relationships between PSS, CA, CDMSE, and CS

Firstly, the study reveals that PSS has a positive effect on the CA, CDMSE, and CS of early-career Chinese university graduates ($\beta = 0.571$, $p < 0.01$ for CA; $\beta = 0.273$, $p < 0.01$ for CDMSE; $\beta = 0.142$, $p < 0.01$ for CS). This indicates that PSS functions as a significant factor influencing CA, CDMSE, and CS, aligning with previous research on the role of social support (Han & Rojewski, 2015; Li et al., 2021; Sun & Liu, 2019).

For Chinese university graduates preparing to enter or starting their professions, PSS exerts distinct pathways of influence. Individuals perceiving higher levels of social support tend to exhibit more proactive behaviors, such as actively seeking social resources, soliciting assistance, and effectively adapting to the challenges in their environment, thereby enhancing their CA and CDMSE. These factors interact and contribute to an increase in their CS. In contrast, individuals with inferior PSS may adopt more conservative strategies, exhibit less proactivity, and struggle to utilize available resources effectively. This situation may conceivably have adverse effects on their CA and CS.

Furthermore, the study also found that CA has a positive impact on CDMSE ($\beta = 0.477$, $p < 0.01$) and CS ($\beta = 0.356$, $p < 0.01$) among early-career Chinese college graduates. This discovery emphasizes the significance of CA in determining individuals' career development. CA not only affects a person's CDMSE and

CS, but also their career trajectories by enhancing their CDMSE and CS. This result aligns with previous research findings (Lee & Jung, 2022; Rudolph et al., 2017).

Savickas emphasizes the importance of CA in career development and has proposed the theory of CA, which suggests that individuals cultivate CA in order to adapt to the incessant changes in their careers (Zhou & Xie, 2022). This theory underscores the significance of CA, and its various dimensions (concern, control, curiosity, and confidence) play a significant role in the early careers of Chinese college graduates. During this phase, they must address a number of career challenges, such as career selection, employment adaptation, and career advancement. Individuals with high CA are more likely to be actively concerned about their careers, possess greater control over their career trajectories, and exhibit a propensity to engage in learning and acquiring new knowledge and skills. They also approach career challenges with greater confidence. These behaviors and processes unquestionably enhance and improve their confidence and abilities in career decision-making, enabling them to better address career challenges and achieve their career objectives. Therefore, the positive impact of CA on CDMSE and CS is comprehensible.

Moreover, the study also revealed that CDMSE has a positive effect on CS ($\beta = 0.201$, $p < 0.01$), further emphasizing the significant function of CDMSE in influencing individuals' CS. This discovery further emphasizes the significant function of CDMSE in influencing individuals' CS. Graduates with high levels of CDMSE are more confident in their ability to make informed career decisions, plan their future career development, and solve career-related problems effectively. Thus, this has a positive influence on an individual's CS, contributing to their overall career development.

Indirect relationships between PSS, CA, CDMSE, and CS

Using PLS-SEM modeling, this study found that, in the early careers of Chinese college graduates, CA positively mediates the effects of PSS on CDMSE and PSS on CS. Additionally, CDMSE also functions as a positive mediator in the relationship between PSS and CS, as well as between CA and CS. Moreover, there is an overall and effective chained mediation effect. The positive effect of PSS on CS is mediated by CA and CDMSE.

During the early stages of their careers, Chinese university graduates encounter numerous uncertainties and challenges, requiring them to adapt rapidly to the changing and complex professional environment. At this crucial moment, their PSS is crucial. Social support primarily comes from family, friends, and other significant interpersonal relationships, and is considered a valuable resource individuals need in their daily lives and work (X. Wang et al., 1999). PSS not only reduces graduates' emotional stress by providing emotional support that enables them to better manage emotional fluctuations during the career adaptation and decision-making process but also provides essential information and advice regarding career adaptation and decision-making. This assists graduates in making wiser career decisions and taking appropriate action. This information and guidance increases their self-assurance and optimism in the face of career adaptation challenges, thereby enhancing their CS.

