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From Psychological Resilience to Employment Quality: A Four-Wave Longitudinal Study of Career Adaptability and Job-Search Self-Efficacy

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Abstract

Objective: Although psychological resources help graduates navigate competitive labor markets, it remains unclear how psychological resilience—defined here as the capacity to maintain or restore effective functioning when goal pursuit is disrupted by setbacks—is related to the quality rather than the mere acquisition of first employment. This study examines whether resilience predicts employment quality through career adaptability and job-search self-efficacy sequentially, and evaluates digital job-search ability (DJSA) and market pressure as moderators. Methods: A four-wave longitudinal study of 1500 final-year students at tertiary institutions (university undergraduates and vocational-college students in their graduating year) used stratified cluster sampling. Resilience was assessed at T1; adaptability and market pressure at T2; self-efficacy and digital job-search ability at T3; and employment quality at T4. The final analytic sample comprised 860 graduates who were in paid employment at T4. The analyses decomposed sample flow, evaluated employment selection, applied small-cluster corrections, evaluated the study-specific digital scale in split samples and validated the study-specific digital scale in split samples, and varied employment-quality construction and functional form. Results: In the primary latent model, resilience was positively associated with employment quality ($\beta = 0.17$, $p < 0.001$). Three indirect pathways emerged: via adaptability alone (B = 0.07, 95% CI [0.03, 0.11]), via self-efficacy alone (B = 0.06, 95% CI [0.02, 0.10]), and through both sequentially (B = 0.06, 95% CI [0.02, 0.09]). In the prespecified single-level model, moderation effects were small and nominally significant for digital job-search ability × self-efficacy ($\beta = 0.12$, $p < 0.01$, $\Delta R^2 = 0.02$) and market pressure × resilience ($\beta = 0.09$, $p < 0.05$, $\Delta R^2 = 0.01$), but neither was supported after cluster-adjusted small-sample inference. The direct association was comparatively stable in direction; mediation and moderation were specification-dependent. Conclusions: Resilience was prospectively associated with employment quality, but evidence for the proposed mechanisms was specification-dependent.

Keywords: psychological resilience; career adaptability; job-search self-efficacy; employment quality; school-to-work transition; longitudinal study

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1. Introduction

The school-to-work transition has become increasingly uncertain against the backdrop of digital transformation, artificial intelligence adoption, and shifting labor demand that continue to reshape entry-level work landscapes. Globally, 64.9 million people aged 15–24—the ILO definition of youth—were unemployed in 2023, a rate of 13% that was the lowest in 15 years but that masks continued difficulties in accessing decent work: one in five young people (20.4%, roughly 256 million) were not in employment, education, or training, with marked regional and gender disparities (International Labour Organization, 2024). We use the term youth in the ILO sense (15–24); our own participants are a narrower population of final-year students at Chinese tertiary institutions, who are typically 21–23 years old. China presents a particularly demanding setting for studying this transition. The graduating cohort was projected to reach 12.22 million in 2025, an increase of 430,000 over 2024 and the fourth consecutive year above 10 million (Ministry of Education of the People's Republic of China, 2024). This figure describes the supply of new tertiary graduates rather than the availability of suitable positions; China does not publish an official, consistently defined underemployment rate for graduates, and survey-based estimates of qualification mismatch and delayed employment vary in definition and coverage, so we treat competition for quality entry-level positions as context rather than as a measured covariate. We do not treat the youth unemployment rate and the size of the graduating cohort as measures of employment access; structurally, neither statistic captures whether graduates can actually obtain suitable work. They indicate macro-level labor supply and competitive pressure, and even genuine access to a job is an insufficient metric of a successful transition. Early-career positions vary substantially in compensation, employment security, person–job fit, developmental opportunities, and subjective satisfaction—and these initial differences can have lasting effects on long-term career trajectories.

This concern has shifted attention from binary employment status toward employment quality. Employment quality is multidimensional, encompassing objective material and contractual conditions and workers' subjective evaluations of fit, developmental prospects, and satisfaction (Findlay et al., 2013). This distinction is especially consequential at the point of labor market entry, where rapid job placement may mask poor occupational fit or limited upward mobility. Longitudinal and contemporary evidence continues to link pre-entry planning and fit perceptions with later employment quality (Saks & Ashforth, 2002; Wanberg et al., 2020), while a systematic review synthesizes research on career adaptability (Johnston, 2018) and a study of the school-to-work transition links precarious employment with subjective career success (Zhong & Xu, 2023). Nevertheless, graduate transition research still prioritizes binary placement outcomes, job-search intensity, or perceived employability. As a result, the processes through which distal psychological resources are translated into substantively higher-quality first employment remain largely unexamined.

We focus on psychological resilience as the starting point of this process. Following contemporary occupational scholarship, we define psychological resilience as the capacity to maintain or restore effective functioning when goal-directed action is threatened by situational demands, and we treat the descriptive phrase "coping capacity" as synonymous with this construct rather than as a separate variable; resilience is understood as context-dependent and dynamically enacted over time, not as a static trait of invulnerability (Hartmann et al., 2020). The graduate job search represents a high-stakes context to examine this capacity, as repeated rejections, ambiguous feedback, and ongoing plan revisions are normative experiences. Resilient graduates may be better able to regulate distress, sustain job-search effort, and interpret setbacks as diagnostic feedback rather than definitive failure. What remains theoretically underspecified, however, is how this general

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coping capacity is converted into career-specific resources that shape the quality—rather than merely the occurrence—of employment.

Career adaptability and job-search self-efficacy represent conceptually distinct candidate mechanisms for this translation process. Career adaptability is a psychosocial resource for preparing for, making, and revising career decisions, comprising four interrelated dimensions: concern, control, curiosity, and confidence (Savickas & Porfeli, 2012). Job-search self-efficacy is a more proximal, task-specific construct, reflecting individuals' confidence in executing job-search behaviors and attaining desired search outcomes (Saks et al., 2015). A meta-analytic review positions career adaptability as a core bridge between broader adaptive readiness and subsequent adaptation outcomes (Rudolph et al., 2017), and a three-wave study of Chinese university graduates found that adaptability predicted subsequent job-search self-efficacy and employment outcomes (Guan et al., 2013). While these findings provide indirect support for a sequential pathway initiated by psychological resilience, they do not offer a full test of the complete chain. Separating resilience, adaptability, self-efficacy, and employment quality across four temporally distinct measurement waves enables a more rigorous evaluation of temporal ordering, though such a design cannot by itself establish causal effects.

The translation of efficacy beliefs into tangible employment outcomes may further depend on contextual enabling conditions. Digital recruitment platforms, algorithmic screening systems, online skill assessments, and remote interviews have become standard gatekeepers of applicant access and evaluation (Woods et al., 2020). Confidence alone may yield weaker employment returns if graduates lack the skills to navigate these digital systems effectively. Accordingly, we hypothesize that digital job-search ability strengthens the association between job-search self-efficacy and employment quality. A second boundary condition is derived from conservation of resources (COR) theory: personal resources exert particularly strong effects when resource loss is salient and resource investment carries elevated risk (Hobfoll et al., 2018). Under conditions of intense perceived competition and uncertainty, resilience may distinguish graduates who sustain planning and exploration from those who disengage from the career development process; under lower pressure, the same resource may matter less as most graduates maintain adaptive behavior. These interaction effects pertain to specific segments of the resource-translation sequence and are therefore modeled as stage-specific boundary conditions rather than additional mediating variables. The Chinese school-to-work context lends particular theoretical significance to these research gaps. Graduates enter an exceptionally large transition cohort amid intense labor market competition, while recruitment practices have become increasingly reliant on digital platforms, automated screening, online assessments, and video interviews (International Labour Organization, 2024; Ministry of Education of the People's Republic of China, 2024; Woods et al., 2020). Career decision-making is further shaped by norms of delayed labor market entry, strong family expectations, and the persistent appeal of stable public-sector or state-affiliated positions. These contextual features allow for the observation of resource-translation processes under conditions of both opportunity scarcity and rapid technological change, while cautioning against the uncritical generalization of findings from less competitive or less digitized labor markets.

Against this background, we followed a cohort of graduating students across four measurement occasions, from six months pre-graduation to six months post-graduation. The study addresses three specific research gaps. First, the study uses four temporally separated waves to evaluate the complete sequential pathway from a general coping resource, to a domain-specific career resource, to a task-specific efficacy belief, and finally to multidimensional employment quality. Second, existing studies commonly treat contextual factors as generic, omnibus moderators; they rarely locate contextual factors such as labor market pressure and digital capability on the specific transition segments where each

should theoretically exert its influence. Third, graduate transition research has concentrated heavily on employment acquisition, leaving employment quality underexamined in the highly competitive and increasingly digitized Chinese context. Accordingly, this study tests a temporally differentiated resource-translation model, in which psychological resilience preserves the capacity for sustained resource investment, career adaptability channels that investment toward career-specific developmental tasks, and job-search self-efficacy converts that preparedness into actionable search behavior. Perceived employment-market pressure is positioned as a boundary condition on the earlier resilience-to-adaptability segment, while digital job-search ability is positioned on the later efficacy-to-employment-quality segment. All analyses examine prospective associations; temporal separation should not be conflated with causal identification. Throughout the article, transition refers to the school-to-work period, whereas resource translation refers to the proposed conversion of a broad personal resource into career-specific and task-specific resources.

