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From Upward Career-Development Signals to Employee Loyalty: The Mediating Roles of Promotion Opportunity Fairness and Organisational Support Under Resource Concentration in Chinese Private Firms

Dr. Gan Weixiang
Post Doctorate-Researcher, Lincoln University College, Petaling Jaya, Selangor Darul Ehsan-47301, Malaysia ORCID: 0009-0003-5879-5395

Liu Qiaoran*
Agriculture and Rural Affairs Bureau of Yindu District, Anyang City, Henan Province 455000, China.

Dr. Xiao Mengfei
Post Doctorate-Researcher, Lincoln University College, Petaling Jaya, Selangor Darul Ehsan-47301, Malaysia. ORCID: 0009-0004-5077-1214

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ABSTRACT: This study examines why employee loyalty declines among rank-and-file employees in Chinese private firms when promotion opportunities are unequally distributed and critical organisational resources are concentrated. Drawing on signalling theory, organisational justice theory and organisational support theory, it develops a PLS-SEM model of the effect of upward career-development signalling strength on employee loyalty and analyses 486 valid questionnaires using SmartPLS 4. The results show that upward career-development signals have a positive effect on loyalty ($\beta = 0.118$, $p = 0.008$) and significantly strengthen perceived fairness of promotion opportunities ($\beta = 0.462$) and perceived organisational support ($\beta = 0.418$). The two indirect effects are 0.148 and 0.119, together accounting for 69.4% of the total effect. Perceived resource concentration weakens the effect of signalling on opportunity fairness ($\beta = -0.146$), reducing the conditional indirect effect from 0.176 to 0.120. The model explains 49.2% of the variance in loyalty and demonstrates out-of-sample predictive capability. These findings suggest that loyalty in private firms is strengthened not by repeating promotion-related slogans, but by making development signals credible through transparent criteria, genuinely contestable opportunities, process feedback and a demonstrable record of honouring commitments, while using procedural safeguards to limit the discounting effect of resource concentration.

KEYWORDS: private enterprises; upward career-development signals; employee loyalty; fairness of promotion opportunities; perceived resource concentration; structural equation modelling

1. RESEARCH BACKGROUND AND PROBLEM STATEMENT

Private enterprises offer employees flexible roles and scope for growth, yet whether career development is predictable, open to competition and ultimately realised directly shapes organisational commitment and decisions to remain. Research on career growth and organisational support shows that clearly defined career opportunities can strengthen commitment. Evidence from China also indicates that job security, compliant management practices, employee care and employer attractiveness influence whether talented people choose private firms (Cao & Gan, 2026a, 2026b; Farh et al., 2007; Gan et al., 2026; Kraimer et al., 2011; Sturges et al., 2002; Weng et al., 2010).

In Chinese private firms, control over budgets, projects, client relationships and personnel decisions is often concentrated among a small number of shareholders or senior managers. Centralised decision-making can accelerate organisational responses. When standards, candidate pools and allocation rationales are opaque, however, employees interpret a series of otherwise discrete events as signals about their future opportunities and adjust their effort and intentions to stay accordingly (Cao & Gan, 2026b; Connelly et al., 2011; Farh et al., 2007; Gan et al., 2026; Spence, 1973). Previous studies have separately explained signalling, organisational justice, organisational support and career growth, but have seldom examined how these mechanisms operate jointly where resources are concentrated in Chinese private firms (Cohen-Charash & Spector, 2001; Colquitt, 2001; Cropanzano & Mitchell, 2005; Eisenberger et al., 1986; Farh et al., 2007; Kraimer et al., 2011; Kurtessis et al., 2017; Rhoades & Eisenberger, 2002; Sturges et al., 2002; Weng et al., 2010). This study tests the direct effect of development signals on loyalty, the parallel mediating roles of fairness and support, and the moderation and moderated mediation associated with perceived resource concentration.

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2 THEORETICAL FOUNDATIONS, CONCEPTUAL DEFINITIONS AND RESEARCH HYPOTHESES

2.1 Meaning of Upward Career-Development Signalling Strength

Signalling theory posits that better-informed actors reduce information asymmetry through observable actions that constrain their subsequent behaviour (Connelly et al., 2011; Spence, 1973). In employment relationships, employees cannot directly observe workforce plans, promotion quotas or resource budgets. They must infer their personal development prospects from formal policies, managerial conduct and actual appointment decisions.

Upward career-development signalling strength refers to employees' overall perception of whether their firm communicates information about capability development, promotion and project authority in a sustained, clear, accessible and verifiable manner. Its core is not the number of available positions, but whether rank-and-file employees can discern an avenue for advancement based on competence and performance (Cao & Gan, 2026a; Connelly et al., 2011; Gan et al., 2026; Spence, 1973).

2.2 Upward Career-Development Signalling Strength and Employee Loyalty

Strong development signals reduce uncertainty about whether effort will be recognised and whether capability can be converted into opportunity, thereby linking present effort to longer-term returns. Research on career growth, career management and organisational commitment supports this expectation (Cropanzano & Mitchell, 2005; Kraimer et al., 2011; Meyer & Allen, 1991; Meyer et al., 2002; Mowday et al., 1979; Sturges et al., 2002; Weng et al., 2010).

H1: In private enterprises, employees' perceived upward career-development signalling strength positively affects employee loyalty.

2.3 Mediating Role of Perceived Fairness of Promotion Opportunities

Organisational justice theory emphasises the combined influence of outcomes, procedures and explanatory processes (Cohen-Charash & Spector, 2001; Colquitt, 2001). Transparent job ladders, eligibility criteria for competitive selection, assessment standards and feedback channels enable employees to distinguish between not receiving an opportunity in a particular round and rank-and-file employees never having access to opportunities at all. This distinction strengthens perceived opportunity fairness and, in turn, loyalty (Meyer et al., 2002; Weng et al., 2010).

H2: Upward career-development signalling strength positively affects perceived fairness of promotion opportunities.

H3: Perceived fairness of promotion opportunities positively affects employee loyalty.

H4: Perceived fairness of promotion opportunities mediates the relationship between upward career-development signalling strength and employee loyalty.

2.4 Mediating Role of Perceived Organisational Support

Perceived organisational support captures whether a firm regards employees as human capital worthy of long-term investment. When training, job rotation, project authority and information about internal vacancies lead to tangible outcomes, they elicit reciprocal obligations that strengthen commitment and intentions to remain (Cropanzano & Mitchell, 2005; Eisenberger et al., 1986; Farh et al., 2007; Kraimer et al., 2011; Kurtessis et al., 2017; Rhoades & Eisenberger, 2002).

H5: Upward career-development signalling strength positively affects perceived organisational support.

H6: Perceived organisational support positively affects employee loyalty.

H7: Perceived organisational support mediates the relationship between upward career-development signalling strength and employee loyalty.

2.5 Moderating Role of Perceived Resource Concentration

Perceived resource concentration is the extent to which employees believe that critical budgets, projects, promotion quotas and personnel decisions are controlled primarily by a small group of shareholders or an inner circle. It is not equivalent to objective ownership concentration. Rather, when formal rules are perceived as unable to constrain the actual allocation of resources, publicly communicated development information is discounted (Cao & Gan, 2026b; Connelly et al., 2011; Cropanzano & Mitchell, 2005; Farh et al., 2007; Gan et al., 2026).

H8: Perceived resource concentration negatively moderates the relationship between upward career-development signalling strength and perceived fairness of promotion opportunities.

H9: Perceived resource concentration negatively moderates the indirect effect of upward career-development signalling strength on employee loyalty through perceived fairness of promotion opportunities. The hypothesised model is presented in ***Figure 1***.

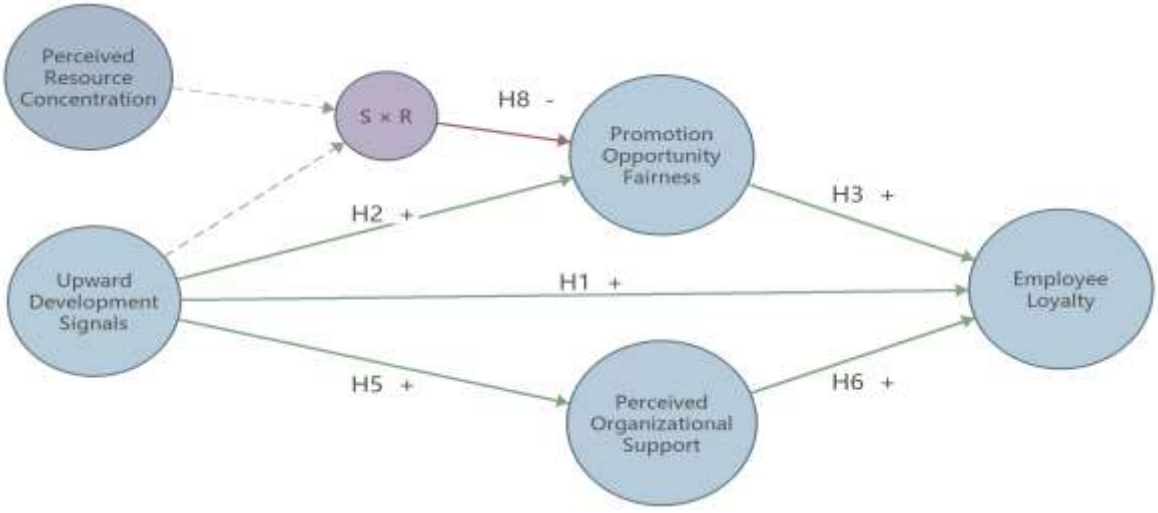


Figure 1: SmartPLS-Style Theoretical Path Model and Research Hypotheses

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3. RESEARCH DESIGN AND EMPIRICAL METHODS

3.1 Participants and Research Design

This study uses a cross-sectional questionnaire and PLS-SEM to test reflective measurement, parallel mediation and interaction effects. Eligible participants were formal or long-term contract employees aged 18 or above who had worked continuously for at least 6 months in a private enterprise operating in China. Entrepreneurial partners, ultimate controllers and workers engaged solely through labour outsourcing were excluded. PLS-SEM is appropriate for the study's predictive orientation and complex mechanisms (Hair et al., 2019; Hair et al., 2022; Ringle et al., 2024). Questionnaire administration should follow the principles of anonymity, voluntary participation and data minimisation; names, mobile telephone numbers and exact company names should not be recorded. Employees from the same firm may exhibit nested dependence. If firm identifiers subsequently become available and the number of firms is sufficient, the results should therefore be checked using cluster-robust standard errors or multilevel SEM.

3.2 Variable Measurement and Questionnaire Design

The questionnaire uses a five-point Likert scale. Items measuring development signals, fairness, organisational support and loyalty were adapted from established English-language scales and research on career growth (Colquitt, 2001; Connelly et al., 2011; Eisenberger et al., 1986; Kraimer et al., 2011; Kurtessis et al., 2017; Meyer & Allen, 1991; Meyer et al., 2002; Mowday et al., 1979; Rhoades & Eisenberger, 2002; Spence, 1973; Weng et al., 2010), whereas perceived resource concentration was operationalised to reflect the governance context of Chinese private firms. HR expert review and employee cognitive interviews were used during pretesting to assess comprehensibility and sensitivity.