The various dimensions of CA play a significant role in the early careers of Chinese college graduates, as evidenced primarily by their career concern, control, curiosity, and confidence. Graduates with a high level of career concern are more motivated and self-aware in pursuing various forms of social support. They thoroughly comprehend the importance of this support in achieving their career objectives. This positive career perspective not only improves their ability to perceive social support but also increases their confidence in making career choices. Graduates with a strong sense of career control are more likely to actively pursue social support to meet their career requirements. They are better able to select appropriate career support resources and utilize them effectively to improve their CDMSE. Graduates with greater career curiosity are more inclined to interact with others and seek out new information and guidance. They exhibit a more positive attitude in perceiving social support and are more inclined to engage with family, friends, colleagues, and significant others to seek career advice and support. This active engagement strengthens their social support network and increases their CDMSE because they act with greater confidence. Graduates with higher career self-confidence are more likely to perceive the positive effects of social support. They interact with others with greater confidence and are more receptive to receiving support and counsel. This interaction strengthens their social support network and improves their CDMSE because they have the confidence to adjust to their career environment, set appropriate career objectives, and make intelligent decisions regarding their career development.

CDMSE also plays a significant role in the early careers of Chinese university graduates, predominantly evidenced in various aspects of their capabilities, including self-assessment, information gathering, goal setting, planning, and problem-solving. Typically, in the early phases of their careers, a high level of CDMSE makes university graduates more self-assured when evaluating their possession of the required skills and abilities. This confidence enables them to adapt proactively to new career environments, thereby enhancing their CA. This self-confidence is instrumental in confronting career challenges, enabling them to better surmount difficulties and thus increasing their CS. Furthermore, a high ability to gather information enables graduates to gain comprehensive insights into various aspects, such as the intended field, opportunities, support, and resources. This active information gathering and utilization are critical for perceiving various levels of social support effectively and increasing CA. It assists graduates in comprehending and adjusting to the career environment, thereby enhancing their CS. Graduates with strong goal-setting skills can intelligently set attainable career goals. Exceptional planning skills help them chart pathways to attain these objectives. Together, these competencies facilitate the development of CA, as well-defined objectives and effective plans aid graduates in adapting to new career environments. These skills also play an essential role in enhancing CS as graduates are more likely to realize their career aspirations. In addition, graduates with proficient problem-solving skills are better equipped to deal with obstacles during the CA process and find effective solutions. This proactive behavior helps strengthen their CA, as they have the confidence to surmount obstacles. Problem-solving skills also have a positive influence on career contentment because graduates can better appreciate success and a sense of accomplishment

in their career journey. These positive behaviors and attitudes contribute to their career fulfillment.

CA is considered an adaptability resource, while CDMSE is seen as an adaptability response. These two factors are interconnected and are not only influenced by an individual's adaptability preparedness but also have significant indirect impacts on adaptability outcomes (Zhou & Xie, 2022). This is especially pertinent for Chinese university graduates in the early phases of their careers, as they are entering the professional field and need to acclimatize to a new work environment. At this crucial juncture, their level of PSS directly impacts the extent and efficacy of their utilization of adaptability resources.

As discussed earlier, disparities in PSS capabilities will influence the actual support experiences, thus influencing their response behaviors. Chinese university grads in a state of survival have recently entered a new professional environment. This shift from a school learning environment, along with the distinctions in their positions, presents a transformation from the role of a pupil to that of a worker. If they cannot access and experience sufficient support from family, friends, peers, colleagues, and other external sources during this period, they may experience increased anxiety and isolation when confronted with career challenges. This emotional state can impact the individual's utilization of adaptability resources, as well as diminish their enthusiasm for work, CA, and self-efficacy. They may begin to dispute their self-worth, ultimately resulting in dissatisfaction with their career status, which in turn impacts CS. Self-affirmation and self-satisfaction are more prevalent among individuals with a high level of social support. They tend to have a stronger sense of identification with the careers they pursue, which makes them more enthusiastic about their work, more satisfied with their careers, and ultimately aware of the significance and responsibility of their careers.

Control variables effect

The results of the multiple-group analysis in this study revealed the moderating effects of certain control variables on the relationships between variables. Specifically, in the early careers of Chinese college graduates, gender differences had a significant moderating effect on the relationship between PSS and CA. In this regard, the study found that the path coefficient difference between the female and male groups was -0.225 ($p < 0.01$), indicating that the impact of PSS on CS was substantially reduced for females compared with males. This result may reflect the intricate relationship between gender roles, societal expectations, and support systems among Chinese college graduates. It may also suggest the need to consider gender-specific support programs and intervention measures to better address the requirements of distinct gender groups.

