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Multilevel Analysis of Employee Satisfaction on Commitment to Organizational Culture: Case Study of Chinese State-Owned Enterprises

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Abstract: This study analyzes the effects of employee satisfaction and demographic indicators on employee commitment to organizational culture at the enterprise level. With data from a survey of 3029 employees from 27 state-owned enterprises (SOEs), a hierarchical linear model (HLM) is used to identify the influencing factors of employee commitment to organizational culture at the enterprise level. An empirical study indicates that apart from the factors of employee satisfaction and demographic background, four contextual variables of enterprises, namely, comprehensive management, energy intensity, cost-income ratio, and capacity-load ratio, also influence commitment to organizational culture levels. Results show that applying HLM can substantially improve the explanatory power of employee satisfaction factors on commitment to organizational culture using nested enterprise contextual variables. Although measurement scales and satisfaction models have been proposed over the years, only a few studies have addressed the particular nature inherent in Chinese SOEs. HLM, which accounts for the nested data structure and determines the effects of employee satisfaction factors on commitment to organizational culture without bias, is developed in this study. Through an insider view based on empirical work, this research can improve the ability of senior managers to understand the culture and dynamics of organizations, to deliver strong leadership, and to enhance corporate internal management.

Keywords: employee satisfaction; commitment to organizational culture; enterprise contextual factors; hierarchical linear model

1. Introduction

State-owned enterprises (SOEs) play a significant role in China's economy because they are critical to the functioning of a considerable segment of the industry. SOEs are among the largest employers in China. Therefore, achieving balance between employee satisfaction and commitment to organizational culture is a matter of concern, and the relationship between the influence of enterprise contextual factors and the subjective perception of employees is a challenging theoretical research issue.

Employee satisfaction is a subjective value judgment, a psychological perception, or an attitude toward an enterprise. Eschleman and Bowling determined that affective disposition is positively associated with well being and can predict job satisfaction [1]. Hahn et al. proved that their results support an interactionist view of job satisfaction given that the situational and dispositional determinants of job satisfaction are relevant [2]. However, there exist few studies that are focused on the cases of China revealed contradictory results on the effects of employee satisfaction on enterprise management [3–5]. Tso et al. has pointed out in the study that the related research based on China's

background is very limited [5]. Moreover, tracing the historical literature review are also the result of over 10 years ago [3,6]. In 2000, the mode of the state-owned enterprises in China was quite different from the present.

Organizational culture refers to the behavior of managers and employees and the meanings that people attach to such behavior [7]. Organizational culture is an abstract, sensitive, and complex phenomenon that researchers continuously struggle to understand [7]. Debates over the definition of organizational culture (i.e., whether it should be assessed by using only qualitative methods) and the extent to which culture influences corporate management [7,8] continue. Two general definitions of organizational culture have been proposed in the literature. First, it represents a set of cognitions shared by members of a social unit [9]. Second, it is a system of shared values and beliefs that produces norms of behavior and establishes an organizational way of life [10]. Thus, organizational culture affects the manner in which employees interact with one another and with other stakeholders.

The current study takes an insider view through a field study and examines the influences of the employees' satisfaction factors on their commitment to organizational culture, which may enhance corporate internal management [5,11].

This study contributes to the literature by investigating the relationships between employee satisfaction factors and employee commitment to organizational culture in different Chinese SOEs. Based on the data from Tso's survey on employee satisfaction and organizational culture develops a model that represents the relationship between employee satisfaction and their commitment to organizational culture [5]. Data are obtained from different enterprises, we therefore, this paper develop a hierarchical linear model (HLM) to account for the nested data structure within the enterprises.

This research aims to analyze the effects of the satisfaction factors of employees on their commitment to organizational culture at the enterprise level via a multilevel study, taking into account various enterprise contextual factors. This empirical work aims to improve the ability of senior managers to understand the culture and dynamics of organizations, to enhance the management and efficiency of enterprises, and to make valuable suggestions.

Tso et al. designed a survey to obtain a sample, which consists of 3029 employees from 27 SOEs that are located in 8 provinces or municipalities in China via proportionate stratified random sampling [5]. A novel customized employee satisfaction scale with 29 items was used to analyze Chinese SOEs, with each item rated using a five-point Likert-type scale ranging from 1 (strongly disagree/very dissatisfied) to 5 (strongly agree/very satisfied). The items were attributed to the culture satisfaction, job satisfaction, management satisfaction, and welfare satisfaction of the enterprises using exploratory factor analysis.