The control variables comprise gender, age, educational attainment, organisational tenure, firm size, industry and region. The core constructs contain 22 reflective items, with construct blocks presented in random order. Loyalty is measured through intentions to remain, willingness to recommend the organisation and discretionary effort (Kraimer et al., 2011; Meyer & Allen, 1991; Meyer et al., 2002; Mowday et al., 1979; Sturges et al., 2002; Weng et al., 2010). **Table 1** summarises the measurement dimensions, item codes and scale sources.

Table 1: Measurement Dimensions, Item Codes and Scale Sources

Variable	Item code	Measurement Content	Principal Sources
Upward career-development signalling strength	S1-S5	Clarity of promotion criteria; consistency of information; accessibility of opportunities; verifiability of promises; feedback on outcomes	(Connelly et al., 2011; Spence, 1973)
Perceived fairness of promotion opportunities	F1-F4	Transparent eligibility and assessment rules; opportunities open to rank-and-file employees; explainable outcomes; channels for voicing concerns	(Cohen-Charash & Spector, 2001; Colquitt, 2001)
Perceived organisational support	O1-O4	The organisation values employee development; is willing to invest in employee development; provides job and project resources; and cares about employees' long-term growth	(Eisenberger et al., 1986; Kurtessis et al., 2017; Rhoades & Eisenberger, 2002)
Perceived resource concentration	R1-R4	Critical organisational resources are controlled by a few people; decision-making has low visibility; non-core employees have limited influence; personal ties affect the direction of resource flows	(Cao & Gan, 2026b; Connelly et al., 2011; Farh et al., 2007; Gan et al., 2026)
Employee loyalty	L1-L5	Willingness to remain over the long term, recommend the organisation, protect its reputation, undertake extra tasks and resist the attraction of external opportunities	(Kraimer et al., 2011; Meyer & Allen, 1991; Meyer et al., 2002; Mowday et al., 1979; Sturges et al., 2002; Weng et al., 2010)

Note: S, F, O, R and L denote upward career-development signals, perceived fairness of promotion opportunities, perceived organisational support, perceived resource concentration and employee loyalty, respectively; the numeral identifies the item within each construct.

Table 2: Smart PLS 4 Estimation and Testing Settings

Module	Parameter	Setting
Software and algorithm	Software	SmartPLS 4
Software and algorithm	Structural-model weighting	Path weighting scheme
Software and algorithm	Reflective measurement	Mode A reflective measurement; standardised output
Software and algorithm	Maximum iterations / stopping criterion	3,000 / 1×10^{-7}
Bootstrap	Bootstrap resamples and test	5,000 bootstrap resamples; two-tailed; significance level = 0.05
Bootstrap	Confidence interval	95% bootstrap percentile confidence interval; no sign changes
Moderation	Interaction term	Two-stage approach; upward career-development signals (S) and perceived resource concentration (R) standardised

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Corresponding Author: Liu Qiaoran*

Module	Parameter	Setting
Partial least squares prediction (PLSpredict)	Cross-validation	10 folds × 10 repetitions
PLSpredict	Comparison benchmarks	Indicator average (IA) and linear model (LM)
Cross-validated predictive ability test (CVPAT)	Cross-validation / loss	10 folds × 10 repetitions; squared-error loss
Measurement invariance of composites (MICOM)	Permutation	5,000; two-tailed; α = 0.05
Multi-group analysis (MGA)	Between-group test	Permutation test + partial least squares multi-group analysis (PLS-MGA)
Missing data	Core items	Missingness was 0 in the valid sample
Reporting precision	Decimal places	Coefficients reported to 3 decimal places; $p < 0.001$ reported separately

Note: SmartPLS 4 was used for partial least squares structural equation modelling (PLS-SEM). CI = confidence interval; IA = indicator average; LM = linear model; S = upward career-development signals; R = perceived resource concentration; MGA = multi-group analysis; and PLS-MGA = partial least squares multi-group analysis. Mode A denotes the reflective measurement setting. PLSpredict is the out-of-sample prediction procedure; CVPAT is the cross-validated predictive ability test; and MICOM is the measurement invariance of composites procedure. These procedures use the same indicators, variable directions and data-preprocessing specifications as the main model.

3.3 Data Collection, Sample Cleaning and SmartPLS 4 Analysis Settings

Data-status statement: Every sample statistic, model estimate and numerical value reported in the figures and tables must be checked individually against the raw questionnaire data, the sample-cleaning log and the complete SmartPLS 4 export files. Until this verification is complete, the manuscript should not be presented publicly as a research output whose data have been audited.

A total of 530 records were obtained. Applying the prespecified criteria for completion time, screening logic, long strings of identical responses and missing core items led to the exclusion of 44 records, leaving 486 valid responses and a valid-response rate of 91.70% (**Table 3**). The valid-response rate was calculated using **Eq. (1)**.

$$\textit{Valid-response rate} = \frac{\textit{valid questionnaires}}{\textit{completed questionnaires}} \times 100\% = \frac{486}{530} \times 100\% = 91.70\% \quad (1)$$

Table 3: Questionnaire Collection, Exclusions and Formation of the Valid Sample

Step	Excluded at This Step	Retained Sample	Retention Rate (%)	Decision Criterion
Records obtained	-	530	100.00	Records exported from the questionnaire platform
Completion time too short	18	512	96.60	Below the lower bound of reasonable completion times established in the pretest
Contradictory screening logic	9	503	94.91	Inconsistent with the inclusion criteria or logic-check items
Long strings of identical responses and failed attention check	11	492	92.83	Identical-response rate >80% and attention-check failure
Missing core items	6	486	91.70	At least one core-construct item missing
Final valid sample	44 (cumulative)	486	91.70	Used in all main-model analyses

Note: Exclusion reasons were classified in the prespecified order according to the first criterion met, preventing the same record from being counted more than once; 44 = 18 + 9 + 11 + 6.

The 486 observations meet the requirements imposed by the model's complexity and statistical power, although an adequate sample size does not imply national representativeness (Hair et al., 2019; Hair et al., 2022).

The cleaning rules were independent of construct means and path significance. For records associated with the same device or IP address, only the complete and plausible record with the earliest timestamp was retained.

Before model estimation, values on the 1-5 scale, skewness, kurtosis and missingness were checked. Continuous variables were standardised, categorical variables were dummy-coded, and the interaction term was generated after S and R had been centred (Hair et al., 2019; Hair et al., 2022).

Bootstrapping used 5,000 resamples. Significance was assessed using two-tailed p-values and 95% percentile confidence intervals, with results reported to three decimal places (Hair et al., 2019; Hair et al., 2022; Ringle et al., 2024).

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The analysis proceeded through the measurement model, structural model, PLSpredict/CVPAT, mediation and moderation, MICOM and MGA, in that order. **Table 2** reports the algorithm and resampling parameters (Hair et al., 2019; Hair et al., 2022; Henseler et al., 2015, 2016; Ringle et al., 2024; Sarstedt et al., 2011; Sharma et al., 2023; Shmueli et al., 2019).

4: EMPIRICAL RESULTS

4.1 Data Cleaning and Sample Profile

After 44 responses were removed in accordance with the prespecified criteria, 486 valid questionnaires remained (valid response rate: 91.70%). Men accounted for 52.3% of the sample, respondents aged 26-35 for 45.5%, and those with 1-3 years of organisational tenure for 36.2%; the three firm-size categories represented 36.4%, 32.5%, and 31.1%, respectively. The sample composition is reported in **Table 4** and **Figure 2**. The findings primarily capture the perceptions of employees at a pivotal stage of their career development and should therefore be generalised with caution. Following data cleaning, no missing values were found for the core items, nor was there any anomalous concentration within response categories. Construct scores were standardised, and the interaction term was formed by multiplying the centred values of S and R.

Table 4: Demographic and Firm Characteristics of the Sample (N = 486)

Category	Group	Frequency	Percentage (%)
Sex	Male	254	52.3
Sex	Female	232	47.7
Age	25 years or younger	83	17.1
Age	26-35 years	221	45.5
Age	36-45 years	125	25.7
Age	46 years or older	57	11.7
Organisational tenure	Less than 1 year	64	13.2
Organisational tenure	1-3 years	176	36.2
Organisational tenure	4-6 years	132	27.2
Organisational tenure	7 years or more	114	23.5
Firm size - descriptive classification	Fewer than 100 employees	177	36.4
Firm size - descriptive classification	100-299 employees	158	32.5
Firm size - descriptive classification	300 employees or more	151	31.1
Firm size - classification used for multi-group analysis	199 employees or fewer	231	47.5
Firm size - classification used for multi-group analysis	200 employees or more	255	52.5
Industry	Manufacturing	168	34.6
Industry	Commercial and trading services	139	28.6
Industry	Technology services	98	20.2
Industry	Construction and other industries	81	16.7
Region	Eastern China	217	44.7
Region	Central China	155	31.9
Region	Western China	114	23.5

Note: The groups used for multi-group analysis (MGA) were formed from the original continuous employee count using a cut-off of 200 employees; this criterion differs from the three-category firm-size classification used to describe the sample.

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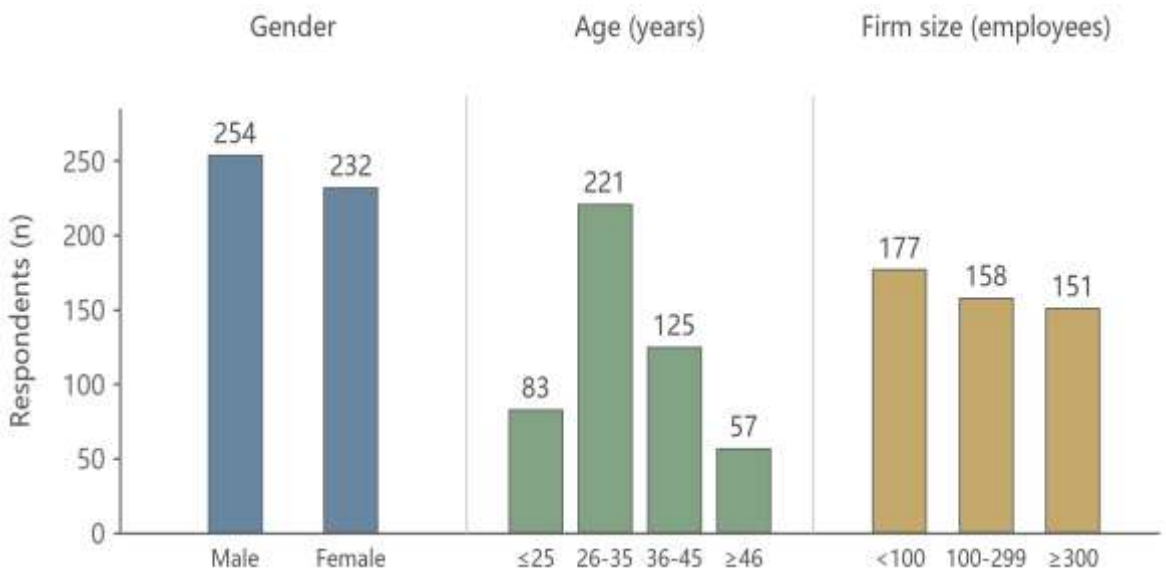


Figure 2: Sample Distribution by Sex, Age, and Firm Size

4.2 Descriptive Statistics, Common Method Bias, and Collinearity Diagnostics

The respective means of S, F, O, R, and L were 2.94, 2.73, 2.86, 3.48, and 2.95 (**Table 5** and **Figure 3**). Perceived fairness of promotion opportunities had the lowest mean, whereas perceived resource concentration had the highest, indicating that respondents regarded access to career-development opportunities as relatively limited. Harman's first factor accounted for 32.56% of the variance, and the full-collinearity VIFs ranged from 1.38 to 2.47. No serious common method bias was detected, although this test cannot establish that common-source bias is absent (Podsakoff et al., 2003).