2. Theoretical Framework and Hypotheses

2.1. From Psychological Resilience to Career-Specific Action

COR theory provides the overarching theoretical logic for the proposed model. Individuals are motivated to acquire, retain, and protect valued resources, and initial resource possession can facilitate further investment and iterative resource gain (Hobfoll et al., 2018). Psychological resilience is conceptualized here as a foundational personal resource that helps graduates contain resource loss following job-search setbacks and sustain ongoing search effort. COR theory alone, however, does not specify the domain-specific career behaviors or cognitions through which such general resource capacity translates into employment outcomes. Career construction theory (CCT) and social cognitive career theory (SCCT) address this gap by supplying more proximal, career-specific mechanisms.

CCT frames career adaptability as the core psychosocial resource individuals use to navigate developmental tasks and career transitions (Savickas, 2005, 2013). Concern directs attention toward future career possibilities, control supports agency over career decisions, curiosity promotes exploration of occupational alternatives, and confidence supports problem solving in the face of career challenges (Savickas & Porfeli, 2012). These resources should help resilient graduates convert psychological resilience into career-relevant preparation. SCCT then explains how adaptive resources influence action through self-efficacy beliefs and contextual supports or barriers (Lent et al., 2000; Lent & Brown, 2013). In the job-search domain, self-efficacy refers to confidence in performing search behaviors and achieving search outcomes (Saks et al., 2015), making it more proximally linked to application effort, persistence, and interview performance than either general resilience or broad career adaptability.

Taken together, the three theories provide complementary, multi-level explanations for the resource-translation process. COR supplies the bottom-up logic of resource conservation and gain: resilience helps graduates maintain adaptive functioning when repeated rejection threatens further resource loss. CCT anchors that preserved capacity in the career domain by specifying the intermediate psychosocial resource form—concern, control, curiosity, and confidence—that organizes occupational exploration and career decision-making. SCCT then explains how that career resource becomes behaviorally proximal through task-specific self-efficacy beliefs and contextual supports or barriers. The integrated theoretical chain proceeds from resource preservation, to career-directed resource conversion, and further to behavioral enactment. No single theory fully accounts for all three links: COR does not specify career-specific mechanisms, CCT does not connect broad adaptive resources to concrete job-search behavior, and SCCT does not explain why a distal personal resource would be available at the outset of the transition process.

2.2. Psychological Resilience and Employment Quality

Resilient graduates should be better positioned to sustain goal-directed behavior when job applications are unsuccessful or career plans require revision. During the job-search process, resilience may reduce premature disengagement and lower the likelihood of accepting a poor-fit offer solely to resolve uncertainty. It may also support more accurate person-job matching by enabling applicants to compare multiple alternatives, seek constructive feedback, and iteratively revise application materials rather than settling for the first available opportunity. Better emotional regulation may further preserve bargaining confidence when negotiating salary, contract terms, or developmental opportunities.

These mechanisms predict not merely whether a graduate receives a job offer, but whether the resulting position is secure, adequately compensated, well-matched to skills and preferences, and developmentally beneficial. Workplace resilience research has documented consistent links with adaptive functioning while emphasizing the context-dependent nature of resilience effects (Hartmann et al., 2020).

H1: *T1 psychological resilience is positively associated with T4 employment quality among graduates in paid employment.*

2.3. Career Adaptability as a Mediator

Resilience should temporally precede career adaptability because effective coping with uncertainty preserves the cognitive and emotional capacity required for proactive career planning and exploration. A resilient graduate can revisit career goals without framing every revision as personal failure, systematically compare occupational alternatives, and maintain a sense of personal control during an inherently unpredictable job-search process. These regulatory capacities correspond closely to the concern, control, curiosity, and confidence dimensions of career adaptability.

In turn, career adaptability should support higher employment quality. It represents a structured upgrade of psychological resilience into a domain-specific career-management resource: concern maintains awareness of future career possibilities, control supports agency over career decisions, curiosity broadens the range of perceived occupational opportunities, and confidence supports problem solving in the face of setbacks. These resources should help graduates identify roles that align with their interests and qualifications, revise search strategies as new information emerges, and resist accepting the first available position solely to terminate an uncomfortable search process. Meta-analytic evidence links career adaptability to both adapting responses and adaptation outcomes (Rudolph et al., 2017), and longitudinal studies associate it with job-search efficacy, employment status, person–environment fit, and longer-term career success (Guan et al., 2013; Haenggli & Hirschi, 2020). This pathway is tested in parallel with the more proximal efficacy pathway, rather than being collapsed into a single indirect effect.

H2: *T1 psychological resilience has a positive indirect association with T4 employment quality through T2 career adaptability.*

2.4. Job-Search Self-Efficacy as a Mediator

Resilience may also predict employment quality through job-search self-efficacy. A critical review of self-efficacy research identifies mastery experiences, vicarious learning, social persuasion, and affective or physiological arousal as the primary sources of efficacy judgments (Usher & Pajares, 2008). Resilient graduates are more likely to interpret an unsuccessful application as a correctable performance episode rather than a definitive rejection of their qualifications, maintain emotional regulation, and continue accumulating

mastery experiences through sustained search effort. These processes should protect and strengthen confidence in job-search behaviors and outcomes.

Job-search self-efficacy is consequential because it represents the motivational, task-specific upgrade of broader psychological resources. It encompasses confidence in identifying relevant vacancies, preparing competitive application materials, performing effectively in interviews, negotiating employment terms, and coping with search-related setbacks. Graduates with stronger job-search self-efficacy are better positioned to translate job-search intentions into sustained, strategically targeted search behavior (Saks et al., 2015; Wanberg et al., 2020).

Accordingly, career adaptability and job-search self-efficacy serve distinct functional roles: the former organizes career information and structures choice sets, while the latter provides the behavioral confidence to execute concrete search tasks. Testing both parallel indirect effects and the serial indirect effect is necessary to distinguish these functions and to determine whether adaptability influences employment quality primarily after it has been converted into task-specific efficacy beliefs.

H3*: T1 psychological resilience has a positive indirect association with T4 employment quality through T3 job-search self-efficacy.*

2.5. Sequential Mediation Through Career Adaptability and Job-Search Self-Efficacy

The two mediators should not be treated solely as parallel explanatory pathways. Career adaptability is a broad, domain-general resource for managing career developmental tasks, whereas job-search self-efficacy concerns confidence in performing a specific set of job-search behaviors and attaining related outcomes. Adaptive planning and occupational exploration can generate clearer career goals, higher-quality occupational information, and repeated task practice. These experiences should in turn strengthen job-search efficacy, which supports sustained and strategically targeted job-search action.

This sequential ordering is consistent with SCCT's account of how person and contextual inputs shape learning experiences, self-efficacy beliefs, adaptive career behavior, and performance-related outcomes (Lent et al., 2000; Lent & Brown, 2013). COR theory adds a resource-gain interpretation: resilience helps preserve baseline adaptive functioning; adaptability channels preserved capacity into structured career preparation; and job-search self-efficacy converts that preparation into actionable confidence for search behavior.

The adaptability-to-efficacy segment has received three-wave empirical support among Chinese graduates, with self-efficacy mediating the link between adaptability and both employment status and person–environment fit (Guan et al., 2013). The untested steps are whether psychological resilience initiates this sequential chain and whether the process culminates in multidimensional employment quality. Assigning each construct to a separate measurement wave provides a temporally ordered test of this theoretical extension.

H4: *T1 psychological resilience has a positive sequential indirect association with T4 employment quality through T2 career adaptability and T3 job-search self-efficacy.*

2.6. Boundary Conditions

2.6.1. Digital Job-Search Ability

SCCT recognizes that efficacy beliefs are more likely to produce favorable outcomes when contextual supports and corresponding capabilities enable effective action (Lent et al., 2000). The widespread adoption of digital recruitment makes this principle especially relevant: contemporary personnel selection commonly integrates online application sys-

tems, social media screening, technology-mediated skill assessments, and remote interviews (Woods et al., 2020). A graduate may feel confident about job searching yet still struggle to identify credible vacancies, tailor application materials for applicant tracking systems, manage professional online profiles, or perform effectively in virtual interview settings.

Digital job-search ability may mark conditions under which efficacy beliefs are more strongly associated with later employment quality, while limited digital competence may coincide with a weaker association. Digital job-search ability and job-search self-efficacy were both measured at T3, so the moderator is temporally matched to—but not temporally separable from—the efficacy-to-outcome segment. We treat H5a as a same-wave conditional association: the six-factor measurement model (Table 1) and the Fornell–Larcker criterion provide evidence that the two T3 constructs are empirically distinguishable, and Section 4.1 reports earlier-resource diagnostics, but a moderator assessed at T2 would be required for a strictly prospective test. The present study tests a linear interaction effect; potential substitution, threshold, or nonlinear effects are left for future investigation.

Table 1. Confirmatory factor analysis results.

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	Δdf
Six-factor	1247.35	695	1.795	0.962	0.958	0.048	0.045	—	—
Four-factor	3856.72	715	5.394	0.881	0.869	0.086	0.092	2609.37 *	20
Three-factor	4521.18	718	6.297	0.856	0.841	0.094	0.101	3273.83 *	23
Two-factor	5678.43	725	7.832	0.815	0.797	0.107	0.115	4431.08 *	30
One-factor	7834.56	728	10.762	0.742	0.718	0.128	0.138	6587.21 *	33

Note. T2 constructs and T3 constructs were combined within wave. Predictor, mediator, and outcome/contextual constructs were combined into broader blocks. Personal-resource constructs were contrasted with contextual/outcome constructs. * $p < 0.001$.