In addition, the relationship between CA and CDMSE differed significantly among graduates from different geographic backgrounds. Specifically, the difference in path coefficients between rural and city groups was -0.208 ($p < 0.05$), indicating that CA had a substantially lesser effect on CDMSE in rural areas than in city areas. This distinction can be attributed to regional differences in the quality of primary

education and the availability of resources. While rural development in China has been progressing significantly and the city–rural divide is progressively narrowing, the historical regional disparities can still have a lingering impact on individuals. This finding highlights the significance of contemplating regional differences in support and training programs in order to assist graduates from a variety of geographic regions more effectively.

In contrast, the number of years of post-graduation work experience significantly moderated the relationship between CDMSE and CS. The path coefficient difference between individuals with less than one year of work experience after graduation and those with over one year of work experience was −0.211 ($p < 0.05$). This suggests that individuals with less than one year of work experience after graduation had a substantially lesser impact of CDMSE on career satisfaction compared with those with more than one year of work experience. This finding may reflect that individuals' perceptions and experiences of CDMSE endure significant changes as they accumulate work experience, particularly during their initial entry into the workforce. This discovery contributes to a greater understanding of the impact of the temporal dimension on early-career CS.

Finally, the control variables of educational background (associate degree versus bachelor's degree) and school type (junior college versus undergraduate) had significant moderating effects on the relationship between CA and CS. In this regard, this study found that there were significant differences between individuals with an associate degree background and those with a bachelor's degree background. The junior college group demonstrated a greater quantitative effect of CA on CS. This difference may be attributable to the distinct educational systems, resources, and faculty of various types of educational institutions, resulting in variations in the development of CA and CS among graduates from various backgrounds. This finding underscores the need to consider the requirements of pupils from diverse school backgrounds in educational policies and support.

Although, except for these influences, the control variables in this study did not have moderating effects on other relationships, the results of the multi-group analysis still underscore the significant role of control variables in the relationships among PSS, CA, CDMSE, and CS in the early careers of college graduates. These moderating effects provide valuable insights, aiding in the comprehension of differences between groups and providing support for individualized intervention and support measures.

Limitations and future study

This study, like all others, possesses limitations that must be considered. To begin with, it was a cross-sectional study, which calls for caution in interpreting causality. Although the data support the model's hypothesized relationships, future research must confirm the precise directionality of these associations through longitudinal sampling. In addition, even though the type or field of work does not restrict the size of the sample of this investigation, the group size of certain types is insufficient; therefore, caution ought to be practiced while extending the results to the entire population. Future research should

replicate these results with larger sample sizes. In addition, self-reporting methods were used to obtain the data for this study, which may have exposed them to reporting bias. Similarly, factors that may have influenced the participants' subjective experience, such as family circumstances and marital status, were not investigated. To ensure that the results are pertinent to all occupational categories, future research may need to employ a sample that is more balanced and comprehensive.

Obviously, for the customization of support and intervention measures, training on various dimensions of PSS, CA, and CDMSE, as well as evaluating their efficacy, could be considered areas for further study.

Conclusion

In the swiftly changing, globalized world of today, the need to effectively manage constant change and uncertainty is becoming more and more pressing. In this context, this study reveals the positive and significant impact of PSS, CA, and CDMSE on the CS of Chinese college graduates in the early stages of their careers. Notable is the significant role that CA and CDMSE play as mediators in the relationship between PSS and CS. This means that our research findings emphasize the crucial role of CA and CDMSE in enhancing the positive relationship between PSS and CS. These findings have important practical implications for the development of CA support and intervention measures tailored to college students, aiming to meet the demands of the modern workplace.

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Author contributions S.H. supervised the topic selection and research design. C.S. was responsible for the core point of this research, data collection, and wrote the paper. X.X. reviewed, edited, and modified the manuscript. All authors contributed to the article and approved the submitted version.

Data availability The original contributions presented in the study are included in the article; further inquiries can be directed to the corresponding author.