In relative terms, perceived opportunity fairness was lower than upward career-development signalling strength. Employees were therefore not wholly deprived of development information; rather, they remained uncertain whether such information would translate into opportunities for which they could genuinely compete. Perceived resource concentration was also above the scale midpoint, further suggesting that these reservations were related to access to critical organisational resources. This pattern echoes Chinese private-enterprise research that emphasises managerial compliance, job security, and employee-centred care in employer attractiveness, but the present study extends the focus from recruitment to incumbent employees' continuing investment and loyalty judgements (Cao & Gan, 2026a; Gan et al., 2026).

Table 5: Descriptive Statistics, Distributional Properties, and Full-Collinearity Diagnostics

Construct	Mean	Standard deviation	Skewness	Kurtosis	Cronbach's alpha	Full-collinearity variance inflation factor (VIF)
Upward career-development signals	2.94	0.77	0.21	−0.31	0.905	1.58
Perceived fairness of promotion opportunities	2.73	0.82	0.36	−0.18	0.901	2.47
Perceived organisational support	2.86	0.76	0.18	−0.27	0.887	2.11
Perceived resource concentration	3.48	0.79	−0.29	−0.22	0.861	1.38
Employee loyalty	2.95	0.79	0.14	−0.35	0.914	2.35

Note: SD = standard deviation. Cronbach's alpha assesses internal consistency. The full-collinearity variance inflation factor (VIF) was used to diagnose common method bias; inner VIFs are reported separately in Table 11. Harman's unrotated first factor explained 32.56% of the variance.

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Corresponding Author: Liu Qiaoran*

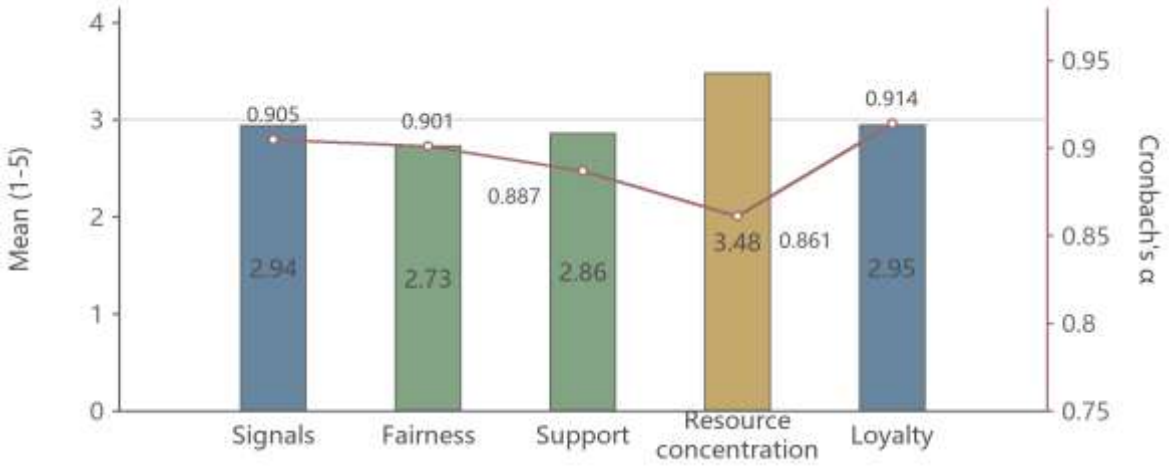


Figure 3: Comparison of Construct Means and Internal Consistency

Source: Prepared by the authors from the data analysed in this study. The dashed line denotes the theoretical midpoint of the five-point scale.

4.3 Measurement Model Assessment

The 22 outer loadings ranged from 0.812 to 0.894; α ranged from 0.861 to 0.914, ρ_A from 0.866 to 0.916, ρ_C from 0.905 to 0.944, and AVE from 0.705 to 0.772. All values met the criteria for reflective measurement (Hair et al., 2019; Hair et al., 2022). Item loadings and construct quality are reported in **Tables 6 and 7** and **Figure 4**.

The values of α, ρ_C, and AVE were calculated using **Eqs. (2)-(4)**, where k is the number of items, σ_i^2 is the variance of item i, σ_T^2 is the variance of the total score, and λ_i is the standardised outer loading of item i (Hair et al., 2019; Hair et al., 2022).

$$\alpha = \frac{k}{k\text{-}1}\left[1 - \frac{\sum_i \sigma_i^2}{\sigma_T^2}\right] \quad (2)$$

$$CR = \frac{(\sum_i \lambda_i)^2}{(\sum_i \lambda_i)^2 + \sum_i (1-\lambda_i^2)} \quad (3)$$

$$AVE = \frac{\sum_i \lambda_i^2}{k} \quad (4)$$

Using S as an illustration, its five outer loadings yielded ρ_C = 0.930 and AVE = 0.727, consistent with the item-level results. Although S5 and R1 had the lowest loadings for their respective constructs, both exceeded 0.708 and were retained.

Table 6: Outer Loadings and Bootstrap Results for the Reflective Measurement Items

Construct	Item code	Original sample (O)	Sample mean (M)	Standard deviation	t statistic	p value	95% confidence interval
Upward career-development signals	S1	0.842	0.840	0.025	33.680	<0.001	[0.793, 0.891]
Upward career-development signals	S2	0.865	0.864	0.022	39.318	<0.001	[0.822, 0.908]
Upward career-development signals	S3	0.857	0.857	0.023	37.261	<0.001	[0.812, 0.902]
Upward career-development signals	S4	0.881	0.880	0.020	44.050	<0.001	[0.842, 0.920]
Upward career-development signals	S5	0.816	0.814	0.028	29.143	<0.001	[0.761, 0.871]
Perceived fairness of promotion opportunities	F1	0.848	0.846	0.024	35.333	<0.001	[0.801, 0.895]
Perceived fairness of promotion opportunities	F2	0.887	0.886	0.018	49.278	<0.001	[0.852, 0.922]
Perceived fairness of promotion opportunities	F3	0.871	0.871	0.020	43.550	<0.001	[0.832, 0.910]
Perceived fairness of promotion opportunities	F4	0.853	0.852	0.022	38.773	<0.001	[0.810, 0.896]
Perceived organisational support	O1	0.831	0.829	0.025	33.240	<0.001	[0.782, 0.880]
Perceived organisational support	O2	0.859	0.858	0.022	39.045	<0.001	[0.816, 0.902]
Perceived organisational support	O3	0.872	0.872	0.020	43.600	<0.001	[0.833, 0.911]
Perceived organisational support	O4	0.846	0.845	0.023	36.783	<0.001	[0.801, 0.891]
Perceived resource concentration	R1	0.812	0.810	0.029	28.000	<0.001	[0.755, 0.869]

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Construct	Item code	Original sample (O)	Sample mean (M)	Standard deviation	t statistic	p value	95% confidence interval
Perceived resource concentration	R2	0.839	0.838	0.025	33.560	<0.001	[0.790, 0.888]
Perceived resource concentration	R3	0.857	0.857	0.022	38.955	<0.001	[0.814, 0.900]
Perceived resource concentration	R4	0.850	0.849	0.023	36.957	<0.001	[0.805, 0.895]
Employee loyalty	L1	0.876	0.874	0.020	43.800	<0.001	[0.837, 0.915]
Employee loyalty	L2	0.894	0.893	0.017	52.588	<0.001	[0.861, 0.927]
Employee loyalty	L3	0.889	0.889	0.018	49.389	<0.001	[0.854, 0.924]
Employee loyalty	L4	0.861	0.860	0.022	39.136	<0.001	[0.818, 0.904]
Employee loyalty	L5	0.872	0.870	0.020	43.600	<0.001	[0.833, 0.911]

Note: O = original sample; M = sample mean; STDEV = standard deviation; t = bootstrap t statistic; p = two-tailed p value; and CI = 95% bootstrap percentile confidence interval. Bootstrap subsamples = 5,000. In item codes, O1-O4 refer to perceived organisational support; S, F, R and L refer to upward career-development signals, perceived fairness of promotion opportunities, perceived resource concentration and employee loyalty, respectively. All confidence intervals excluded 0 and all loadings were >0.708; consequently, all 22 items were retained.

As shown in **Tables 8 and 9**, the square root of AVE for every construct in the Fornell-Larcker matrix exceeded its correlations with the other constructs. HTMT estimates ranged from 0.412 to 0.781, and the upper bounds of all bootstrap confidence intervals were below 0.85, supporting discriminant validity (Henseler et al., 2015). HTMT was calculated using **Eq. (5)**.

$$HTMT_{a\beta} = \frac{mean(|r_{ij}|),\ i \in a,\ j \in b}{\sqrt{[mean(|r_{ij}|),\ i \neq j \in a \cdot mean(|r_{ij}|),\ i \neq j \in b]}} \quad (5)$$

S captures the clarity, continuity, and verifiability of career-development information, whereas F captures judgements about the allocation of opportunities. The two constructs are related but conceptually distinct.

From a model-identification perspective, a stable measurement model is a necessary basis for interpreting the mediation and moderation results that follow. The upward career-development signal items concern whether institutional information is explicit, sustained, and accessible; the opportunity-fairness items address eligibility, procedures, and explanations of outcomes; and the organisational-support items capture the value that the firm places on employees' contributions and development. In substantive terms, the three sets of items respectively represent information, rules, and relationships, while the statistical tests also support their empirical distinctiveness. The structural paths therefore do not merely restate a common favourable evaluation; instead, they trace a sequential process in which employees receive information, assess institutional arrangements, and form perceptions of reciprocity. The common method bias tests did not indicate that a single method factor dominated the results, although this does not imply that bias was eliminated entirely. Anonymous completion, dispersion of items, and multiple statistical diagnostics were used to mitigate the risk, and the conclusions remain appropriately circumspect about causal inference from cross-sectional data (Podsakoff et al., 2003).