On the basis of Tso's survey, employee commitment to organizational culture is measured using three indicators, namely, cognition of organizational culture, participation in organizational culture, and identity toward organizational culture, with each item rated using a five-point Likert-type scale. These indicators represent employee perception of the organizational culture [5,7,8]. An internal consistency test showed that employee satisfaction factors and commitment to organizational culture exhibit high reliability and validity. A questionnaire was used to obtain the demographic information including age and gender of the respondents.

The following research questions regarding corporate contextual factors are derived:

(1) How do employee satisfaction factors affect commitment to organizational culture in the context of SOEs?
(2) What effects will corporate contextual factors based on different enterprises have on employee satisfaction factors?
(3) Which contextual factors are the most significant? The approach for dealing with these factors may capture the attention of the management team.

2. Literature Review

2.1. Employee Satisfaction Factors and Commitment to Organizational Culture

Over the years, numerous empirical studies have been conducted to identify the relationship between employee satisfaction factors and commitment to organizational culture. Social exchange theory posits that human relationships are formed by the use of a subjective cost-benefit analysis and the comparison of alternatives. It is also used quite frequently in the business world to imply a two-sided, mutually contingent and rewarding process involving transactions or simply exchange [12,13]. In enterprises, employers and employees also belong to this relationship.

Many studies have shown that job satisfaction influences employee commitment to organizational culture. Yao and Wang concerned organizational outcomes of normative commitment in Chinese companies, examined the relationship among employee job satisfaction, in-role performance, and organizational behaviour [14]. Strauss et al. claimed that a high level of satisfaction can sustain proactivity [15]. The increasing focus on attitude toward work is linked to the belief that the degree of employee satisfaction is related to various aspects of job behavior, such as productivity, absenteeism, and turnover rates [16]. Nazir et al. argued that satisfaction with extrinsic benefits, supervisor support, coworker support, autonomy, training, and participation in decision making significantly affects the affective and normative commitment of employees [17]. Johnson and McIntye reported that empowerment and involvement are most strongly related to job satisfaction [18]. Currivan [19] and Egan et al. [20] applied structural equation modeling (SEM) and found that job satisfaction is significantly related to organizational commitment. Paulin et al. also used SEM to determine that job satisfaction is strongly related to organizational commitment in customer linkage research [21]. Similarly, DeConinck and Bachmann used SEM to determine that distributive justice, job satisfaction, promotional opportunity, and seniority play important roles in determining organizational commitment [22]. Gondek and Mazur reported that job satisfaction predicts organizational commitment, communication, and perceived benefits [23]. Chong found that tactics are culturally specific in generating employee commitment [24]. Moreover, unsatisfied employees generally resort to either turnover or embittered psychological behaviors [20] depending on the positions and needs of the employee groups to which they belong.

On the other hand, the culture and environment of an organization can influence employee satisfaction and motivation. Egan et al. indicated numerous empirical studies have reported that organizational learning culture is associated with employee satisfaction and motivation to transfer learning [20]. However, interactions between organizational culture and employee satisfaction are becoming increasingly complicated and have been changing over time. For example, Bozionelos asserted that organizational trust moderates the relationship between emotion work and job satisfaction, and further indicated the importance of considering emotion work in interactions with coworkers [25]. Lee and Bin Ahmad indicated that organizational commitment is significantly associated with job satisfaction, but not with employee performance [26]. Baek-Kyoo and Sunyoung proved that organizational culture, career satisfaction, and organizational commitment are predictors of performance [27].

Many researchers have showed that workers in an innovative or supportive organizational culture are more satisfied than those in a bureaucratic organizational culture. Lund determined that job satisfaction, institution of clans, and adhocracy culture enhance job satisfaction, whereas market and hierarchy culture reduce job satisfaction [28]. Bigliardi and Galati validated the relationships between different types of organizational culture and job satisfaction among knowledge workers [29]. Cronley and Kim extended prior empirical work by testing the hypothesis that employee characteristics moderate the mediating effect of organizational culture and job satisfaction and reported that lower mean organizational culture scores are significantly associated with lower satisfaction [30]. Their results showed that workers in an innovative or supportive organizational culture are more satisfied than those in a bureaucratic organizational culture.