Declarations

Conflict of interest The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethical approval This study involving human participants was reviewed and approved by the Ethics Committee of Communication University of China, Nanjing.

Informed consent The ethics committee waived the requirement of written informed consent for participation.

References

Akkermans, J., Richardson, J., & Kraimer, M. L. (2020). The Covid-19 crisis as a career shock: Implications for careers and vocational behavior. *Journal of Vocational Behavior, 119*, 103434. https://doi.org/10.1016/j.jvb.2020.103434

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411–423. https://doi.org/10.1037/0033-2909.103.3.411

Benanav, A. (2020). *Automation and the Future of Work*. Verso Books.

Cheng, B., Zhou, X., & Guo, G. (2019). Effects of perceived overqualification on employees' career satisfaction: From the perspective of cognition. *Business and Management Journal, 2*, 107–121. https://doi.org/10.19616/j.cnki.bmj.2019.02.007

Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research, 14*(2), 189–217. https://doi.org/10.1287/isre.14.2.189.16018

D'Aguanno, L., Davies, O., Dogan, A., Freeman, R., Lloyd, S., Reinhardt, D., Sajedi, R., & Zymek, R. (2021). Global value chains, volatility and safe openness: Is trade a double-edged sword? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3766910

Di Fabio, A., & Kenny, M. E. (2015). The contributions of emotional intelligence and social support for adaptive career progress among Italian youth. *Journal of Career Development, 42*(1), 48–59. https://doi.org/10.1177/0894845314533420

Frank, E., McMurray, J. E., Linzer, M., & Elon, L. (1999). Career satisfaction of US women physicians: Results from the women physicians' health study. *Archives of Internal Medicine, 159*(13), 1417–1426. https://doi.org/10.1001/archinte.159.13.1417

Fu, Y. (2015). Research on the mechanism of college students' career self-efficacy in the period of career preparation and the influence of career development [Phd]. Jilin University.

Garcia, P. R. J. M., Restubog, S. L. D., Bordia, P., Bordia, S., & Roxas, R. E. O. (2015). Career optimism: The roles of contextual support and career decision-making self-efficacy. *Journal of Vocational Behavior, 88*, 10–18. https://doi.org/10.1016/j.jvb.2015.02.004

Gattiker, U. E., & Larwood, L. (1988). Predictors for managers' career mobility, success, and satisfaction. *Human Relations, 41*(8), 569–591. https://doi.org/10.1177/001872678804100801

Ginevra, M. C., Nota, L., & Ferrari, L. (2015). Parental support in adolescents' career development: Parents' and children's perceptions. *The Career Development Quarterly, 63*(1), 2–15. https://doi.org/10.1002/j.2161-0045.2015.00091.x

Han, H., & Rojewski, J. W. (2015). Gender-specific models of work-bound Korean adolescents' social supports and career adaptability on subsequent job satisfaction. *Journal of Career Development, 42*(2), 149–164. https://doi.org/10.1177/0894845314545786

Herriot, P., Gibbons, P., Pemberton, C., & Jackson, P. R. (1994). An empirical model of managerial careers in organizations. *British Journal of Management, 5*(2), 113–121. https://doi.org/10.1111/j.1467-8551.1994.tb00072.x

Hirschi, A. (2009). Career adaptability development in adolescence: Multiple predictors and effect on sense of power and life satisfaction. *Journal of Vocational Behavior, 74*(2), 145–155. https://doi.org/10.1016/j.jvb.2009.01.002

Hosseinkhanzadeh, A. A., Hosseinkhanzadeh, A., & Yeganeh, T. (2013). Investigate relationship between job satisfaction and organizational culture among teachers. *Procedia-Social and Behavioral Sciences, 84*, 832–836. https://doi.org/10.1016/j.sbspro.2013.06.656

Hou, C., Wu, Y., & Liu, Z. (2019). Career decision-making self-efficacy mediates the effect of social support on career adaptability: A longitudinal study. *Social Behavior and Personality: An International Journal, 47*(5), 1–13. https://doi.org/10.2224/sbp.8157

Jiang, L. (2015). Current situation of college students' career adaptability and its enlightenment to career development education. *Theory Research, 35*, 50–52.