The measurement results further show that upward career-development signals, fairness, and support were correlated without becoming statistically indistinguishable. The high loadings indicate that employees formed stable judgements about each construct, while the HTMT confidence-interval test rules out spurious differentiation caused by similar item wording. Distinguishing S from F is especially important because it enables the model to identify the temporal mechanism between what information the firm communicates and how employees evaluate the rules governing opportunities. Were the two constructs combined, the theoretical meaning of fairness as a mediator would be lost (Hair et al., 2019; Hair et al., 2022; Henseler et al., 2015).

Table 7: Construct Reliability and Convergent Validity

Construct	Outer-loading range	Cronbach's alpha	(ρ_A)	(ρ_C)	AVE	Conclusion
Upward career-development signals	0.816-0.881	0.905	0.908	0.930	0.727	Meets criteria
Perceived fairness of promotion opportunities	0.848-0.887	0.901	0.903	0.922	0.748	Meets criteria
Perceived organisational support	0.831-0.872	0.887	0.891	0.914	0.726	Meets criteria
Perceived resource concentration	0.812-0.857	0.861	0.866	0.905	0.705	Meets criteria
Employee loyalty	0.861-0.894	0.914	0.916	0.944	0.772	Meets criteria

Note: Cronbach's alpha (α) assesses internal consistency; Dijkstra-Henseler's rho (ρ_A) and composite reliability (ρ_C) are reliability coefficients; and average variance extracted (AVE) assesses convergent validity. The thresholds were α, ρ_A and ρ_C >0.70 and AVE >0.50. ρ_C and AVE were recalculated from all outer loadings in Table 6 using Eqs. (3) and (4).

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Table 8: Fornell-Larcker Discriminant-Validity Matrix

Construct	(S)	(F)	(O)	(R)	(L)
Upward career-development signals (S)	0.853				
Perceived fairness of promotion opportunities (F)	0.690	0.865			
Perceived organisational support (O)	0.614	0.572	0.852		
Perceived resource concentration (R)	−0.388	−0.507	−0.421	0.840	
Employee loyalty (L)	0.598	0.642	0.611	−0.469	0.879

Note: S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. AVE = average variance extracted. Diagonal entries are the square roots of AVE; off-diagonal entries are interconstruct correlations. Every diagonal value exceeds the absolute correlations in its corresponding row and column.

Table 9: Heterotrait-Monotrait Ratio (HTMT) Point Estimates and Upper Bounds of the Bootstrap 95% Confidence Intervals

Construct	(S)	(F)	(O)	(R)	(L)
S	-	0.827	0.776	0.469	0.762
F	0.781	-	0.741	0.611	0.804
O	0.728	0.694	-	0.535	0.781
R	0.412	0.552	0.476	-	0.589
L	0.715	0.756	0.733	0.529	-

Note: HTMT = heterotrait-monotrait ratio. S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. The lower triangle contains HTMT point estimates, and the upper triangle contains the corresponding upper bounds of the bootstrap 95% confidence intervals. All point estimates and upper bounds are <0.85.

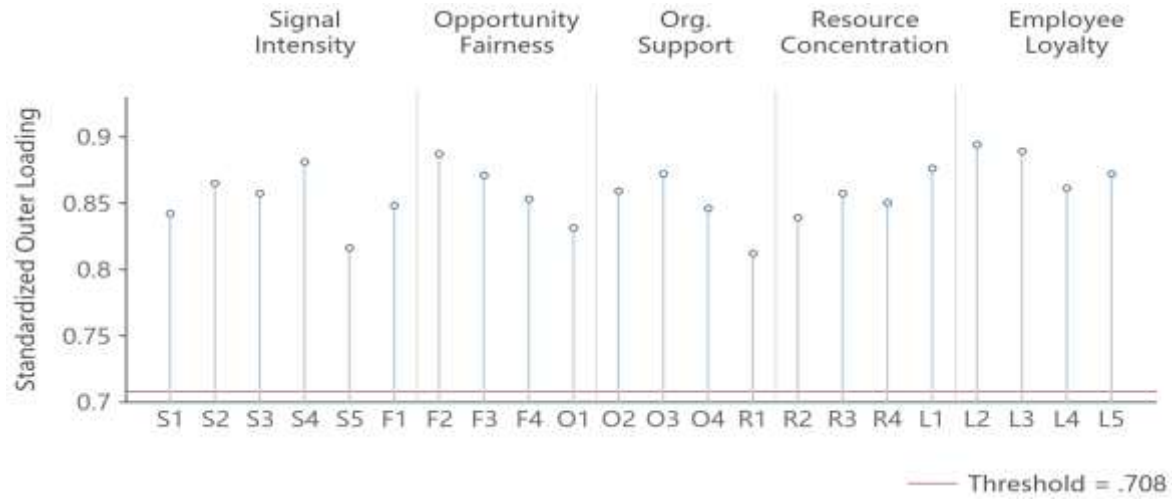


Figure 4: Standardised Outer Loadings of the Reflective Measurement Model

4.4 Structural Model, Explanatory Power, and Out-of-Sample Prediction

Bootstrapping with 5,000 subsamples showed that S→L = 0.118 (p = 0.008), supporting H1. Model estimation and significance testing followed established PLS-SEM reporting standards (Hair et al., 2019; Hair et al., 2022; Ringle et al., 2024).

Let S, F, O, R, and L denote upward career-development signals, perceived fairness of promotion opportunities, perceived organisational support, perceived resource concentration, and employee loyalty, respectively, and let C denote the control variables. The structural equations are given in **Eqs. (6)-(8)**.

$$F = \beta_0 + \beta_1 S + \beta_2 R + \beta_3 (S \times R) + \varepsilon_F \quad (6)$$

$$O = \gamma_0 + \gamma_1 S + \varepsilon_O \quad (7)$$

$$L = \delta_0 + c'S + \delta_1 F + \delta_2 O + \Omega C + \varepsilon_L \quad (8)$$

All core paths were in the expected direction: S→F = 0.462, S→O = 0.418, F→L = 0.321, O→L = 0.284, and S×R→F = -0.146. The comparatively small direct effect indicates that upward career-development signals are translated into loyalty primarily through fairness and support (**Table 15** and **Figures 5 and 6**).

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The path magnitudes reveal a clear ordering. The effects of S on F and O were considerably stronger than the direct effect of S on L, suggesting that career-development signals first shape employees' interpretations of organisational rules and relationships and only then influence their willingness to stay, recommend the organisation and exert discretionary effort. The F→L path was slightly stronger than O→L. In private firms where resource allocation depends heavily on a small number of decision-makers, employees thus need not only to feel that the organisation is willing to invest in their development, but also to be confident that jobs and project opportunities are governed by consistent and explicable competitive procedures. This finding accords with the complementary logic of research on organisational justice and organisational support (Cohen-Charash & Spector, 2001; Colquitt, 2001; Kurtessis et al., 2017).

Although the direct effect was significant, its effect size was small; this should not be taken to mean that career-development communication lacks value. Rather, announcement frequency alone is insufficient to generate loyalty. Signals must entail verifiable costs, such as publishing eligibility criteria, retaining review records, providing feedback to unsuccessful candidates, and consistently honouring commitments. Only when subsequent evidence enables employees to test managerial statements can development communication move from low-cost rhetoric to a credible signal (Connelly et al., 2011; Spence, 1973).

Of the seven control variables, only organisational tenure had a weak positive association with L; adding the controls did not alter the direction of the core coefficients.

The f^2 values indicated medium effects for S→F (0.282) and S→O (0.211), while the remaining core paths had small to medium effects. All inner VIFs were below 3.3; SRMR = 0.061 and NFI = 0.901, and both d_ULS and d_G were below HI95, indicating acceptable structural-model quality (**Tables 10 and 11**).

Effect sizes, explanatory power, and predictive tests provide complementary information. A small-effect path may correspond to an institutional feature that can be adjusted at modest cost, whereas a stronger path does not necessarily support accurate individual-level prediction on its own. Management interventions should therefore not be prioritised solely by statistical significance. A more informative approach is to use S, F, O, and R as an integrated governance dashboard: first establish whether career-development information is widely received, and then determine whether low loyalty stems mainly from opportunity procedures, support investment, or opaque resource allocation. The model's predictive advantage suggests that this combination identifies the sources of problems more effectively than asking only about turnover intentions. Even so, applications should aggregate results by department or group and must not treat statistical probabilities as deterministic judgements about an individual's loyalty.

Explanatory and predictive power should be interpreted separately. The R^2 for L shows that the model explains nearly half of the in-sample variance, but its managerial utility also depends on whether it can predict observations excluded from estimation. PLSpredict and CVPAT both outperformed the naïve and linear benchmarks, indicating that fairness, support, and resource concentration add value not only to retrospective explanation but also to the identification of loyalty risks. The result supports incorporating upward career-development signal indicators into periodic employee surveys; however, predictions should inform institutional diagnosis rather than punitive labelling of individual employees (Sharma et al., 2023; Shmueli et al., 2019).

R^2, $Q^2_predict$, f^2, and adjusted R^2 were calculated using **Eqs. (9)-(12)**. Out-of-sample prediction used 10-fold cross-validation with 10 repetitions (Sharma et al., 2023; Shmueli et al., 2019).

$$R^2 = 1 - \frac{\sum_i (y_i - \hat{y}_i)^2}{\sum_i (y_i - \bar{y})^2} \quad (9)$$

$$Q^2_predict = 1 - \frac{PRESS}{SSO} \quad (10)$$

$$f^2 = \frac{R^2_included - R^2_excluded}{1 - R^2_included} \quad (11)$$

$$R^2_adj = 1 - \frac{(1-R^2)(n-1)}{n-k-1} \quad (12)$$

For F, O, and L, the R^2 values were 0.359, 0.175, and 0.492, respectively; the adjusted R^2 values were 0.355, 0.173, and 0.481; and the mean construct-level $Q^2_predict$ values were 0.232, 0.135, and 0.349. The f^2 effect sizes were 0.282 for S→F, 0.211 for S→O, 0.138 for F→L, 0.111 for O→L, 0.026 for S→L, and 0.034 for S×R→F. **Table 12**, **Table 13** and **Table 14** report the explanatory and predictive results in full.

Table 10: SmartPLS Model-Fit Indices

Index	Saturated model	HI95	Estimated model	HI95	Assessment
SRMR	0.054	0.072	0.061	0.078	Below bootstrap 95th percentile
d_ULS	0.712	0.985	0.894	1.126	Below bootstrap 95th percentile
d_G	0.318	0.459	0.401	0.532	Below bootstrap 95th percentile
χ^2	786.214	-	824.570	-	Descriptive reporting
NFI	0.912	-	0.901	-	>0.90

Note: SRMR = standardised root mean square residual; d_ULS = squared Euclidean distance; d_G = geodesic distance; χ^2 = chi-square statistic; NFI = normed fit index; and HI95 = bootstrap 95th-percentile reference value. d_ULS and d_G were evaluated against HI95; χ^2 was not treated as a stand-alone pass criterion for partial least squares structural equation modelling (PLS-SEM).