However, other literature show that the link between job satisfaction and commitment to organizational culture does not exist. Dougherty et al. performed ANOVA and observed a weak causal relationship between job satisfaction and commitment to organizational culture [31]. They found that the relationship observed between job satisfaction and organizational culture may be spurious because of several mixed common determinants, thereby making it statistically questionable. Lowery et al. claimed that the citizenship behavior of blue collar workers is related to satisfaction with coworkers, supervision, and pay, but not to satisfaction with opportunities for advancement, the work itself, and organizational commitment [32].

Several exploratory studies on satisfaction, organizational culture, and performance have been conducted. Hechanova et al. study to determine the relationship of empowerment with job satisfaction and performance in five different service sectors and pointed out psychological empowerment was positively correlated with both job satisfaction and performance [33]. Amato and Zijlstra specified organizational citizenship behavior as a mediator of the relationships between individual factors (psychological climate and self-efficacy) and work outcomes (quality of performance and emotional exhaustion) [34]. Yao and Wang showed that value internalization predicts higher job satisfaction and weaker turnover intentions via commitment [14]. Sanda and Kuada investigated the influencing dynamics of culture (national and organizational), employee characteristics, employee job satisfaction, and organizational commitment in determining organizational performance [11]. Bowling et al. identified situational strength as a moderator of the relationship between job satisfaction and performance [35]. Wyland et al. indicated that employers benefit from performance gains and positive attitudinal shifts that stem from facilitation experiences between roles [36].

In summary, the influences of employee satisfaction are considered important areas of organizational culture and performance. However, no consensus has been reached because of the continuous changes in the societal norms, technology, and economic structures of individual economies and countries.

2.2. HLM and Enterprise Contextual Factors

HLM is a statistical technique that was developed to incorporate the hierarchical data structure into the modeling process. HLM has received widespread acknowledgment, particularly in terms of modeling organizational culture and climate. Glisson and James applied multilevel models to examine culture and climate; they determined that the two variables vary across organizational units and are related to certain personal characteristics [37]. Glisson and Green used HLM to investigate the effects of organizational culture and climate on access to mental health care and determined that constructive culture is a significant factor in this context [38]. Zazzali et al. analyzed the relationship between organizational culture and satisfaction using HLM and observed that individual evaluation can be predicted using individual-level indicators (e.g., individual satisfaction) and group-level contextual variables (e.g., enterprise management policy, performance, or financial indicators) [39]. Seibert et al. applied HLM to identify macro and micro factors that affect employee empowerment [40]. Lau et al. investigated the effects of the institutional forces of different types of firms in China on the changing schemes in all levels of managers and workers [41]. Wei et al. examined the factors that influence job satisfaction-related organizational dynamism perception and firm performance among individuals in China [42].

3. Methodology

3.1. Conceptual Framework

A coherent conceptual framework is constructed to elaborate the theoretical relationship among employee satisfaction factors, employee commitment to organizational culture, and enterprise contextual factors, as shown in Figure 1. This relationship will be tested and verified based on empirical research.
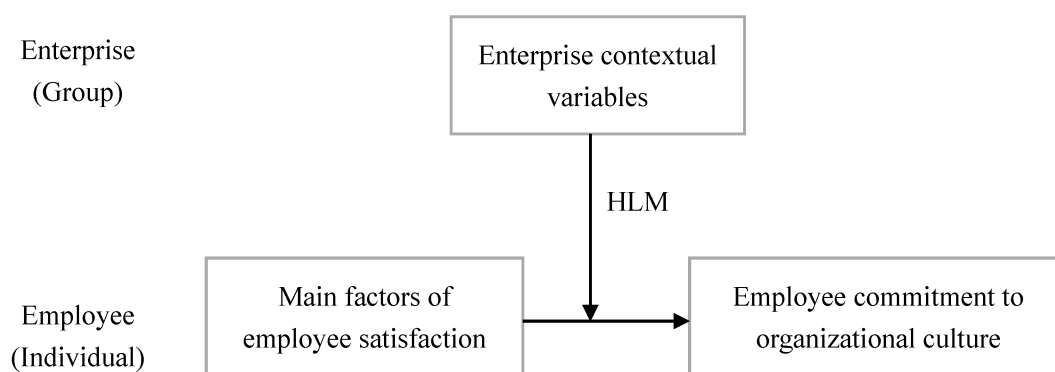
Figure 1. Conceptual framework of employee satisfaction, commitment to organizational culture, and contextual variables.