2.6.2. Perceived Employment-Market Pressure

Perceived employment-market pressure captures graduates' subjective appraisal of labor market competition, uncertainty, and constrained employment opportunities. COR theory suggests that resource effects intensify when resource loss is salient and resource investment carries elevated risk (Hobfoll et al., 2018). Under high perceived pressure, resilient graduates may remain sufficiently emotionally regulated to engage in proactive planning, exploration, and strategy revision, whereas less resilient graduates may narrow their search scope or disengage from career development entirely. Under lower pressure, by contrast, most graduates may maintain adaptive career behavior regardless of resilience level, reducing between-person differences in adaptability.

Perceived pressure and career adaptability were both measured at T2. H5b therefore concerns a same-wave conditional association involving the T2 outcome rather than evidence that perceived pressure causally strengthens the effect of resilience. H5b: Higher perceived employment-market pressure is associated with a stronger conditional association between T1 resilience and T2 career adaptability. The study tests a positive linear interaction and was not designed to distinguish inverted-U or other nonlinear forms. To examine the most direct alternative explanations available in the present data, the analyses tested whether earlier psychological resources predicted the proposed moderators and evaluated whether each same-wave construct pair remained empirically distinguishable in the measurement model.

2.7. The Hypothesized Model

H1. *Psychological resilience at T1 is positively associated with employment quality at T4, among graduates who are in paid employment at T4.*

H2. *Career adaptability at T2 mediates the positive association between T1 psychological resilience and T4 employment quality (resilience → adaptability → employment quality).*

H3. *Job-search self-efficacy at T3 independently mediates the positive association between T1 psychological resilience and T4 employment quality (resilience → self-efficacy → employment quality).*

H4. *Career adaptability (T2) and job-search self-efficacy (T3) serially mediate the association: T1 resilience → T2 adaptability → T3 self-efficacy → T4 employment quality.*

H5a. *Digital job-search ability at T3 moderates the job-search self-efficacy → employment quality path, such that the positive association is stronger at higher levels of digital job-search ability. Given same-wave measurement, this is specified as a same-wave conditional association.*

H5b. *Perceived employment-market pressure at T2 moderates the resilience → career adaptability path, such that the positive association is stronger at higher levels of perceived pressure. Given same-wave measurement, this is likewise specified as a same-wave conditional association.*

3. Method

3.1. Design, Participants, and Procedure

This study employed a four-wave longitudinal cohort design aligned with the natural timeline of the graduate job search. T1 was administered in January 2024 (6 months pre-graduation) to assess psychological resilience and baseline covariates; T2 in April 2024 (3 months pre-graduation) to measure career adaptability and perceived employment-market pressure; T3 in June 2024 (1 month before graduation) to collect data on job-search self-efficacy, digital job-search ability, and job-search intensity; and T4 in December 2024 (6 months post-graduation) to evaluate employment quality.

Participants were recruited via stratified cluster sampling from eight tertiary institutions across eastern, central, and western China, including comprehensive universities, polytechnic universities, applied undergraduate colleges, and vocational colleges. Figure S1 reports the participant flow from baseline enrollment to the final analytic sample. Of the 1500 students enrolled at T1, 1239 responded at T2, 997 responded at T3, and 1290 responded at T4. These are wave-specific response counts rather than cumulative complete-case counts. Among T4 respondents, 860 were in paid employment and formed the employment-quality analytic sample, 275 were unemployed, 115 were pursuing further education, and 40 were outside the labor force. Thus, the reduction from 1500 to 860 followed two mutually exclusive routes: 210 participants did not complete T4, and 430 completed T4 but were not in paid employment (Figure S1).

Baseline comparisons between the 860-person analytic sample and the remainder of the baseline cohort found no statistically significant differences in psychological resilience, gender, university tier, or family socioeconomic status. However, this combined comparison does not distinguish questionnaire nonresponse from selection into paid employment and therefore cannot rule out employment-selection bias. Because employment quality was observed only for paid employees, all estimates are conditional on paid employment at T4.

The final analytic sample was 53.7% female. Mean age was 22.38 years (SD = 0.49; range = 22–23). Fields of study included engineering, science, humanities, business, and other

disciplines, with representation across university tiers. The study was approved by the institutional review board of the lead author's institution. Informed consent was obtained at each wave, and incremental monetary compensation supported longitudinal retention.

3.2. Measures

Established scales, adapted measures, and study-specific Chinese-language self-report items were used as detailed below. Unless otherwise specified, items were rated on 5-point Likert scales and averaged to form composite scores, with higher values representing higher levels of the construct. Agreement-based items used anchors of 1 = strongly disagree to 5 = strongly agree; efficacy-focused items used anchors of 1 = not at all confident to 5 = very confident.

3.2.1. Predictor and Mediator Variables

Psychological resilience (T1): assessed via the 10-item short form (Campbell-Sills & Stein, 2007) of the Connor–Davidson Resilience Scale (Connor & Davidson, 2003), with Chinese wording adapted from Yu and Zhang (2007). The scale captures perceived capacity to persist, adapt, and recover from adversity, with a Cronbach's α of 0.89 in the present sample.

Career adaptability (T2): measured using the 24-item Career Adapt-Abilities Scale—China Form (Hou et al., 2012; Savickas & Porfeli, 2012), comprising four 6-item dimensions: concern, control, curiosity, and confidence. The total scale had strong internal consistency ($\alpha = 0.93$), with subscale α values ranging from 0.83 to 0.86.

Job-search self-efficacy (T3): evaluated with a 20-item scale adapted from the behavioral and outcome efficacy framework proposed by Saks et al. (2015), covering four core domains: information search, application preparation, interview performance, and setback coping. Participants rated their confidence in completing each job-search task. The total scale α was 0.91, with subscale α values between 0.83 and 0.87.

3.2.2. Outcome Variable: Employment Quality (T4)

Employment quality was operationalized as a composite combining formative objective indicators with a reflective subjective scale for participants in paid employment at T4. As the transparent, a priori specification, the objective and subjective components were weighted equally (50%/50%) and the four objective indicators equally (25% each). Because fixed weights implicitly equate one-standard-deviation changes across qualitatively different indicators, Section 4.5 reports sensitivity analyses under alternative weights (60/40 with salary upweighted and principal-component weights). A MIMIC-style formative model was considered but not estimated; the identification limitation is explained in Section 3.5.3 (Diamantopoulos & Winklhofer, 2001).

Objective component: Four positively oriented indicators were z-standardized and averaged with equal weights (25% each): monthly salary (continuous in Chinese yuan), contract quality (4-point ordinal: no written contract to permanent contract), social insurance coverage (3-point ordinal: none to full statutory coverage), and job stability (4-point ordinal based on contract duration).

Subjective component: Eight items assessed major–job match, person–job fit, career development potential, and overall job satisfaction. Internal consistency and composite reliability were acceptable ($\alpha = 0.83$, CR = 0.85). AVE was 0.49, just below the conventional 0.50 benchmark, indicating marginal convergent-validity evidence despite adequate reliability (Fornell & Larcker, 1981; Hair et al., 2010). The Fornell–Larcker discriminant criterion was met, but this does not remove the convergent-validity limitation.

Objective-only and subjective-only operationalizations were tested in sensitivity analyses. All inferences regarding employment quality are conditional on paid employment status.

3.2.3. Moderator Variables

Digital job-search ability (T3): a 15-item study-specific scale was developed to measure competence across five domains: online vacancy search, critical evaluation of digital recruitment information, AI-assisted application tool use, recruitment platform management, and remote interview performance (full items in Supplementary Table S2). Item development was informed by established digital recruitment frameworks (Woods et al., 2020). The scale showed acceptable internal consistency (α = 0.84) and factorial fit (CFI = 0.958, RMSEA = 0.051, SRMR = 0.048). The substantive models use only the total score; the five content domains were treated as provisional and evaluated through the stratified split-sample procedure in Section 3.5.2.

Perceived employment-market pressure (T2): eight items from the employment stress perception scale (Zhang et al., 2020) measured subjective appraisals of labor market competition, employment uncertainty, and economic pressure, with an α of 0.87.

3.2.4. Covariates

A prespecified covariate set was included to adjust for potential confounders: gender, age, field of study, university tier, family socioeconomic status, urban/rural origin, internship experience, academic ranking, and employment region. T3 job-search intensity (5 items, α = 0.81) was tested separately as a sensitivity control, given its potential role as a downstream outcome in the resource-translation process. All categorical variables were dummy-coded.

3.3. Employment-Selection Sensitivity Analyses

Participants were sampled within eight institutions, so students from the same institution may share labor market conditions, career services, employer networks, and other contextual influences. The primary latent SEM was therefore supplemented with institution-clustered manifest path regressions. A conventional CR0 sandwich covariance estimator provides a TYPE = COMPLEX-like check for the corresponding observed-score equations, but it is not identical to re-estimating the full latent SEM and may produce different point estimates when complete-case samples or manifest composites are used. The distinction is maintained in reporting.