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Corresponding Author: Liu Qiaoran*

Table 11: Inner VIFs and f² Effect Sizes for the Structural Model

Endogenous construct	Predictor	VIF	Effect size	Effect-size interpretation
F	S	1.58	0.282	Medium
F	R	1.42	0.041	Small
F	S×R	1.11	0.034	Small
O	S	1.00	0.211	Medium
L	S	1.73	0.026	Small
L	F	2.47	0.138	Small-to-medium
L	O	2.11	0.111	Small-to-medium
L	Control variables	1.04-1.32	0.001-0.009	Negligible-to-small

Note: S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. An arrow (→) denotes a tested directional path, and × denotes an interaction. VIF = variance inflation factor; f² = effect size. All inner VIFs were <3.3. The f² benchmarks of 0.02, 0.15 and 0.35 denote small, medium and large effects, respectively, but the values were interpreted alongside theoretical importance.

Table 12: Explanatory Power and Predictive Relevance of the Endogenous Constructs

Endogenous construct	(R^2)	(k)	Adjusted (R^2)	(Q^2_predict)	Assessment
Perceived fairness of promotion opportunities (F)	0.359	3	0.355	0.232	Moderate explanatory power; predictive relevance
Perceived organisational support (O)	0.175	1	0.173	0.135	Low-to-moderate explanatory power; predictive relevance
Employee loyalty (L)	0.492	10	0.481	0.349	Moderate explanatory power; predictive relevance

Note: n = sample size (486); R^2 = explained variance; k = number of predictors entering the corresponding endogenous equation; and Q^2_predict = cross-validated predictive relevance, reported as the mean across the relevant outcome indicators.

Table 13: Item-Level Out-of-Sample Prediction Results from PLSpredict

item	Q^2_predict	RMSE_PLS	RMSE_LM	ΔRMSE	MAE_PLS	MAE_LM	ΔMAE	Predictive power
F1	0.228	0.714	0.741	−0.027	0.563	0.586	−0.023	High
F2	0.251	0.681	0.709	−0.028	0.538	0.562	−0.024	High
F3	0.236	0.698	0.724	−0.026	0.551	0.574	−0.023	High
F4	0.214	0.729	0.748	−0.019	0.576	0.592	−0.016	Medium
O1	0.128	0.756	0.772	−0.016	0.598	0.611	−0.013	Medium
O2	0.143	0.738	0.759	−0.021	0.584	0.601	−0.017	Medium
O3	0.151	0.721	0.746	−0.025	0.571	0.591	−0.020	High
O4	0.119	0.769	0.781	−0.012	0.607	0.617	−0.010	Medium
L1	0.348	0.671	0.711	−0.040	0.529	0.561	−0.032	High
L2	0.372	0.648	0.694	−0.046	0.512	0.549	−0.037	High
L3	0.365	0.655	0.701	−0.046	0.517	0.554	−0.037	High
L4	0.321	0.692	0.724	−0.032	0.547	0.573	−0.026	High
L5	0.337	0.681	0.716	−0.035	0.539	0.568	−0.029	High

Note: Q^2_predict = predictive relevance based on cross-validation; RMSE = root mean square error; MAE = mean absolute error; PLS = partial least squares; LM = linear model; and Δ = PLS - LM. A negative difference indicates lower prediction error for the partial least squares model than for the linear-model benchmark. F1-F4 are indicator items for perceived fairness of promotion opportunities; O1-O4 are indicator items for perceived organisational support; and L1-L5 are indicator items for employee loyalty.

Table 14: Cross-Validated Predictive Ability Test (CVPAT)

Outcome construct	Benchmark	Mean loss difference	SD	t	p	95% CI
Perceived fairness of promotion opportunities (F)	Indicator average (IA)	−0.046	0.015	−3.120	0.002	[−0.075, −0.017]
Perceived fairness of promotion opportunities (F)	Linear model (LM)	−0.027	0.011	−2.430	0.016	[−0.049, −0.005]
Perceived organisational support (O)	Indicator average (IA)	−0.021	0.010	−2.080	0.038	[−0.041, −0.001]

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Corresponding Author: Liu Qiaoran*

Outcome construct	Benchmark	Mean loss difference	SD	t	p	95% CI
Perceived organisational support (O)	Linear model (LM)	−0.019	0.009	−2.140	0.033	[−0.037, −0.002]
Employee loyalty (L)	Indicator average (IA)	−0.064	0.015	−4.210	<0.001	[−0.094, −0.034]
Employee loyalty (L)	Linear model (LM)	−0.041	0.012	−3.560	<0.001	[−0.064, −0.018]

Note: Standard deviation, t statistic, p value and confidence intervals are bootstrap results. Mean loss difference = PLS loss - benchmark loss; a significant negative value indicates lower out-of-sample prediction loss for the partial least squares model. The mean loss difference was calculated using Eq. (13).

$$\Delta\bar{L} = \bar{L}_PLS - \bar{L}_benchmark \quad (13)$$

Table 15: Bootstrap Tests of Structural-Model Paths and Control Variables

Path	(O)	(M)	SD	t	p	95% CI	Conclusion
S→L (H1)	0.118	0.119	0.044	2.682	0.008	[0.032, 0.205]	Supported
S→F (H2)	0.462	0.461	0.043	10.744	<0.001	[0.381, 0.538]	Supported
F→L (H3)	0.321	0.320	0.044	7.295	<0.001	[0.234, 0.407]	Supported
S→O (H5)	0.418	0.417	0.040	10.450	<0.001	[0.337, 0.491]	Supported
O→L (H6)	0.284	0.283	0.045	6.311	<0.001	[0.197, 0.369]	Supported
R→F	−0.171	−0.170	0.041	4.171	<0.001	[−0.251, −0.091]	Significant
S×R→F (H8)	−0.146	−0.145	0.041	3.561	<0.001	[−0.224, −0.067]	Supported
Sex→L	0.034	0.034	0.044	0.773	0.440	[−0.052, 0.120]	Non-significant
Age→L	0.052	0.051	0.044	1.182	0.237	[−0.034, 0.138]	Non-significant
Education→L	−0.041	−0.040	0.043	0.953	0.341	[−0.125, 0.043]	Non-significant
Organisational tenure→L	0.089	0.088	0.043	2.070	0.039	[0.005, 0.173]	Significant
Firm size→L	0.061	0.060	0.043	1.419	0.156	[−0.023, 0.145]	Non-significant
Manufacturing→L	−0.028	−0.028	0.042	0.667	0.505	[−0.110, 0.054]	Non-significant
Eastern region→L	0.037	0.037	0.041	0.902	0.367	[−0.043, 0.117]	Non-significant

Note: S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. An arrow (→) denotes a tested directional path, × denotes an interaction, and H denotes a hypothesis. O = original sample; M = sample mean. Bootstrap statistics are based on 5,000 two-tailed resamples. Categorical control variables were dummy-coded.

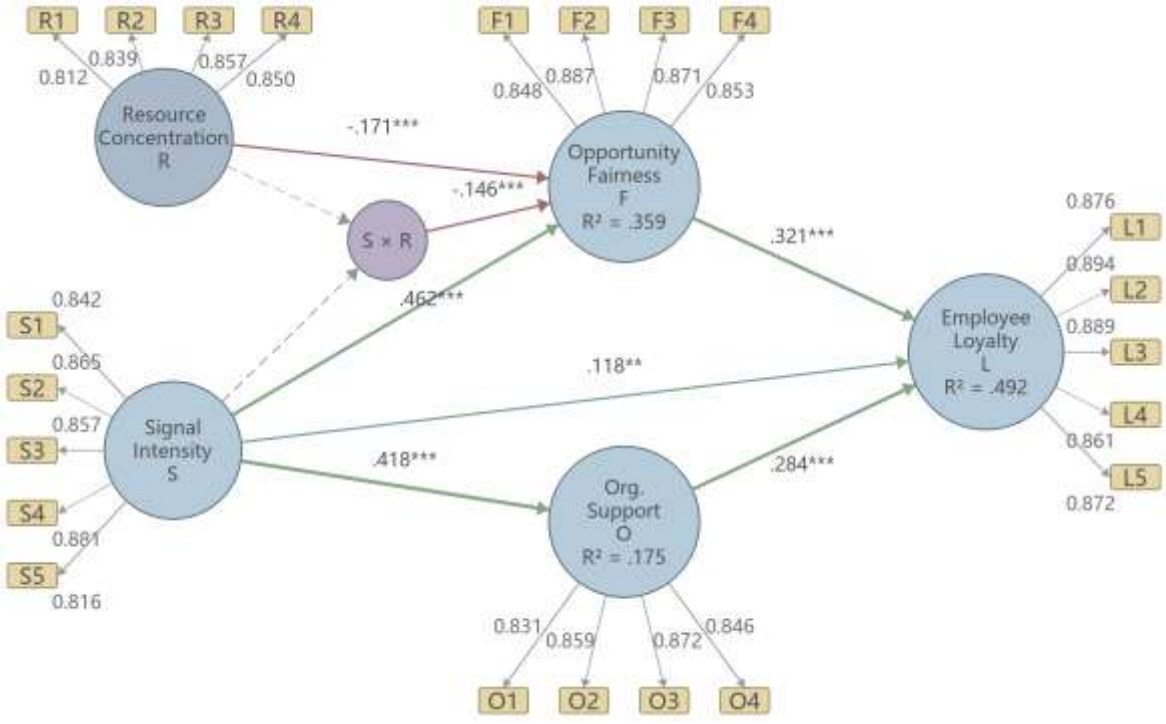


Figure 5: SmartPLS 4 Algorithm Results: Outer Loadings, Path Coefficients, and R^2

Source: Prepared by the authors from the data analysed in this study, following the standard SmartPLS 4 graphical reporting style. Control variables are omitted to preserve visual clarity.