HLM is adopted because of the nature and hierarchical structure of the data. An effective model is developed to determine commitment to organizational culture (response variable), which can identify the effects of employee satisfaction factors on the response nested within enterprise contextual variables and estimate the influences of enterprise contextual variables.

3.2. Dataset and Selection of Variables

Using the raw data from Tso's survey [5], four satisfaction factors, namely, culture, job, management, and welfare satisfaction, were selected as independent variables, whereas commitment to organizational culture was selected as the response variable. Age is a categorical variable that indicates whether a respondent is below 40 years old. In Chinese SOEs, the age of 40 years old is considered a critical age because employees aged 40 years or above belong to a stable group with over 10 years of work experience and have the lowest intention to leave the company. Forty years old is also the average age of all survey samples.

Enterprise contextual variables were used to evaluate the characteristics of Level 2 enterprises with 27 sample sizes each. In the 27 sampled SOEs, several common indicators are selected as the main study variables despite certain differences in business types. These variables include aspects of operation management, production, performance, and size.

Each performance indicator reflects the effect of one aspect. Several variables are closely related, and thus, the specified model is at risk of creating multicollinearity problem. Accordingly, the principal component analysis (PCA) method was adopted to translate these variables into composite indicators that retain the original variable information as much as possible but uncorrelated to one another [43].

In summary, 15 contextual variables were selected and used as Level 2 or contextual variables including two variables obtained using PCA (Table 1). The first variable is enterprise size from eight scale indicators. The second variable is financial assets from four financial indicators. The Enterprise size variable is transformed the using natural logarithm to reduce the effect of extreme observations, and transform the nonlinear relationship of variables into linear relationship. There exist 13 other indicators that reflect organizational operation and enterprise performance.

Table 1. Summary of enterprise contextual variables.

Type	Level 2 Variables (Abbreviation)	
Comprehensive variables	Principal component 1: Enterprise size (*CorpS*)	(1) Total assets (2) Gross profit (3) Total depreciation (4) Gross payroll (5) Economic value added (6) Total output (7) Total energy consumption (8) Total employees
	Principal component 2: Enterprise assets (*CorpA*)	(1) Total assets per capita (2) Average balance of total assets per capita (3) Circulating assets per capita (4) Owner's equity per capita
Independent variables		1. Risk management (*RiskM*) 2. Comprehensive management (*CompM*) 3. Total factor productivity (*TFP*) 4. Output per capita (*OutPC*) 5. Prime operating revenue per capita (*PORPC*) 6. Quality of the staff (*QualS*) 7. Profit per capita (*ProPC*) 8. Energy consumption per capita (*EneCPC*) 9. Energy intensity (*EneInt*) 10. Cost-income ratio (*CostIR*) 11. Cost of prime business per capita (*CostPBPC*) 12. Capacity-load ratio (*CapaLR*) 13. Percentage of retirees (*PerRet*)

3.3. HLM Based on the Hierarchical Organizational Structure

The assumptions of traditional linear regression are violated if the data have inherent nesting relationships. For example, individual employees at Level 1 are inherently nested in enterprises at Level 2 (organizational level). HLM is developed to address such problem.

HLM is also a preferred method for nested data because it requires fewer assumptions that should be met than other statistical methods [44]. However, a limitation of HLM is that it requires large sample sizes for adequate power. Kreft proposed the "30/30 rule" in 1996, which indicates that researchers should strive for a sample of at least 30 groups with at least 30 individuals per group to be on the safe side [45]. Bryk and Raudenbush required at least 10 observations for each level in HLM to produce statistically reliable and valid results [46]. Two levels have been identified for the data in the present study: individual employees at Level 1 ($n = 3029$), enterprises at Level 2 ($E = 27$).