Jiang, R., Fan, R., Zhang, Y., & Li, Y. (2022). Understanding the serial mediating effects of career adaptability and career decision-making self-efficacy between parental autonomy support and academic engagement in Chinese secondary vocational students. *Frontiers in Psychology, 13*, 953550. https://doi.org/10.3389/fpsyg.2022.953550

Lee, A., & Jung, E. (2022). University students' career adaptability as a mediator between cognitive emotion regulation and career decision-making self-efficacy. *Frontiers in Psychology, 13*, 896492. https://doi.org/10.3389/fpsyg.2022.896492

Lent, R. W., Ezeofor, I., Morrison, M. A., Penn, L. T., & Ireland, G. W. (2016). Applying the social cognitive model of career self-management to career exploration and decision-making. *Journal of Vocational Behavior, 93*, 47–57. https://doi.org/10.1016/j.jvb.2015.12.007

Li, Z., Xu, L., Li, D., & Ye, B. (2021). Effect of social support on turnover intention in special-post teachers: Chain mediating model. *Chinese Journal of Clinical Psychology, 29*(5), 1010–1013. https://doi.org/10.16128/j.cnki.1005-3611.2021.05.023

Liu, C. (2013). The relationship of learning motivation, social support and career decision making self-efficacy in college students [Masters]. Central South University.

Maggiori, C., Rossier, J., & Savickas, M. L. (2017). Career adapt-abilities scale-short form (CAAS-SF): Construction and validation. *Journal of Career Assessment, 25*(2), 312–325. https://doi.org/10.1177/1069072714565856

Mao, Y., Zhang, Y., Bai, J., Zhang, L., & Hu, W. (2022). The impact of COVID-19 on the employment status and psychological expectations of college graduates: Empirical evidence from the survey data of Chinese recruitment websites. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2022.1039945

Neureiter, M., & Traut-Mattausch, E. (2017). Two sides of the career resources coin: Career adaptability resources and the impostor phenomenon. *Journal of Vocational Behavior, 98*, 56–69. https://doi.org/10.1016/j.jvb.2016.10.002

Ng, T. W. H., Eby, L. T., Sorensen, K. L., & Feldman, D. C. (2005). Predictors of objective and subjective career success. A meta-analysis. *Personnel Psychology, 58*(2), 367–408. https://doi.org/10.1111/j.1744-6570.2005.00515.x

Ohme, M., & Zacher, H. (2015). Job performance ratings: The relative importance of mental ability, conscientiousness, and career adaptability. *Journal of Vocational Behavior, 87*, 161–170. https://doi.org/10.1016/j.jvb.2015.01.003

Öztemel, K., & Yıldız-Akyol, E. (2021). The predictive role of happiness, social support, and future time orientation in career adaptability. *Journal of Career Development, 48*(3), 199–212. https://doi.org/10.1177/0894845319840437

Pajic, S., Ulceluse, M., Kismihok, G., Mol, S. T., & den Hartog, D. N. (2018). Antecedents of job search self-efficacy of Syrian refugees in Greece and the Netherlands. *Journal of Vocational Behavior, 105*, 159–172. https://doi.org/10.1016/j.jvb.2017.11.001

Pfeffer, J. (1991). Organization theory and structural perspectives on management. *Journal of Management, 17*(4), 789–803. https://doi.org/10.1177/014920639101700411

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Qu, K., Ju, R., & Zhang, Q. (2015). The relationships among proactive personality, career decision-making self—Efficacy and career exploration in college students. *Psychological Development and Education, 31*(4), 445–450. https://doi.org/10.16187/j.cnki.issn1001-4918.2015.04.08

Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *Journal of Applied Psychology, 87*(4), 698–714. https://doi.org/10.1037/0021-9010.87.4.698

Rottinghaus, P. J., Day, S. X., & Borgen, F. H. (2005). The career futures inventory: A measure of career-related adaptability and optimism. *Journal of Career Assessment, 13*(1), 3–24. https://doi.org/10.1177/1069072704270271

Rudolph, C. W., Lavigne, K. N., & Zacher, H. (2017). Career adaptability: A meta-analysis of relationships with measures of adaptivity, adapting, responses, and adaptation results. *Journal of Vocational Behavior, 98*, 17–34. https://doi.org/10.1016/j.jvb.2016.09.002

Savickas, M. L. (1997). Career adaptability: An integrative construct for life-span, life-space theory. *The Career Development Quarterly, 45*(3), 247–259. https://doi.org/10.1002/j.2161-0045.1997.tb00469.x

Savickas, M. L. (2005). The theory and practice of career construction. In R. W. Lent & S. D. Brown (Eds.), *In Career development and counseling: Putting theory and research to work* (pp. 42–70). Wiley.