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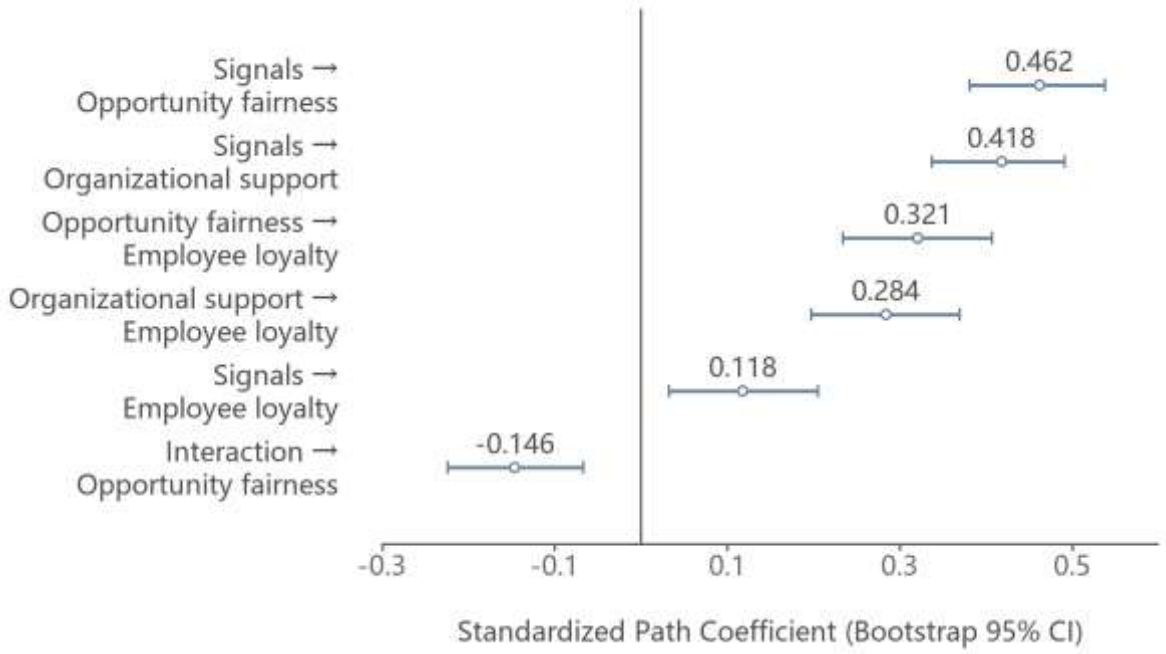


Figure 6: Bootstrap Confidence Intervals for the Key Direct Effects

Source: Prepared by the authors from the data analysed in this study. Horizontal lines represent 95% confidence intervals.

4.5 Testing the Parallel Mediation Effects

The bootstrap estimates of the indirect effects were S→F→L = 0.148 and S→O→L = 0.119. Neither of the 95% confidence intervals included zero, supporting H4 and H7. The total indirect effect was 0.267, accounting for 69.4% of the total effect of 0.385 and indicating complementary partial mediation (**Table 16** and **Figure 7**) (Hair et al., 2019; Hair et al., 2022).

The two indirect effects and the total effect were calculated using **Eqs. (14)-(16)**; the error bars in Figure 7 represent the 95% CIs.

$$IE_F = a_1 b_1 = 0.462 \times 0.321 = 0.148 \quad (14)$$

$$IE_O = a_2 b_2 = 0.418 \times 0.284 = 0.119 \quad (15)$$

$$TE = c' + IE_F + IE_O = 0.118 + 0.148 + 0.119 = 0.385 \quad (16)$$

The pathways through perceived fairness of promotion opportunities and perceived organisational support accounted for 38.4% and 30.9% of the total effect, respectively. Their point estimates differed by 0.029, but no test of the difference between the two effects was conducted; no inference is therefore made as to whether one was significantly stronger than the other.

The finding that 69.4% of the effect was transmitted through the two mediators suggests that talent governance in private firms cannot be reduced to a single incentive instrument. The fairness pathway concerns whether rank-and-file employees are eligible to compete, whether assessments are applied consistently and whether outcomes can be explained. The support pathway concerns whether the firm is prepared to invest in training, empowerment and developmental resources. The former reduces uncertainty about the rules, whereas the latter engenders a reciprocal obligation. The significance of both pathways indicates that open competition without substantive development, or training benefits without access to meaningful positions, is unlikely to translate fully into loyalty (Cropanzano & Mitchell, 2005; Kraimer et al., 2011; Rhoades & Eisenberger, 2002).

Table 16: Bootstrap Tests of the Parallel Mediation Effects

Effect path	Effect	SD	t statistic	p value	95% CI	Share of total effect
S→F→L (H4)	0.148	0.023	6.435	<0.001	[0.106, 0.196]	38.4%
S→O→L (H7)	0.119	0.022	5.409	<0.001	[0.081, 0.166]	30.9%
Total indirect effect	0.267	0.033	8.091	<0.001	[0.203, 0.334]	69.4%
Direct effect	0.118	0.044	2.682	0.008	[0.032, 0.205]	30.6%
Total effect	0.385	0.034	11.324	<0.001	[0.318, 0.452]	100.0%

Note: S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. An arrow (→) denotes a tested directional path and H denotes a hypothesis. Percentages represent each effect as a share of the total effect (effect / total effect). Both indirect effects and the direct effect were significant and in the same direction, indicating complementary partial mediation.

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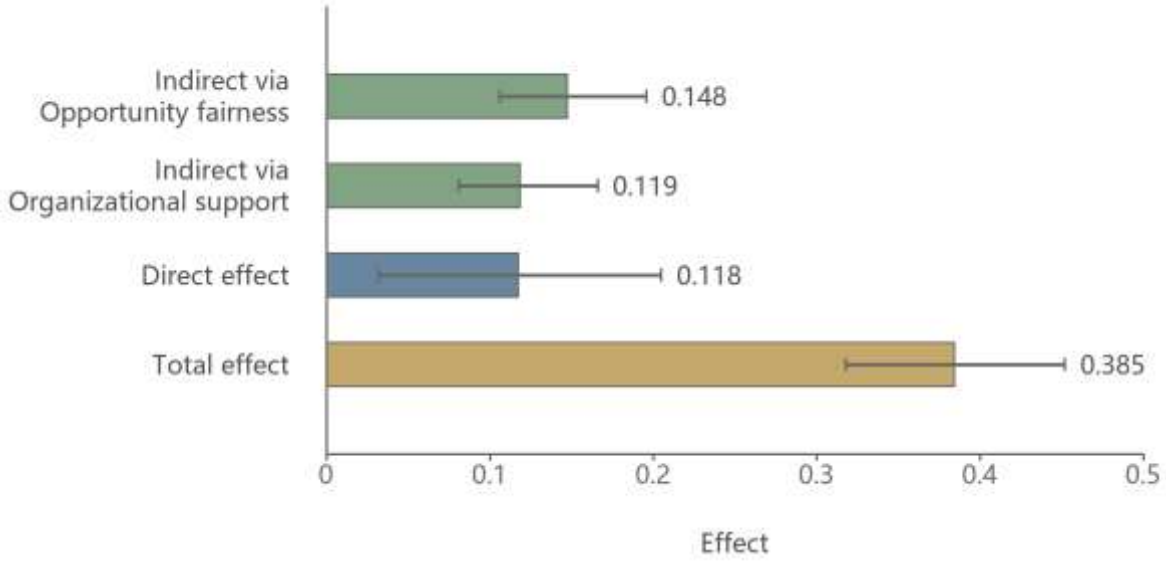


Figure 7: Decomposition of the Effects of Upward Career-Development Signals on Employee Loyalty

4.6 Moderating and Moderated Mediation Effects of Perceived Resource Concentration

The interaction term S×R→F was negative and significant ($\beta = -0.146$, $p < 0.001$), supporting H8. The unstandardised coefficient was $b_3 = -0.087$. At low, mean and high levels of R, the simple slopes for S→F were 0.548, 0.461 and 0.374, respectively (**Table 17** and **Figure 8**).

The conditional slopes were calculated using **Eq. (17)**.

$$\partial F/\partial S = b_1 + b_3 R = 0.461 - 0.087R \quad (17)$$

The corresponding conditional indirect effects were 0.176, 0.148 and 0.120. The index of moderated mediation was −0.028, with a 95% CI of [−0.050, −0.010], supporting H9. The conditional indirect effect and index of moderated mediation were calculated using **Eqs. (18) and (19)**, respectively.

$$IE_F(R) = (b_1 + b_3 R) b_F \rightarrow L \quad (18)$$

$$Index_MM = b_3 b_F \rightarrow L = -0.087 \times 0.322 = -0.028 \quad (19)$$

As perceived resource concentration increased from low to high, the indirect effect through fairness declined by 31.8%. This finding indicates that whether communicated information translates into perceptions of fairness depends on whether formal rules constrain the actual allocation of resources.

Although the f^2 of the moderating effect was small, it revealed an institutionally meaningful boundary: developmental information of the same intensity did not produce equivalent effects under different resource-governance conditions. When employees expect a small number of individuals to be able to overturn the final decision without explanation, published standards are likely to be regarded as procedural window-dressing. By contrast, concentrated decision-making need not conflict with opportunity fairness when scoring, recusal, feedback and review procedures constrain discretion. The concern here is therefore not whether resources are concentrated, but whether concentrated authority is bounded by observable procedures (Farh et al., 2007; Gan et al., 2026).

The simple slope remained significant under high perceived resource concentration, suggesting that upward career-development signals did not cease to function; rather, their marginal effect weakened. Firms should not respond by communicating less, but by making their signals more verifiable. Publishing eligibility criteria is only a first step: firms should also disclose the candidate pool, assessment criteria, exceptional circumstances and reasons for the final decision, while enabling employees to obtain feedback on how they can improve. These measures can reduce the likelihood that formal procedures are interpreted merely as a veneer for decisions already made by an inner circle.

Figure 8 shows that the slope became flatter as R increased, consistent with the negative interaction coefficient.

Rather than discrediting concentrated governance per se, this finding indicates that positions, projects and training related to employee development should be allocated through procedures whose operation can be explained and reviewed.

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Corresponding Author: Liu Qiaoran*

Table 17: Moderating Effect, Simple Slopes and Moderated Mediation Test

Statistic	Estimate	SD	t	p	95% CI	Collinearity and effect-size statistics	Conclusion
S×R→F (standardised, Hypothesis 8)	−0.146	0.041	3.561	<0.001	[−0.224, −0.067]	VIF=1.11; f^2=0.034	Supported
Unstandardised interaction coefficient (b_3)	−0.087	0.026	3.346	0.001	[−0.137, −0.036]	-	Significant
Simple slope at low perceived resource concentration (-1 standard deviation)	0.548	0.055	9.964	<0.001	[0.440, 0.656]	-	Significant
Simple slope at mean perceived resource concentration	0.461	0.047	9.809	<0.001	[0.369, 0.553]	-	Significant
Simple slope at high perceived resource concentration (+1 standard deviation)	0.374	0.057	6.561	<0.001	[0.262, 0.486]	-	Significant
Conditional indirect effect at low perceived resource concentration	0.176	0.027	6.519	<0.001	[0.125, 0.231]	-	Significant
Conditional indirect effect at mean perceived resource concentration	0.148	0.023	6.435	<0.001	[0.106, 0.196]	-	Significant
Conditional indirect effect at high perceived resource concentration	0.120	0.024	5.000	<0.001	[0.076, 0.171]	-	Significant
Index of moderated mediation (H9)	−0.028	0.010	2.800	0.005	[−0.050, −0.010]	-	Supported

Note: S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. An arrow (→) denotes a tested directional path and × denotes an interaction. b_3 = unstandardised interaction coefficient; VIF = variance inflation factor; and f^2 = effect size. The standardised interaction coefficient was used for comparisons across paths; b_3 was used to calculate the simple slopes and the index of moderated mediation.