Sandwich inference relies on a large number of clusters, and k = 8 is insufficient for the usual normal approximation alone (Cameron & Miller, 2015; McNeish & Stapleton, 2016). The two interactions were therefore evaluated first with CR0, then with CR2 using the Bell–McCaffrey adjustment and Satterthwaite degrees of freedom, and finally with an exact Rademacher wild-cluster bootstrap over the eight institutions (Cameron et al., 2008; Pustejovsky & Tipton, 2018). The principal paths were checked with CR2, and the sequential indirect effect received an institution-level cluster-bootstrap interval. Values from 0.05 to below 0.10 were described as trend-level rather than significant; a coefficient opposite to a directional hypothesis was classified as not supportive regardless of its p value. Institution-level ICCs were also reported.

3.4. Institution-Clustered Inference

Four additional diagnostics examined whether the substantive conclusions depended on missing-data handling, functional form, outcome construction, or a single institution. First, a three-category multinomial model distinguished paid employment, T4 response without paid employment, and T4 nonresponse in the full baseline cohort (N =

1500). Predictors were the prespecified baseline covariates, T1 resilience, T2 adaptability, T3 job-search self-efficacy, T3 job-search intensity, and indicators for unavailable T2 or T3 scores; unavailable longitudinal scores were mean-imputed after standardization solely to retain their missingness indicators. Because only eight institutions were sampled, uncertainty for resilience contrasts was summarized with 500 institution-cluster bootstrap resamples and interpreted descriptively.

Second, the manifest path model was re-estimated after 20 multiple imputations among all 860 paid employees, with estimates combined using Rubin's rules; a first-order delta approximation was used for the within-imputation variance of the sequential product. Third, employment quality was reconstructed under a 21-cell multiverse crossing objective shares from 20% to 80% in 10-point increments with salary shares of 25%, 40%, or 50% within the objective component. Fourth, quadratic terms were added separately for the four focal paths and evaluated with Benjamini–Hochberg false-discovery-rate adjustment. Influence was assessed by omitting each institution in turn. Finally, the digital-ability interaction was repeated with a one-factor score rather than the item mean. These analyses were exploratory diagnostics of specification dependence rather than new confirmatory hypothesis tests.

3.5. Statistical Analysis

The primary latent analyses were conducted in SPSS 27.0 and Mplus 8.6. Preliminary screening examined distributions, missingness, and bivariate associations. The primary analysis among 860 paid employees used 20 multiple imputations for missing data. The added manifest sensitivity analyses used standardized observed composites and complete cases when joint T3 mediator and T4 outcome data were required (n = 586). Employment-selection models used the 1290 T4 respondents with observed employment status: stabilized inverse-probability weighting (IPW) addressed measured differences in paid-employment selection, and a secondary Heckman model used institution-level campus vacancy density as an exclusion variable. These checks address selection among T4 respondents and do not, by themselves, adjust T4 nonresponse in the full baseline cohort. The three-state analysis in Section 3.4 examines both processes. Institution-clustered manifest inference followed Section 3.3 (Cameron & Miller, 2015; McNeish & Stapleton, 2016). These checks are not exact re-estimations of the latent SEM: differences in measurement and analytic samples can change point estimates, whereas changing only the covariance estimator for a fixed fitted regression does not. In the manifest analyses, B denotes coefficients for standardized observed scores; primary latent-path β values are standardized, and the primary latent indirect-effect B values are unstandardized. A six-factor CFA tested the measurement model. Discriminant validity was assessed against a four-factor model merging the same-wave pairs and using the Fornell–Larcker criterion (Fornell & Larcker, 1981). A common latent method factor examined common-method covariance (Podsakoff et al., 2003).

The primary structural model tested the prospective associations specified in H1-H4, with adjustment for prespecified demographic, educational, and regional covariates (Figure 1). Indirect effects were evaluated using 5000 bias-corrected bootstrap samples. Standardized coefficients are reported for direct structural paths, and unstandardized coefficients are reported for indirect effects. Moderation effects were tested using mean-centered observed product terms; interaction terms are interpreted as conditional associations, given the same-wave measurement of each moderator and its corresponding proximal construct. Model fit was evaluated using the χ^2 statistic, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Robustness checks included alternative outcome operationalizations, multi-group comparisons, an expanded covariate model, and

two competing path specifications. Importantly, in every comparison the wave-to-construct assignment was held fixed (resilience T1, adaptability T2, self-efficacy T3, employment quality T4); the alternatives only re-specify the direction of the structural paths. The 'reversed mediator order' model estimates the counter-theoretical T3→T2 path between the two mediators, and the 'resilience-as-mediator' model places the T1 construct downstream of T2. Because measurement occasions cannot be reassigned, these are descriptive fit comparisons; they do not identify causal direction or support experimental conclusions.



Figure 1. Hypothesized four-wave resource-translation model. Note. Path labels a, b, and c denote resilience → adaptability, adaptability → job-search self-efficacy, and job-search self-efficacy → employment quality, respectively. The diagram emphasizes the sequential backbone; the additional resilience → self-efficacy and adaptability → employment-quality paths used in the separate indirect effects are reported in Table 2. Solid arrows represent prospective structural paths used to test H1–H4; dashed arrows represent prespecified, time-matched boundary conditions tested in H5a and H5b. T1 = 6 months pre-graduation; T2 = 3 months pre-graduation; T3 = 1 month pre-graduation; T4 = 6 months post-graduation. H5a and H5b were not supported in the institution-clustered small-sample sensitivity analyses.

Table 2. Standardized structural path coefficients.

Path	β	SE	z	*p*	95% CI
Resilience → Career adaptability	0.46	0.03	15.33	<0.001	[0.40, 0.52]
Resilience → Job-search self-efficacy	0.22	0.03	7.33	<0.001	[0.16, 0.28]
Career adaptability → Job-search self-efficacy	0.44	0.03	14.67	<0.001	[0.38, 0.50]
Resilience → Employment quality	0.17	0.04	4.25	<0.001	[0.09, 0.25]
Career adaptability → Employment quality	0.07	0.04	1.75	0.08	[−0.01, 0.15]
Job-search self-efficacy → Employment quality	0.3	0.04	7.5	<0.001	[0.22, 0.38]

Note. Coefficients adjust for all prespecified demographic, educational, and regional covariates (gender, age, family SES, university tier, field of study, urban/rural origin, internship experience, academic ranking, and employment region). β values are standardized.

3.5.1. Earlier-Resource Prediction of the Proposed Moderators

Two hierarchical diagnostic regressions assessed whether the proposed moderators could largely reflect evaluations generated by earlier psychological resources. T2 perceived employment-market pressure was regressed on the prespecified covariates in Step 1 and T1 resilience in Step 2. T3 digital job-search ability was regressed on the covariates in Step 1 and on T1 resilience and T2 career adaptability in Step 2. Standardized coefficients and incremental explained variance (ΔR^2) were emphasized rather than statistical significance alone. Small coefficients and low ΔR^2 would reduce, but could not eliminate, the plausibility that the moderator scores primarily reflect earlier psychological states or reverse appraisal.

3.5.2. Split-Sample Validation of Digital Job-Search Ability

Participants with observed T3 digital-ability items were divided approximately equally into calibration and holdout samples, with randomization stratified by institution and gender. The calibration sample was evaluated with maximum-likelihood exploratory factor analysis and oblique promax rotation. Parallel analysis, the scree plot, primary loadings, and cross-loadings informed factor retention. No holdout observations were used to revise the item set. The prespecified five-domain structure was then tested in the holdout sample by CFA, with chi-square/df, CFI, TLI, RMSEA, SRMR, alpha, composite reliability, AVE, and factor correlations reported. This internal split reduces circular validation but does not replace external psychometric replication.

3.5.3. Employment-Quality Weight Sensitivity

Dependence on the baseline 50% objective and 50% subjective weighting rule was evaluated with two alternatives. First, a fixed 60% objective and 40% subjective composite was constructed; within the objective component, salary received 40% and contract quality, social insurance, and stability each received 20%. Second, principal-component weights were estimated from the four objective indicators and four subjective domain scores. Each alternative was standardized and entered into the same manifest path equations with individual bootstrap intervals for the sequential path product. A MIMIC-style formative specification was considered conceptually (Diamantopoulos & Winklhofer, 2001) but was not estimated because the available indicators did not provide external reflective outcomes needed for a defensible identification strategy.

4. Results

4.1. Measurement Quality and Common Method Diagnostics

This section evaluates measurement quality, same-wave construct distinctiveness, and the most direct reverse-appraisal diagnostics available in the study. The six-factor model fit acceptably, $\chi^2(695) = 1247.35$, CFI = 0.962, TLI = 0.958, RMSEA = 0.048, and SRMR = 0.045. The four-factor model that merged adaptability with market pressure at T2 and self-efficacy with digital ability at T3 fit substantially worse, $\Delta\chi^2(20) = 2609.37$, $p < 0.001$ (Table 1), indicating that the same-wave pairs were not empirically interchangeable. The correlation between digital job-search ability and job-search self-efficacy was r = 0.42, below the square roots of their AVEs ($\sqrt{0.53} = 0.73$ and $\sqrt{0.54} = 0.73$). Likewise, perceived market pressure correlated only r = 0.17 with career adaptability, below their AVE square roots ($\sqrt{0.51} = 0.71$ and $\sqrt{0.56} = 0.75$). These comparisons satisfy the Fornell–Larcker criterion (Fornell & Larcker, 1981). All reflective scales showed acceptable internal consistency and composite reliability (Table 3). A common latent method factor improved fit only trivially (ΔCFI = 0.003; ΔRMSEA = −0.002) and explained 3.2% of additional variance. These diagnostics provide evidence of construct separation and limited additional covariance attributable to the specified method factor. They do not establish the absence of method bias or rule out reverse appraisal within a wave (Podsakoff et al., 2003; Voorhees et al., 2016).