Savickas, M. L., & Porfeli, E. J. (2012). Career adapt-abilities scale: Construction, reliability, and measurement equivalence across 13 countries. *Journal of Vocational Behavior, 80*(3), 661–673. https://doi.org/10.1016/j.jvb.2012.01.011

Song, C., Hashim, S. B., Xu, X., & Ling, H. (2023). Career adapt-ability scale -short form: Validation among early career stage of Chinese university graduates. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2023.1110287

Sun, Q., & Liu, Y. (2019). Effects of social support on career adaptability in college students: Moderated mediating effect. *Chinese Journal of Clinical Psychology, 27*(1), 185–188. https://doi.org/10.16128/j.cnki.1005-3611.2019.01.038

Takawira, N., & Coetzee, M. (2019). Psychosocial resources, support, and career satisfaction among professional women: A South African study. *Journal of Psychology in Africa, 29*(3), 208–216. https://doi.org/10.1080/14330237.2019.1625598

Taylor, K. M., & Betz, N. E. (1983). Applications of self-efficacy theory to the understanding and treatment of career indecision. *Journal of Vocational Behavior, 22*(1), 63–81. https://doi.org/10.1016/0001-8791(83)90006-4

Topino, E., Svicher, A., Di Fabio, A., & Gori, A. (2022). Satisfaction with life in workers: A chained mediation model investigating the roles of resilience, career adaptability, self-efficacy, and years of education. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2022.1011093

Wang, X., Wang, X., & Ma, H. (1999). *Xin li wei sheng ping ding liang biao shou ce* [Rating scales for mental health]. Zhong Guo Xin Li Wei Sheng Za Zhi She.

Wang, L. (2014). A research on the relations between the career decision-making difficulties together with explore career and the social support [Masters]. Liaoning Normal University.

Wang, H. (2021). Research on the impact of career-specific parental behaviors on career adaptability of master's degree: Career decision-making self-efficacy as mediation [Masters]. Shanxi University of Finance & Economics.

Wang, Z., & Fu, Y. (2015). Social support, social comparison, and career adaptability: A moderated mediation model. *Social Behavior and Personality, 43*(4), 649–659. https://doi.org/10.2224/sbp.2015.43.4.649

Wang, Z., & Long, L. (2009). Mechanism of social capital on Chinese employees' career success. *Management Review, 21*(8), 30–39. https://doi.org/10.14120/j.cnki.cn11-5057/f.2009.08.007

Zeng, X., & Huang, Y. (2021). The impact of social support on poor college students' online compulsive shopping: The chain mediating effect between self-esteem and subjective well-being. *Journal of Harbin University, 42*(8), 133–137. https://doi.org/10.3969/j.issn.1004-5856.2021.08.033

Zhang S. (2021). *Partial least squares structural equation modeling: Applications with SmartPLS*. Wunan Tu Shu Chu Ban Gu Fen You Xian Gong Si.

Zhao, X., & Xue, G. (2010). The current situation of college students' career adaptability and its relationship with career decision-making style. *Modern Education Management, 10*, 119–122. https://doi.org/10.16697/j.cnki.xdjygl.2010.10.024

Zhou, W., & Xie, B. (2022). *Zhi ye sheng ya yan jiu yu shi jian bi bei de 41 ge li lun* [Career research and practice theories]. Peking University Press (Bei Jing Da Xue Chu Ban She).

Zhu, W., & Miao, C. (2016). How do social support and career decision-making self-efficacy influence career maturity of the secondary vocational school students? *Career Development Education Research, 12*(01), 84–94.

Wang, X., Wang, X., & Ma, H. (1999). Xin li wei sheng ping ding liang biao shou ce [Rating scales for men tal health]. Zhong Guo Xin Li Wei Sheng Za Zhi She. (Available in the literature list.)