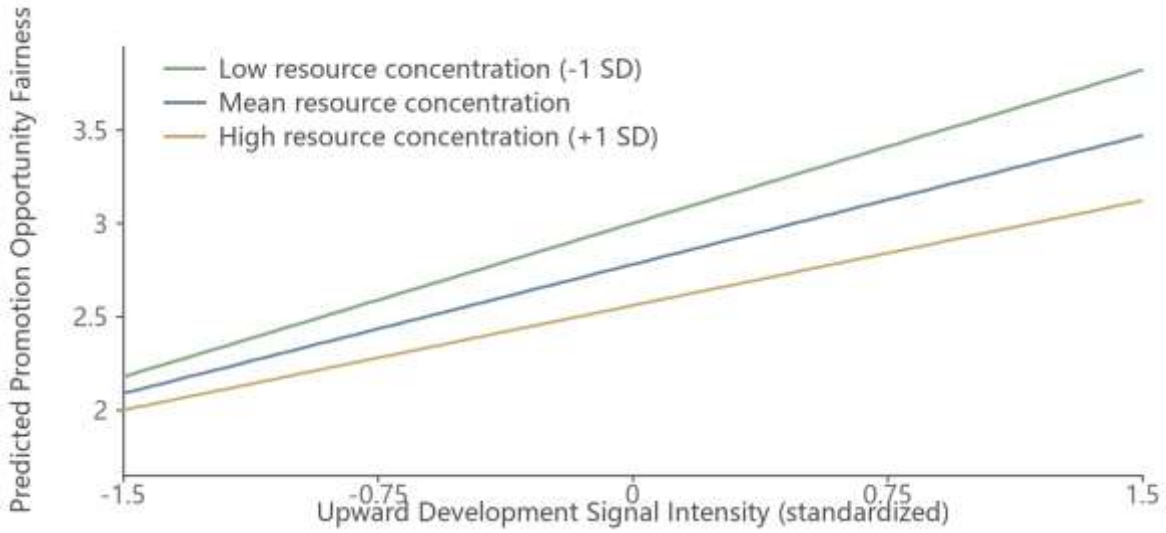


Figure 8: Simple Slopes for Perceived Resource Concentration

Source: Prepared by the authors from the data analysed in this study. All control variables were held at their sample means.

4.7 Measurement Invariance, Robustness and Heterogeneity Analyses

Firms with no more than 199 employees and those with at least 200 employees were classified into the small and micro-enterprise group (n = 231) and the medium and large-enterprise group (n = 255), respectively. The MICOM procedure based on 5,000 permutations supported full measurement invariance (Henseler et al., 2016) (**Table 18**).

Table 18: Measurement Invariance of Composites (MICOM) Test across Firm-Size Groups

Construct	Configural invariance	Compositional-invariance value (c)	5th percentile of the permutation distribution	Compositional invariance	Difference in means and 95% permutation confidence interval	Difference in variances and 95% permutation confidence interval	Conclusion
S	Yes	0.998	0.982	Yes	0.041 [−0.112, 0.119]	0.063 [−0.168, 0.181]	Full measurement invariance

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F	Yes	0.997	0.979	Yes	−0.052 [−0.128, 0.111]	0.071 [−0.192, 0.205]	Full measurement invariance
O	Yes	0.999	0.984	Yes	0.036 [−0.105, 0.123]	−0.048 [−0.177, 0.184]	Full measurement invariance
R	Yes	0.996	0.978	Yes	−0.061 [−0.132, 0.115]	0.082 [−0.209, 0.218]	Full measurement invariance
L	Yes	0.998	0.981	Yes	0.029 [−0.118, 0.109]	−0.054 [−0.185, 0.191]	Full measurement invariance

Note: S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. c = compositional-invariance value. The indicators, algorithm settings and data treatment were identical in Step 1. In Step 2, every value of c exceeded its 5th percentile. In Step 3, all differences in means and variances fell within their permutation confidence intervals. Full measurement invariance was therefore established.

$$\Delta\beta_S\rightarrow F = \beta_medium/large - \beta_micro/small = 0.517 - 0.392 = 0.125 \quad (20)$$

Once comparability had been established, the S→F coefficient was 0.125 higher in the medium and large-enterprise group than in the small and micro-enterprise group (permutation p = 0.038; PLS-MGA p = 0.041). The coefficient difference was calculated using **Eq. (20)**. None of the other core path differences was significant (Sarstedt et al., 2011).

For the alternative outcome, the coefficient for S→intention to stay and recommend was 0.126. The core coefficients changed by less than 0.03 as the control variables were added sequentially, supporting the robustness of the results (**Table 19** and **Figure 9**).

Medium and large private firms have richer job hierarchies and internal labour markets. Small and micro-enterprises can broaden the range of upward career-development signals that can be fulfilled by using professional grades, project responsibilities and skills certification.

The heterogeneity by firm size further suggests that the appropriate vehicle for upward career-development signals should vary with organisational structure. Medium and large firms can make opportunities more visible through job families, internal talent markets and cross-departmental competition. Small and micro-enterprises have fewer hierarchical levels and should not attempt to replicate elaborate promotion systems; instead, they can create non-positional development pathways through professional grades, project authority, client responsibility, skills certification and gainsharing. Neither the alternative outcome nor the control-variable tests altered the main conclusions. The observed difference is therefore more likely to reflect how organisational structures accommodate development opportunities than the particular wording of the loyalty scale (Cao & Gan, 2026b; Sarstedt et al., 2011).

Table 19: Robustness Tests and Multi-Group Analysis by Firm Size

Test	Path or indicator item	Small and micro-enterprise estimate	Medium and large-enterprise estimate	Coefficient difference	Permutation-test p value	PLS-MGA p value	Conclusion
Alternative outcome	S→intention to stay and recommend	Overall standardised coefficient = 0.126	95% confidence interval = [0.058, 0.194]	Absolute difference from the main-model direct effect = 0.008	<0.001	-	Consistent direction
Multi-group analysis	S→F	0.392	0.517	0.125	0.038	0.041	Significant difference
Multi-group analysis	S→O	0.401	0.434	0.033	0.521	0.508	Non-significant
Multi-group analysis	F→L	0.340	0.309	−0.031	0.614	0.628	Non-significant
Multi-group analysis	O→L	0.277	0.296	0.019	0.701	0.688	Non-significant
Multi-group analysis	S→L	0.129	0.109	−0.020	0.743	0.731	Non-significant
Multi-group analysis	R→F	−0.184	−0.163	0.021	0.688	0.672	Non-significant
Multi-group analysis	S×R→F	−0.158	−0.139	0.019	0.721	0.706	Non-significant

Note: S = upward career-development signals; F = perceived fairness of promotion opportunities; O = perceived organisational support; R = perceived resource concentration; and L = employee loyalty. MGA = multi-group analysis; PLS-MGA = partial least squares multi-group analysis; β = standardised coefficient; and Δβ = difference in standardised coefficients. In the MGA, n = 231 for the small and micro-enterprise group and n = 255 for the medium and large-enterprise group. Between-group coefficient differences were calculated as medium and large enterprises - small and micro-enterprises. For the alternative-outcome row, the displayed coefficient and confidence interval are overall results rather than group-specific estimates.

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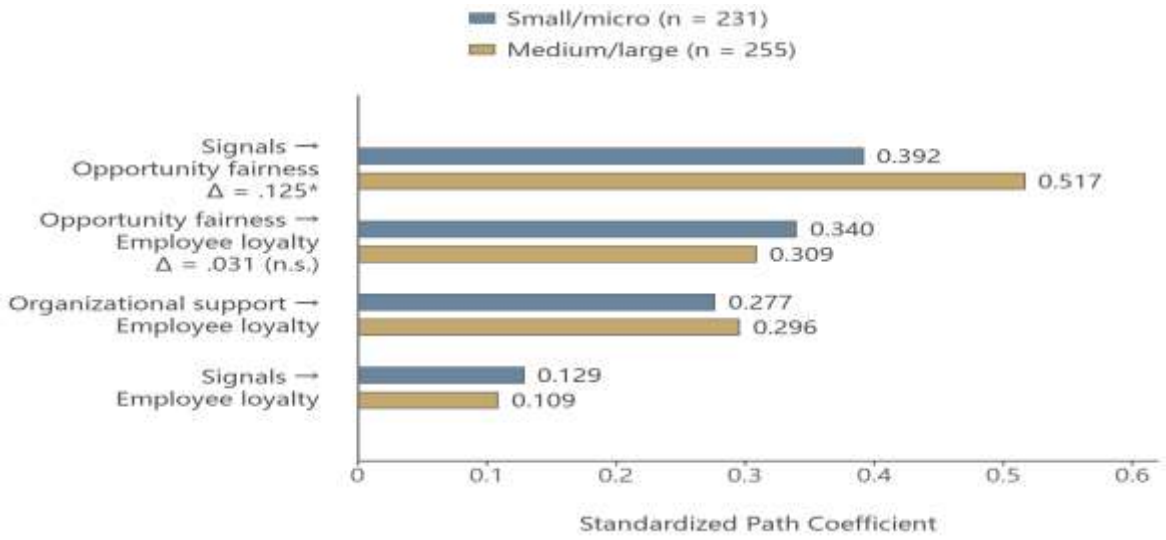


Figure 9: Comparison of Key Paths across Firm Sizes

Source: Prepared by the authors from the data analysed in this study. An asterisk denotes $p < 0.05$; n.s. denotes non-significance.

5. DISCUSSION, THEORETICAL CONTRIBUTIONS AND MANAGERIAL IMPLICATIONS

5.1 Discussion of the Findings

The results show that developmental information must first be translated into perceived fairness of promotion opportunities and perceived organisational support before it can engender stronger loyalty. This mechanism accords with research on social exchange, organisational support and career growth, as well as work examining the cultural boundary conditions of these relationships in China (Cohen-Charash & Spector, 2001; Colquitt, 2001; Cropanzano & Mitchell, 2005; Eisenberger et al., 1986; Farh et al., 2007; Kraimer et al., 2011; Kurtessis et al., 2017; Rhoades & Eisenberger, 2002; Sturges et al., 2002; Weng et al., 2010). The attenuating effect of perceived resource concentration further shows that employees are concerned with whether formal rules can constrain the actual allocation of resources.

First, the findings conceptualise employee loyalty as an assessment of the future exchange relationship rather than an immediate response to current remuneration. Upward career-development signals enable employees to assess whether their individual effort can yield sustained returns within the organisation. When opportunity rules are clear and the organisation is prepared to invest in developmental resources, employees are more likely to view their current contribution as an investment in a long-term relationship. This interpretation accords with research on career growth, career management and organisational commitment, and helps explain why a one-off pay rise may improve short-term satisfaction but cannot substitute for a credible development pathway (Meyer et al., 2002; Sturges et al., 2002; Weng et al., 2010).