Table 3. Reliability and convergent validity of reflective measures.

Measure	Items	α	CR	AVE
Psychological resilience (T1)	10	0.89	0.9	0.52
Career adaptability (T2)	24	0.93	0.94	0.56
Job-search self-efficacy (T3)	20	0.91	0.92	0.54
Subjective employment quality (T4)	8	0.83	0.85	0.49
Digital job-search ability (T3)	15	0.84	0.85	0.53

Perceived market pressure (T2)	8	0.87	0.88	0.51

Note. Objective employment-quality indicators were formative and were therefore not evaluated with α, CR, or AVE. For subjective employment quality, AVE = 0.49 indicates marginal convergent-validity evidence despite CR = 0.85. All reflective items used five-point response scales; see Methods for response anchors and the employment-quality construction rule.

Earlier-resource diagnostics provided little evidence that the moderators were evaluations generated by prior psychological resources. T1 resilience weakly predicted T2 market pressure (B =0.036, SE = 0.029, p = 0.208; ΔR^2 = 0.0013; n = 1239). In the T3 model (n = 997), neither T1 resilience (B = −0.025, SE = 0.032, p = 0.431) nor T2 adaptability (B = −0.022, SE = 0.032, p = 0.505) predicted digital job-search ability; their joint incremental R^2 was 0.0011. These near-zero estimates reduce the plausibility of a simple earlier-resource appraisal account, but they cannot establish temporal independence because each moderator was measured once.

The split-sample results did not validate five distinct digital-ability domains. The calibration sample included 498 participants and the holdout sample 499. Calibration alpha was 0.848 and holdout alpha was 0.828. Sampling adequacy was high (KMO = 0.933; Bartlett's test of sphericity: $\chi^2(105)$= 1495.76, p < 0.001), but parallel analysis retained one factor. In the forced five-factor solution, only 5 of 15 items loaded primarily on the intended domain and the largest cross-loading was 0.79. The holdout five-factor CFA showed favorable global fit (χ^2/df = 1.26, CFI = 0.983, TLI = 0.977, RMSEA = 0.023, SRMR = 0.033), yet factor correlations ranged from 0.844 to 0.994, domain CR values from 0.47 to 0.56, and domain AVE values from 0.23 to 0.30. The total score is therefore used as a broad exploratory index; the five domains should not be interpreted as validated subscales.

4.2. Descriptive Statistics and Correlations

This section presents the descriptive characteristics and zero-order correlations among study variables, providing an initial unadjusted test of the directional consistency of the proposed model. Overall, the correlational pattern was fully consistent with the hypothesized resource-translation sequence, with moderate rather than redundant associations that permit meaningful mediation and moderation testing. As shown in Table 4, psychological resilience was positively associated with career adaptability (r = 0.46, p < 0.001), job-search self-efficacy (r = 0.42, p < 0.001), and employment quality (r = 0.36, p < 0.001). Career adaptability and job-search self-efficacy were moderately correlated (r = 0.54, p < 0.001) but remained empirically distinct. Correlations involving the two moderators were smaller in magnitude, reducing concern that interaction effects would merely reflect construct overlap. In summary, the bivariate pattern aligns with theoretical expectations and justifies further examination of prospective mediation and moderation effects.

Table 4. Descriptive statistics and correlations (N = 860).

Variable	M	SD	Skew.	Kurt.	1	2	3	4	5	6
1. Resilience (T1)	3.19	0.59	−0.03	0.26	—					
2. Career adaptability (T2)	3.36	0.56	0.01	−0.26	0.46 **	—				
3. Job-search self-efficacy (T3)	3.05	0.63	−0.03	−0.24	0.42 **	0.54 **	—			
4. Employment quality (T4)	3.24	0.55	0.14	0.06	0.36 **	0.39 **	0.45 **	—		
5. Digital job-search ability (T3)	3	0.6	−0.07	0.18	0.23 **	0.30 **	0.42 **	0.33 **	—	
6. Perceived market pressure (T2)	3.37	0.68	0.06	−0.38	0.30 **	0.17	0.18	0.11	0.16 **	—

Note. ** p < 0.001. Descriptive statistics and correlations are reported for the paid-employment analytic sample (N = 860).

4.3. Structural Model and Indirect Effects

This section tests the direct prospective association and the three hypothesized indirect pathways linking psychological resilience to employment quality. Overall, the prespecified latent structural model fit the data well and supported H1–H4 within that specification; however, the sensitivity analyses indicated that the direct association was comparatively stable in direction, whereas the individual mediation pathways were more specification-dependent. The structural model yielded adequate fit to the data: $\chi^2(742) = 1523.68$, $\chi^2/df = 2.053$, CFI = 0.956, TLI = 0.951, RMSEA = 0.043, 90% CI [0.040, 0.046], SRMR = 0.049. The model explained 21% of variance in career adaptability, 34% in job-search self-efficacy, and 32% in employment quality. As presented in Table 2, T1 psychological resilience positively predicted T4 employment quality after covariate adjustment ($\beta = 0.17$, $p < 0.001$), supporting H1. Resilience also positively predicted T2 career adaptability ($\beta = 0.46$, $p < 0.001$) and T3 job-search self-efficacy ($\beta = 0.22$, $p < 0.001$), and career adaptability positively predicted subsequent job-search self-efficacy ($\beta = 0.44$, $p < 0.001$). The residual direct path from career adaptability to employment quality was small and did not reach conventional statistical significance ($\beta = 0.07$, $p = 0.080$). Bootstrapped results in the primary latent model (Table 5) indicated nominal support for all three indirect pathways: the indirect effect via career adaptability alone (B = 0.07, 95% CI [0.03, 0.11]), via job-search self-efficacy alone (B = 0.06, 95% CI [0.02, 0.10]), and the sequential indirect effect via both mediators (B = 0.06, 95% CI [0.02, 0.09]) were all statistically significant. Within this specification, the direct and indirect associations are consistent with the proposed resource-translation sequence; they do not establish a causal mechanism. These are the prespecified latent-model results. The manifest selection, weighting, and small-cluster analyses in Section 4.5 were materially weaker, so support for H1-H4 is model-dependent rather than uniformly robust.

Table 5. Bootstrapped indirect effects (5000 resamples).

Effect	B	Boot SE	*p*	Bias-Corrected 95% CI	Approx. βind
Total indirect effect	0.19	0.03	<0.001	[0.14, 0.24]	—
Resilience → Career adaptability → Employment quality	0.07	0.02	<0.001	[0.03, 0.11]	0.03
Resilience → Job-search self-efficacy → Employment quality	0.06	0.02	0.003	[0.02, 0.10]	0.07
Resilience → Career adaptability → Job-search self-efficacy → Employment quality	0.06	0.02	0.003	[0.02, 0.09]	0.06
Direct effect	0.17	0.04	<0.001	[0.09, 0.24]	—
Total effect	0.36	0.03	<0.001	[0.30, 0.42]	—

Note. B values for indirect, direct, and total effects are unstandardized. Approx. βind values are descriptive products of the reported standardized constituent paths and are included only for relative effect-size comparison; they do not constitute statistical tests.

4.4. Moderation and Conditional Indirect Effects

The prespecified single-level model yielded small positive interactions for digital job-search ability by job-search self-efficacy ($\beta = 0.12$, nominal $p < 0.01$; $\Delta R^2 = 0.02$) and market pressure by resilience ($\beta = 0.09$, nominal $p < 0.05$; $\Delta R^2 = 0.01$). These increments represent only 1–2% additional explained variance. The institution-clustered manifest checks did not confirm either result. The market-pressure interaction was negative ($B = -0.058$) and reached only trend-level evidence under CR2 ($p = 0.084$) and the wild-cluster test ($p = 0.094$); because its direction opposed H5b, H5b was not supported. The digital-ability interaction was also negative and nonsignificant ($B = -0.037$; CR2 $p = 0.587$; wild-cluster $p = 0.578$), so H5a was not supported. Figures 2 and 3 and Table 6 display the nominal single-level conditional patterns for transparency, not confirmed boundary effects. Because each moderator was measured in the same wave as its proximal construct, even the nominal

estimates describe conditional associations with limited temporal separation and do not establish causal amplification or exclude reciprocal self-evaluation.

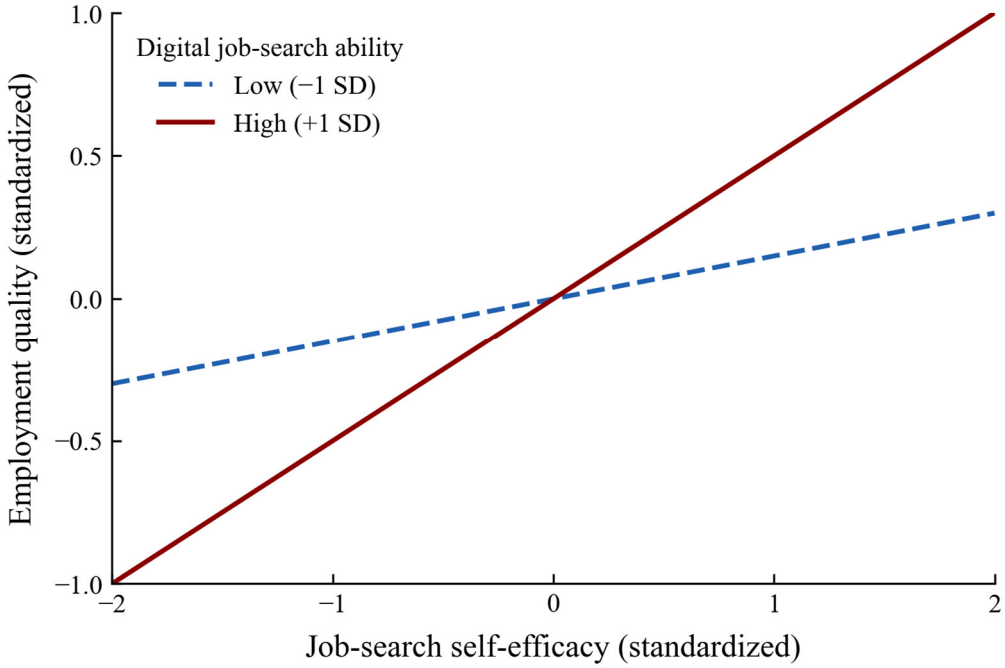


Figure 2. Nominal single-level simple slopes for the job-search self-efficacy × digital job-search ability interaction predicting employment quality. Note: The *x*-axis represents standardized job-search self-efficacy; the *y*-axis represents standardized employment quality. Lines show nominal single-level estimates at low (−1 SD) and high (+1 SD) digital job-search ability. The interaction was not supported by CR2 or wild-cluster inference and is shown descriptively.

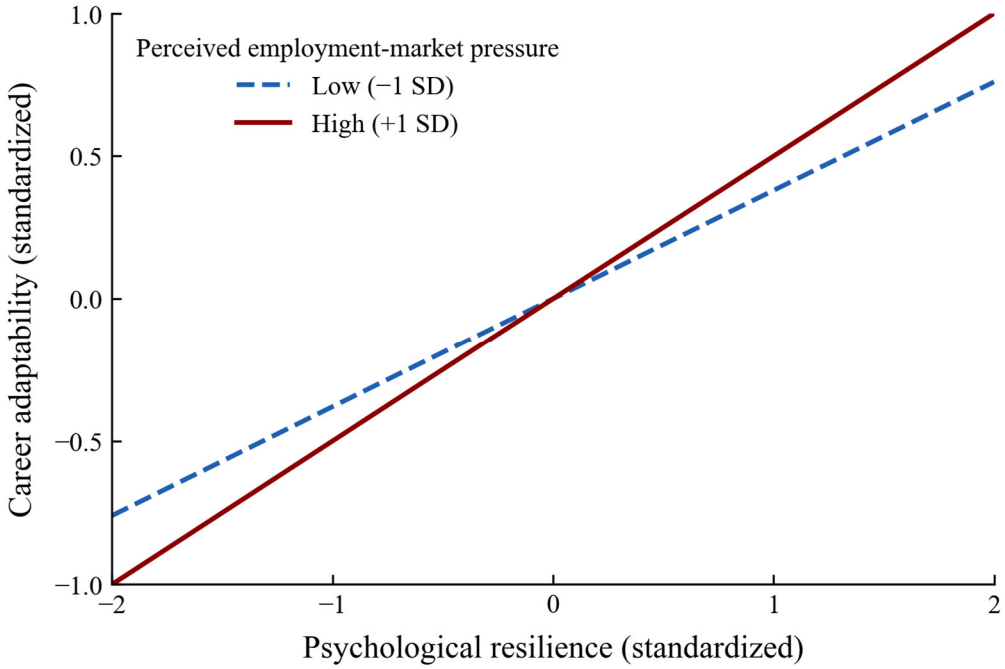


Figure 3. Nominal single-level simple slopes for the psychological resilience by perceived employment-market pressure interaction predicting career adaptability. Note: The *x*-axis represents standardized psychological resilience; the *y*-axis represents standardized career adaptability. Lines show nominal single-level estimates at low (−1 SD) and high (+1 SD) market pressure. The cluster-adjusted manifest estimate was opposite in sign to H5b; the figure is descriptive only.

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Table 6. Conditional total indirect effects.

Moderator	Moderated Segment	Condition	Indirect Effect	SE	95% CI
Digital job-search ability	JSSE → employment quality	Low (−1 SD)	0.14	0.03	[0.08, 0.20]
		Mean	0.18	0.03	[0.12, 0.24]
		High (+1 SD)	0.23	0.03	[0.17, 0.29]
		High-low difference	0.09	0.04	[0.01, 0.17]
Perceived market pressure	Resilience → adaptability	Low (−1 SD)	0.16	0.03	[0.10, 0.22]
		Mean	0.19	0.03	[0.13, 0.25]
		High (+1 SD)	0.23	0.03	[0.17, 0.29]
		High-low difference	0.07	0.03	[0.01, 0.13]

Note. JSSE = job-search self-efficacy. Conditional estimates are from the nominal single-level models at +/−1 SD. Neither interaction was supported in the small-cluster sensitivity analyses; these values are descriptive rather than confirmatory.

4.5. Robustness Checks

Table 7 separates previously reported latent-SEM checks from newly estimated manifest sensitivity analyses. The latter used 586 complete cases when T3 mediators and T4 employment-quality indicators were all required. Objective-only, subjective-only, alternative-weight, selection-adjusted, and institution-clustered manifest models all produced sequential intervals spanning zero. The reversed-order and resilience-as-mediator models retained each construct at its original wave and changed only the directed paths. Because this makes the reversed ordering temporally incoherent (for example, a T3 construct predicting a T2 construct), those comparisons are fit diagnostics only and do not approximate causal tests of temporal order.

Table 7. Summary of robustness checks.

Check	Key Result	Interpretation
Objective-only employment quality	Manifest sequential B = −0.00008, 95% CI [−0.00056, 0.00021] (n = 586)	Not reproduced in complete-case manifest model
Subjective-only employment quality	Manifest sequential B = 0.00005, 95% CI [−0.00025, 0.00049] (n = 586)	Not reproduced in complete-case manifest model
Earlier-resource prediction of moderators	Pressure: resilience B = 0.036, ΔR^2 = 0.0013; digital ability: resilience B = −0.025, adaptability B = −0.022, joint ΔR^2 = 0.0011	Little evidence of simple earlier-resource appraisal
Digital-ability split-sample validation	Calibration n = 498; holdout n = 499; parallel analysis retained 1 factor; holdout five-factor CFI = 0.983, TLI = 0.977, RMSEA = 0.023, SRMR = 0.033; factor correlations = 0.844–0.994	Reliable total score; five distinct domains not supported
Alternative fixed employment-quality weights	Objective:subjective = 60:40; baseline correlation = 0.963; direct B = 0.068, p = 0.109; sequential B = 0.00001, 95% CI [−0.00030, 0.00036]	Primary mediation not reproduced
Principal-component employment-quality weights	PC1 variance = 33.3%; baseline correlation = 0.885; direct B = 0.045, p = 0.285; sequential B = 0.00005, 95% CI [−0.00025, 0.00049]	PC1 dominated by subjective domains; mediation not reproduced
MIMIC/formative employment quality	Not estimated; fixed and PCA checks addressed weight sensitivity	No claim based on an unestimated model
Undergraduate vs. vocational	Previously reported primary SEM: $\Delta\chi^2(6)$ = 5.82, p = 0.443	No path difference detected in primary SEM
Eastern vs. central/western	Previously reported primary SEM: $\Delta\chi^2(6)$ = 7.15, p = 0.307	No path difference detected in primary SEM
Additional control for search intensity	Previously reported primary SEM: sequential B = 0.06, 95% CI [0.02, 0.09]	Pattern retained in primary SEM

Reversed mediator order	Constructs retained at original waves; paths reordered; sequential B = 0.02, 95% CI [−0.01, 0.05]; delta AIC = +38.6	Descriptive fit check only; not a causal-order test
Resilience as mediator	Constructs retained at original waves; paths reordered; CFI = 0.812; RMSEA = 0.112	Descriptive fit check only; temporal order is incompatible
Employment-selection IPW	Weights: M = 1.000, SD = 0.098, range = 0.782–1.463, ESS = 851.9; maximum |SMD| = 0.006; direct B = 0.063, p = 0.070; sequential B = 0.000006, 95% CI [−0.000150, 0.000186]	Selection balance achieved; primary effects not reproduced
Heckman selection model	Vacancy-density exclusion p = 0.725; inverse Mills ratio coefficient = −2.168, p = 0.271; adjusted direct B = 0.152, p = 0.100; sequential B = −0.000018	Weak exclusion; no evidence of selection term; secondary analysis
Institution clustering: priority interactions	Pressure × resilience: B = −0.058, CR2 p = 0.084, wild p = 0.094; digital ability × self-efficacy: B = −0.037, CR2 p = 0.587, wild p = 0.578	H5b not supported (opposite sign); H5a not supported
Institution clustering: principal paths and ICCs	ICCs: adaptability = 0.003, self-efficacy approximately 0, employment quality = 0.008; all four CR2 principal-path p values ≥ 0.163; sequential cluster-bootstrap CI [−0.00019, 0.00060]	Manifest small-cluster analysis did not confirm core paths

The fixed 60:40 employment-quality score correlated 0.963 with the baseline 50:50 score. In the complete-case manifest model, its direct resilience coefficient was B = 0.068 (p = 0.109), and the standardized sequential path product was 0.00001 with a 95% bootstrap interval of [−0.00030, 0.00036]. The first principal component explained 33.3% of the eight indicators' variance and correlated 0.885 with the baseline score. Its loadings concentrated on the four subjective domains (approximately 0.49–0.51) and were near zero for the objective indicators (−0.07 to 0.03), showing that PC1 primarily represented subjective fit and satisfaction rather than a balanced employment-quality construct. The PCA-weighted direct coefficient was B = 0.045 (p = 0.285), and the sequential product was 0.00005, 95% CI [−0.00025, 0.00049]. Thus, the added weighting checks did not reproduce the primary mediation finding. A MIMIC model was not estimated because the available indicator allocation did not provide a defensible set of external reflective outcomes. Weight-sensitivity analyses do not substitute for identification of a formative measurement model.