Second, the two mediating pathways show that loyalty is not generated by any single human resource policy in isolation; it depends on consistency across related organisational practices. If vacancies are advertised but candidates continue to be chosen through undisclosed nominations, inconsistency in implementation will negate the clarity of the information. Likewise, if a firm provides training but affords trained employees no opportunity to assume greater responsibility, its investment in support will do little to create an expectation of career returns. Conversely, when eligibility criteria, developmental resources, project authority and outcome feedback corroborate one another, each observable action adds to the credibility of the signal. The pertinent question thus shifts from whether a promotion system exists to whether its constituent arrangements jointly create a verifiable commitment. For private firms, this lies closer to the heart of loyalty governance than simply communicating more frequently.

Third, perceived resource concentration helps to explain why employees in Chinese private firms may remain sceptical even after a policy has been issued. Employees do not merely read policy documents; they also observe how exceptions are handled, who ultimately receives critical positions and whether subsequent actions substantiate earlier promises. Lower loyalty is therefore not simply a consequence of small firm size or concentrated ownership. It arises when employees cannot ascertain whether formal rules will influence actual allocation decisions. This finding extends concerns about security, compliance and organisational attractiveness at the job-search stage to post-entry perceptions of fairness and support, and ultimately to sustained loyalty (Cao & Gan, 2026a; Farh et al., 2007; Gan et al., 2026).

5.2 Research Contributions and Theoretical Advances

This study contributes by bringing the credibility of developmental information, its operating mechanisms, governance boundary conditions and predictive value into a single framework, rather than simply reconfirming the association between promotion opportunities and loyalty. The four contributions are detailed below.

5.2.1 Conceptual Contribution: From Promotion Systems to Developmental Signals

Previous research has generally described employee development in terms of career growth, career management or organisational support. This study introduces upward career-development signalling strength, with an emphasis on clarity, consistency, accessibility and verifiability. The construct distinguishes between a firm having a system and employees believing that the system will have consequences: identical promotion policies may send signals of different strength when their implementation records differ. The focus thus moves beyond the objective number of opportunities to how employees form actionable expectations about the future under information asymmetry, extending the application of signalling theory to internal talent governance (Connelly et al., 2011; Spence, 1973).

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5.2.2 Mechanism Contribution: Parallel Pathways through Rules and Relationships

By incorporating both perceived fairness of promotion opportunities and perceived organisational support, this study shows that upward career-development signals convey meanings about both rules and relationships. The fairness pathway captures employees' need to ascertain the terms of entry into competition, the assessment criteria and the reasons for decisions. The support pathway captures whether employees believe that the firm is willing to invest resources in their long-term development. The parallel model avoids subsuming these mechanisms within a generic positive attitude, while the decomposition of effects shows that together they account for most of the relationship. It thereby connects research on organisational justice, social exchange and career development (Colquitt, 2001; Cropanzano & Mitchell, 2005; Eisenberger et al., 1986; Kraimer et al., 2011).

5.2.3 Boundary Contribution: Signal Discounting under Resource Concentration

Rather than treating concentrated ownership or founder control as intrinsically deficient governance, this study uses employees' perceived resource concentration to explain when signals are discounted. The moderation and moderated mediation results show that the critical issue is not concentration itself, but whether employees believe that formal rules can constrain the ultimate allocation of critical organisational resources. This formulation translates a macro-level governance characteristic into a micro-level psychological mechanism and provides a testable boundary condition for explaining why private firms with similar ownership structures may exhibit different levels of employee loyalty (Cao & Gan, 2026b; Farh et al., 2007).

5.2.4 Methodological Contribution: Integrating Explanatory and Predictive Power

Methodologically, the study reports indicator quality, discriminant validity, structural effects, out-of-sample prediction, measurement invariance and multi-group differences sequentially within a single PLS-SEM framework. PLSpredict and CVPAT avoid judging a model solely by significant paths and R^2, whilst MICOM ensures that comparisons between firm-size groups rest on comparable constructs. Together, these procedures allow the findings to address both whether the proposed mechanism holds and whether the model has predictive value, thereby enhancing the reproducibility and practical relevance of research on employee loyalty in private firms (Hair et al., 2019; Hair et al., 2022; Henseler et al., 2016; Sharma et al., 2023; Shmueli et al., 2019).

This methodological combination also creates a chain of evidence from measurement to application. Reliability and validity establish that the measures are sound; path and indirect-effect tests assess the theoretical mechanism; the interaction term and multi-group comparisons identify boundary conditions; and out-of-sample prediction then determines whether the model outperforms a benchmark. Each component answers a distinct question, and no single significant result can substitute for an integrated assessment. Such disclosure is particularly important in applied research because managers need to know not only that variables are related, but also whether the conclusions are robust, comparable across groups and capable of providing a meaningful predictive gain.

5.3 Talent-Governance Recommendations for Chinese Private Firms

First, firms should establish a career-development register that rank-and-file employees can readily consult. It should regularly report job families, eligibility criteria, vacancies, project-selection procedures, training opportunities and feedback, so that organisational promises become observable and verifiable commitments (Cao & Gan, 2026a; Connelly et al., 2011; Gan et al., 2026; Kraimer et al., 2011; Spence, 1973; Weng et al., 2010).

econd, firms should introduce minimum procedural safeguards where resources are concentrated. They may retain authority over strategic decisions, but developmental resources should be governed by cross-departmental review, scoring, recusal, written feedback and a limited appeal mechanism to strengthen procedural fairness and managerial credibility (Cao & Gan, 2026b; Cohen-Charash & Spector, 2001; Colquitt, 2001; Farh et al., 2007).

Third, employees who are not promoted should be offered alternative routes, such as professional grades, project leadership, job rotation, mentor status and skills certification. These routes enable small and micro-enterprises with few formal positions to continue sending upward career-development signals that can be fulfilled (Cao & Gan, 2026b; Kraimer et al., 2011; Sturges et al., 2002; Weng et al., 2010).

As an implementation sequence, firms could begin with pilot departments in which staffing requirements are stable and performance criteria reasonably clear. They should record six stages over time: vacancy announcement, application, shortlisting, assessment, communication of the outcome and subsequent development. Changes in employee perceptions can then be reviewed alongside internal mobility, absence and turnover data. A pilot should not be judged solely by the final number of promotions. Evaluation should also cover the proportion of rank-and-file employees eligible to apply, the coverage of feedback, the proportion of exceptional decisions accompanied by an explanation and the fulfilment rate for promised development resources. This approach avoids equating institutional reform with an increase in the number of positions and enables firms with limited hierarchies to send credible upward career-development signals through project responsibility, professional grades and skills development.

These measures should operate as an integrated cycle rather than as isolated initiatives. Firms should first publish opportunities and standards, retain records of assessments and exceptions, provide unsuccessful candidates with actionable feedback and periodically examine the proportion of rank-and-file employees admitted to critical projects and training. Management should also compare signalling perceptions across departments, lengths of service and firm sizes, prioritising units in which low perceived fairness coincides with high perceived resource concentration.

5.4 Limitations and Future Research

A cross-sectional questionnaire cannot rule out reverse causality or common method bias (Podsakoff et al., 2003). Future research could use a three-wave design, matched supervisor-employee data or a quasi-experiment based on an institutional change, supplemented with records of actual promotions and turnover.

Perceived resource concentration has not yet been disaggregated into the concentration of ownership, decision-making, information and relational networks. Future studies should combine governance data, human resource policy documents and interviews to identify the conditions under which these forms of concentration arise (Cao & Gan, 2026b; Farh et al., 2007).

In addition, employee loyalty encompasses attitudes and behavioural intentions and cannot substitute for records of actual turnover, promotion or performance. Future studies could link survey responses to human resource records to test whether upward career-development signals predict

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subsequent promotion applications, internal mobility and actual departures, and compare the paths across family firms, entrepreneurial firms and firms governed by professional managers.

6: CONCLUSION

This study examined the direct, parallel mediation and moderated mediation mechanisms through which upward career-development signalling strength affects employee loyalty. The results show that clear, stable, accessible and verifiable upward career-development signals strengthen loyalty primarily by increasing perceived fairness of promotion opportunities and perceived organisational support. The greater the perceived resource concentration, the weaker the effect of the signals on opportunity fairness. Private firms should make job criteria, project-authority arrangements, internal competition, feedback and appeal procedures into consistent, repeatedly observable organisational practices, enabling rank-and-file employees to see how effort is converted into developmental returns.

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Corresponding Author: Liu Qiaoran*

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Appendix A Formal Survey Questionnaire on Upward Career Development and Employee Loyalty in Private Enterprises

Dear participant, this questionnaire examines how employees of private enterprises perceive opportunities for upward career development, organisational support and their intention to remain. Please answer each item with reference to your actual experience during the past 12 months. The questionnaire is intended solely for academic research, and anonymous completion is recommended. There are no right or wrong answers. For each item, select a response from 1 to 5: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree. Before the questionnaire is administered, approval should be obtained from the relevant institutional ethics body, or informed consent should be secured from the participating firms and respondents. Any information that could identify an individual or a firm should be removed. The core questionnaire items are reported in **Table A1**.

Table A1: Core Survey Items

Dimension	Item code	Item (1 = strongly disagree, 5 = strongly agree)
Upward career-development signals	S1	The company clearly explains the qualifications and developmental requirements for different positions or levels.
	S2	I receive timely information about internal positions, project-leadership roles or promotion opportunities.
	S3	Different departments and managers interpret employee-development standards in broadly consistent ways.
	S4	The company's commitments concerning development or promotion are usually borne out by subsequent arrangements.
	S5	Even if I have not yet received an opportunity, I am given clear feedback on how I can improve.
Perceived fairness of promotion opportunities	F1	Rank-and-file employees can compete for important positions or project opportunities on the basis of published criteria.
	F2	The company applies reasonably consistent assessment criteria when selecting candidates for promotion or project-leadership roles.
	F3	I can understand the main reasons for the company's decisions about promotions or appointments to important positions.
	F4	When I have questions about how development opportunities are allocated, an appropriate channel is available through which I can express my views.
Perceived organisational support	O1	The company values my prospects for long-term growth within the firm.
	O2	The company is willing to provide resources or opportunities that enable me to develop higher-level capabilities.
	O3	When I wish to take on more challenging work, the company provides reasonable support.
	O4	The company regards employee development as an area requiring sustained investment.
Perceived resource concentration	R1	I feel that critical projects, budgets or development opportunities are controlled mainly by a small number of core individuals.
	R2	Rank-and-file employees generally find it difficult to understand or influence how important resources are allocated.
	R3	Employees outside the inner circle find it difficult to obtain developmental resources commensurate with their capabilities.
	R4	I feel that personal connections exert a marked influence on who receives certain important development opportunities.
Employee loyalty	L1	Where circumstances permit, I am willing to continue working for my current firm.
	L2	I would recommend this firm to suitable friends as a place to work.
	L3	I am willing to protect the firm's reputation among customers, colleagues and people outside the organisation.
	L4	When the firm encounters difficulties or faces urgent tasks, I am willing to make an extra effort.
	L5	Even if other job opportunities arise, I would give serious consideration to remaining with this firm.

Note: S, F, O, R and L identify the five constructs listed in the first column; the numeral identifies the item within the construct.

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Corresponding Author: Liu Qiaoran*