Employment-selection sensitivity analyses defined selection among the 1290 T4 respondents, of whom 860 were in paid employment. Stabilized IPW weights had mean 1.000 (SD = 0.098), range 0.782–1.463, and effective sample size 851.9. Post-weighting balance was excellent (maximum absolute standardized mean difference = 0.006). The weighted direct resilience coefficient was B = 0.063 (p = 0.070), and the standardized sequential path product was 0.000006, 95% bootstrap CI [−0.000150, 0.000186]. In the Heckman model, campus vacancy density was a weak exclusion predictor (B = −0.075, SE = 0.212, p = 0.725). The inverse Mills ratio coefficient was −2.168 (SE = 1.967, p = 0.271); the adjusted direct coefficient was B = 0.152 (p = 0.100), and the adjusted sequential product was −0.000018. Because the exclusion varied only across eight institutions and was weak, the Heckman estimates are secondary and weakly identified. Neither selection adjustment reproduced the primary sequential effect.

Institution-clustered manifest inference likewise weakened the conclusions. For market pressure by resilience (n = 1239), the estimate was B = −0.058 (CR0 p = 0.025; CR2 t(6.75) = −2.03, p = 0.084; exact wild-cluster p = 0.094). Its sign opposed H5b, so the hypothesis was not supported. For digital ability by self-efficacy (n = 586), B = −0.037 (CR0 p = 0.533; CR2 t(6.11) = −0.57, p = 0.587; wild-cluster p = 0.578), providing no support for H5a. Institution-level ICCs were 0.003 for adaptability, approximately zero for self-efficacy (ANOVA estimate = −0.002), and 0.008 for employment quality. CR2 tests of the principal manifest paths were nonsignificant: resilience to adaptability p = 0.163, adaptability to self-efficacy p = 0.203, resilience to employment quality p = 0.250, and self-efficacy to employment quality

p = 0.886. The institution-level bootstrap interval for the sequential path product was [−0.00019, 0.00060]. These analyses do not invalidate the reported latent SEM, but they show that its direct, mediated, and moderation conclusions were not confirmed in the manifest small-cluster sensitivity specification.

4.6. Sensitivity to Missing Data, Functional Form, and Institutional Influence

The expanded diagnostics converged on a cautious interpretation (Table 8). In the full-cohort multinomial model, the covariate set explained little separation among the three flow states (McFadden R^2 = 0.016; likelihood-ratio $\chi^2(42)$ = 46.50, p = 0.292). A one-SD increase in T1 resilience was not clearly associated with T4 response without paid employment rather than paid employment (OR = 1.15, institution-bootstrap 95% CI [0.97, 1.31], p = 0.080) or with T4 nonresponse rather than paid employment (OR = 1.02, 95% CI [0.91, 1.16], p = 0.748). The first contrast was directionally opposite to a simple account in which low resilience selectively removes graduates from paid employment, but its interval included the null; the analysis therefore neither demonstrates nor eliminates employment-selection bias.

Table 8. Additional specification and influence diagnostics.

Diagnostic	Key Estimate	Inference
Three-state sample flow	Resilience: nonpaid response vs. paid OR = 1.15, 95% CI [0.97, 1.31], p = 0.080; nonresponse vs. paid OR = 1.02, 95% CI [0.91, 1.16], p = 0.748	No clear resilience-related separation of flow states
20-dataset multiple imputation	Direct B = 0.058, 95% CI [−0.010, 0.126], p = 0.095; sequential product = 0.000007, 95% CI [−0.000083, 0.000098], p = 0.873	Primary manifest direct and sequential effects not confirmed
Employment-quality multiverse	21 specifications: direct B = 0.049–0.073, p = 0.085–0.251; 0/21 p < 0.05; sequential product = −0.000046 to 0.000048	Direction of direct effect stable, statistical support absent
Quadratic functional form	Four focal quadratic terms; maximum ΔR^2 = 0.0065; minimum FDR-adjusted p = 0.203	No supported departure from linearity
Leave-one-institution-out	Direct B = 0.022–0.083; sequential product = −0.000010 to 0.000129; H5a = −0.069 to 0.007; H5b = −0.078 to −0.043	Direct direction stable; mediation and H5a unstable; H5b consistently opposite
Digital one-factor score	Factor-score/item-mean r = 1.000; H5a B = −0.036, CR2 p = 0.592, wild-cluster p = 0.586	H5a null is not an item-scoring artifact

Note. OR = odds ratio; FDR = false-discovery rate; CR2 = Bell–McCaffrey cluster-robust adjustment. Multinomial intervals and p values use 500 institution-cluster bootstrap resamples. Multiple-imputation estimates are standardized manifest coefficients pooled across 20 datasets. Ranges are descriptive specification or influence diagnostics and should not be read as simultaneous confidence intervals.

Multiple imputation used all 860 paid employees and recovered the same weak manifest pattern as the complete-case analysis: the pooled direct coefficient was B = 0.058 (p = 0.095), while the sequential product was effectively zero (p = 0.873). Across 21 defensible employment-quality weights, the direct coefficient remained positive but never reached p < 0.05, and the sequential product crossed zero across specifications. None of the four quadratic terms survived FDR correction, so the weak manifest results were not explained by a simple curvilinear relation. Omitting one institution at a time preserved a positive direct point estimate, but the sequential product and H5a changed sign; every H5b estimate remained negative. Replacing the digital item mean with a one-factor score produced the same negative, nonsignificant H5a estimate. Together, these checks localize the model sensitivity: the direct direction is comparatively stable, whereas mediation magnitude and both proposed boundary conditions are not.

5. Discussion

This four-wave study followed 1500 final-year university students from eight Chinese institutions, with employment quality observed for 860 graduates in paid employment. The prespecified latent SEM was consistent with a sequence from resilience to adaptability, self-efficacy, and employment quality. The added analyses qualify that interpretation. The digital-ability scale did not reproduce five domains in split samples, the selection- and weight-adjusted manifest models did not reproduce the sequential indirect effect, and small-cluster inference did not support either moderation hypothesis. The contribution is therefore a theoretically specified longitudinal test accompanied by evidence about where its conclusions are sensitive to measurement and model choice, rather than a definitive verification of a causal resource-translation mechanism.

5.1. Multiple Mediating Pathways Underlying the Resilience–Employment Quality Association

The primary latent model was consistent with direct and indirect associations between resilience and employment quality, but this evidence was specification-dependent. After adjustment for the prespecified covariates, T1 resilience was positively associated with T4 employment quality ($\beta = 0.17$, $p < 0.001$; Table 2). Table 5 reported three positive indirect estimates: through adaptability ($B = 0.07$, 95% CI [0.03, 0.11]), through job-search self-efficacy ($B = 0.06$, 95% CI [0.02, 0.10]), and through both sequentially ($B = 0.06$, 95% CI [0.02, 0.09]); the total indirect estimate was $B = 0.19$. These estimates describe the primary latent specification rather than a proportion of a causal effect. The complete-case manifest models, IPW model, and institution-level bootstrap produced intervals spanning zero for the sequential product. The proposed mechanism therefore received support within the primary latent model but was not confirmed across the sensitivity specifications.

The proposed sequence is theoretically compatible with COR accounts of resource investment and gain (Hobfoll et al., 2018), and with the meta-analytic association between career adaptability and adaptation outcomes (Rudolph et al., 2017). The present design adds resilience before adaptability and assesses multidimensional employment quality after job-search self-efficacy. Guan et al. (2013) examined adaptability, self-efficacy, and employment outcomes across three waves; the present four-wave ordering extends that question but does not isolate within-person resource accumulation. Each focal construct was measured at one occasion, so stable individual differences, omitted common causes, and differences between latent and manifest measurement remain alternative explanations. Replication with repeated measurements of each construct is needed before interpreting the sequence as a resource-gain process.

5.2. Stage-Specific Boundary Effects of Contextual Factors

Unlike previous studies that treat contextual factors as generic, one-size-fits-all moderators, this study locates two boundary conditions on different segments of the resource-translation sequence based on theoretical logic, verifying their differential action nodes and effect magnitudes. Perceived employment-market pressure significantly moderated the association between resilience and career adaptability (interaction $\beta = 0.09$, $p < 0.05$, $\Delta R^2 = 0.01$; Figure 3); the simple slope was 0.52 versus 0.38 at high versus low pressure (a 36.8% relative difference that corresponds to a small interaction term, $\beta = 0.09$, $\Delta R^2 = 0.01$). In contrast, digital job-search ability operated on the later segment of the model, significantly strengthening the link between job-search self-efficacy and employment quality (interaction $\beta = 0.12$, $p < 0.01$, $\Delta R^2 = 0.02$; Figure 2); the simple slope was 0.41 versus 0.25 (a 64% relative difference, again on a small interaction term, $\beta = 0.12$, $\Delta R^2 = 0.02$). These relative contrasts should be read against the small absolute incremental variance, not as evidence of large practical contingencies. Conditional total indirect effect analyses further

confirmed that the overall indirect association between resilience and employment quality increased monotonically across levels of both moderators, with statistically significant high–low differences for both boundary conditions (Table 6).

The moderating pattern of perceived market pressure can be explained from the resource threat perspective of COR theory: when the risk of resource loss is salient, the protective value of existing resilience resources becomes more prominent, consistent with the core argument that resource effects intensify under conditions of high loss salience (Hobfoll et al., 2018). This finding adds nuance to prior research that has largely framed employment market pressure as a uniformly negative contextual factor that undermines job-search engagement (Zhang et al., 2020) by showing that pressure can also amplify the adaptive benefits of psychological resources in the preparatory stage. For the moderating effect of digital job-search ability, the findings align with SCCT's emphasis on contextual supports: efficacy beliefs can only be translated into actual outcomes when supported by corresponding capabilities and environmental conditions (Lent et al., 2000). This result also complements the research of Woods et al. (2020) on digital recruitment, confirming that digital job-search competence is a critical enabling condition for efficacy beliefs to generate employment returns in the digital recruitment era. In sum, the stage-specific pattern of the two boundary conditions indicates that different segments of the resource-translation process are constrained by different contextual factors: the upstream resource development stage is more strongly shaped by environmental pressure, while the downstream outcome conversion stage relies more on the support of instrumental capabilities.

5.3. Reconsidering the Role of Career Adaptability in Shaping Employment Quality

After controlling for job-search self-efficacy, the direct association between career adaptability and employment quality fails to reach conventional statistical significance, with its effect fully transmitted through task-specific efficacy beliefs. This finding clarifies the action mechanism of career adaptability in relation to employment quality and revises previous conclusions drawn from binary employment status outcomes. As shown in Table 2, after including job-search self-efficacy in the model, the residual direct path from career adaptability to employment quality was only $\beta = 0.07$ and did not meet the conventional significance threshold ($p = 0.080$). Combined with the effect decomposition in Table 5, the influence of career adaptability on employment quality is primarily realized through two routes: the sequential mediation path with job-search self-efficacy, and shared variance with psychological resilience.

The three-wave study by Guan et al. (2013) found that career adaptability had a significant direct effect on employment status, while also being partially mediated by job-search self-efficacy. The discrepancy between their findings and the present study stems from the difference in outcome variables: employment acquisition primarily depends on the breadth of career exploration and planning, while employment quality relies more on the precision and strategic execution of job-search behavior. Haenggli and Hirschi (2020) also noted in their research on career success that career adaptability is a distal preparatory resource and its impact on career success needs to be mediated by specific behaviors and beliefs. The present findings further refine this conclusion, showing that the distal attribute of adaptability is more pronounced for quality-focused outcomes than for binary employment outcomes. This also helps explain why some career adaptability interventions have limited effects on improving employment quality—they often lack the subsequent efficacy conversion link.

5.4. Contextualized Contribution to Employment Quality Research in the Chinese Graduate Labor Market

This study extends the endpoint of graduate transition research from employment acquisition to multidimensional employment quality and verifies the applicability of the resource-translation model in the unique context of China's large graduate cohort, fierce competition, and highly digitalized recruitment, supplementing empirical evidence of school-to-work transition in non-Western contexts. The employment quality index integrates four objective indicators (monthly salary, contract quality, social insurance coverage, job stability) and eight subjective indicators (major–job match, person–job fit, career development potential, overall job satisfaction). However, in the complete-case manifest sensitivity analyses summarized in Table 7, the sequential mediation effect was not reproduced when employment quality was operationalized using objective-only or subjective-only indicators, further indicating that the mediation findings were specification-dependent. Meanwhile, multi-group analyses show no significant differences in the model between undergraduate and vocational students, or between eastern and central/western regions (Table 7), suggesting that the mechanism is consistent across different educational tiers and geographic regions in China.

Most Western graduate transition studies focus on employment status or single indicators such as salary (Saks & Ashforth, 2002), and their labor market contexts are far less competitive than China's. Against the background of the largest-ever graduate cohort in China, this study confirms that individual psychological resources remain important predictors of employment outcomes even in a highly competitive environment, rather than being completely determined by structural factors. In addition, digital job-search ability remains theoretically relevant in the context of high digital recruitment penetration in China and is consistent with the broader importance of digital competence reported by Kelley et al. (2024), although its proposed moderating effect was not supported in the cluster-adjusted sensitivity analyses. Overall, the findings of this study not only possess cross-contextual theoretical consistency but also reflect the contextual characteristics of China's highly competitive and highly digitalized graduate labor market, providing empirical support for the localized application of career transition theories.

Practical implications are suggested by the theoretical framework and prior intervention research; the present observational study did not test intervention effectiveness or optimal timing. At approximately six months before graduation, universities can deliver resilience training programs incorporating rejection simulation exercises, cognitive reappraisal techniques, and help-seeking skill practice; randomized trials of brief group-based coping interventions among undergraduates provide a preliminary evidence base for such approaches (Houston et al., 2017). At approximately three months before graduation, career planning curricula can integrate structured occupational exploration assignments and mentorship matching to foster the concern, control, curiosity, and confidence dimensions of career adaptability, building on evidence that adaptability training yields longitudinal benefits during the school-to-work transition (Koen et al., 2012). At approximately one month before graduation, targeted digital job-search workshops can cover applicant tracking system optimization, online interview rehearsal, vacancy credibility verification, professional profile management, and responsible use of AI-assisted application tools, given evidence that access to digital job platforms can shape employment expectations and behavior (Kelley et al., 2024). Digital capability training should be delivered alongside psychological resource development rather than as a separate, supplementary afterthought. Curricula should address the critical evaluation of online recruitment information, professional online identity management, ethical use of AI writing tools, preparation for automated screening procedures, and virtual interview performance, while also attending to issues of digital privacy, procedural transparency, and unequal access to digital resources. Students reporting high levels of perceived market pressure may benefit from individualized career counseling and timely feedback to reduce the likelihood of

pressure-driven occupational compromise. Importantly, psychological and skill-based interventions cannot compensate for structural shortages of high-quality entry-level positions. The absence of robust support for the proposed interactions provides no basis for shifting responsibility for structural labor market constraints onto individual graduates. Institutions should complement individual-level support with employer partnerships, accessible placement services, and transparent labor market information.

This study has several limitations that define the scope of its conclusions and point to future research directions. First, the digital job-search ability scale was newly developed for this study; the split-sample results supported use of an exploratory total score but did not validate the five proposed domains. Independent replication is required and external convergent validity (against established digital-literacy or computer-self-efficacy measures) is still required before the instrument is adopted in other settings. Most focal variables also relied on self-report; although temporal separation and common-method diagnostics reduce method-bias concerns, multi-source and behavioral data (e.g., platform-verified task performance) would strengthen future work. Furthermore, although earlier-wave resources weakly predicted the moderators and the same-wave constructs were psychometrically distinct (Section 4.4), the moderators were measured in the same wave as their proximal constructs; reverse-appraisal or shared-ratings effects cannot be excluded. Future designs should assess digital job-search ability and market pressure one wave earlier than the constructs they are hypothesized to moderate. Second, the observational four-wave design orders measurements but does not establish within-person change or causal effects. The restriction of the employment-quality sample to paid employees introduces potential selection bias. The reported IPW analysis addresses measured selection among T4 respondents, and the Heckman check was weakly identified; neither eliminates unmeasured selection or T4 nonresponse. Future work needs a defensible exclusion restriction or an appropriate joint model of employment entry and quality; nonemployment should not be coded as zero employment quality. Controlling for broad personality traits would also clarify whether resilience offers incremental predictive value beyond stable dispositional factors. Third, equal weighting is a transparent a priori convention rather than an empirically estimated set of indicator weights; the mediation findings were specification-dependent across 60/40, salary-upweighted, and principal-component-weighted composites (Section 4.5), but a formally estimated formative (MIMIC) model in a larger sample, together with preregistered weights, would better represent how each indicator contributes to perceived job quality. Fourth, although cluster-robust and CR2 small-sample-corrected standard errors were computed, only eight institutions were sampled, which places an upper bound on cluster-level inference and precludes modeling institutional random slopes; the multi-group null findings across tier and region are correspondingly underpowered. Replications with a larger, probability-based sample of institutions are needed before claiming institution-level invariance. Finally, the six-month follow-up captures only early-career outcomes, and longer-term tracking across several years is needed to examine whether resilience-related differences in employment quality persist, widen, or diminish over time as graduates accumulate work experience and make subsequent career transitions.

6. Conclusions

In the primary latent model, psychological resilience was prospectively associated with employment quality among graduates in paid employment, and the indirect estimates were consistent with the proposed adaptability–self-efficacy sequence. These findings were not consistently reproduced in manifest, selection-adjusted, alternative-weight, and small-cluster sensitivity analyses. Neither proposed moderation hypothesis was sup-

ported by the small-cluster checks. The study extends attention from employment acquisition to multidimensional employment quality, but its mechanism-related conclusions remain specification-dependent and associational.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/bs16112102/s1, Figure S1, participant flow from baseline enrollment to the T4 paid-employment analytic sample; Table S1, Wave-specific response counts and derivation of the paid-employment analytic sample; and Table S2, items of the study-specific digital job-search ability scale.

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