The notation adopted by Raudenbush and Bryk was used in this study [44]. As previously stated, HLM allows the simultaneous investigation of the relationship within a given hierarchical level and the relationship across levels. Two models are developed to achieve this objective. One model reflects the relationship within lower-level units, whereas the other model reflects how the relationship within lower-level units varies between units [47].

4. Results

4.1. Multiple Regression Model

Multiple regression was estimated for each enterprise using one type of employee satisfaction at a time to investigate the difference between intercepts and slopes. The intercepts and slopes among different enterprises significantly vary, thereby indicating that the relationships are influenced by contextual variables (i.e., Level 2 variables). The influences of culture, job, management, and welfare satisfaction on commitment to organizational culture differ in terms of intercepts and slopes.

The effective data analysis technique [44] for group-level properties was adopted to compare the group mean with the group means that resulted from randomly assigning individuals into constructed groups. The results show that the existence of contextual effects influences commitment to organizational culture. The analysis results indicate that significant group variations for commitment to organizational culture exist across 27 sampled enterprises, and this result cannot be explained by individual-level variables. Thus, HLM is developed and discussed in the subsequent section to explain the variance of commitment to organizational culture.

The multiple regression model was initially designed to explain commitment to organizational culture based on individual employees. This method was adopted in this study to determine the relationship between commitment to organizational culture and employee satisfaction factors, coupled with demographic information. A multivariate regression equation was constructed based on 3029 samples using commitment to organizational culture as the dependent variable, and culture, job, management, and welfare satisfaction as independent variables, along with the gender and age of the respondents.

A linear regression model was developed to identify the relationship between dependent and independent variables in Level 1. The main factor that influenced the dependent variables were identified, including culture satisfaction (*CulS*), job satisfaction (*JobS*), management satisfaction (*MgtS*), and welfare satisfaction (*WelS*). Gender and age were also considered. The statistical results show that employee satisfaction factors, age, and gender significantly influence employee commitment to organizational culture (*OrgC*), with adjusted $R^2 = 0.61$ and *F* value = 7777.46 (*p*-value < 0.01): *OrgC* = $0.37 + 0.31 \times CulS + 0.11 \times JobS + 0.39 \times MgtS + 0.12 \times WelS + 0.04 \times Gender + 0.03 \times Age$.

The regression analysis results show that the influences of culture and management satisfaction are significant, which is consistent with the findings. Thus, HLM is developed and discussed in the subsequent section to explain the variance of commitment to organizational culture.

4.2. HLM Construction

The following steps were designed to construct the two-level HLM: unconditional (null), random intercept, and random intercept and slope models.

Null (unconditional) model, is used to evaluate the effects of different organizations with null hypotheses on the groups, particularly the non-existence of significant variance in higher levels. The unconditional two-level HLM is expressed as

$$\text{Level 1 model: } \textbf{\textit{OrgC}}_{ij} = \beta_{0j} + r_{ij}$$

$$\text{Level 2 model: } \beta_{0j} = \gamma_{00} + \mu_{0j}$$

The value of $\textbf{\textit{OrgC}}_{ij}$ is attributed to three components. The first constant component γ_{00} is the total mean, the second component μ_{0j} refers to the changes between groups, and the third component r_{ij} refers to the changes within groups. The next step is to test whether the changes between μ_{0j} of the groups and within r_{ij} of the groups significantly differ from 0. If the value is 0, then $\textbf{\textit{OrgC}}_{ij}$ can be modeled using the sample mean and it is not necessary to develop a more complex model. Variance $(\textbf{\textit{OrgC}}_{ij})$ = Variance $(\mu_{0j} + r_{ij}) = \tau_{00} + \sigma^2$. This partition allows the calculation of the ratio of the between-group variance to the total variance, which is called the intraclass correlation coefficient (*ICC*). The *ICC* is one of the statistics used to measure the reliability coefficient of inter-observer reliability and test-retest reliability. Bartko proposed this reliability measure to evaluate the significance of reliability [48]. The *ICC* is calculated by dividing individual changes by total changes. The value of the *ICC* lies between 0 and 1, where 0 indicates unreliability and 1 indicates reliability. The *ICC* is a quantitative measure for evaluating the effects between groups and to reflect the variance of variables between different groups:

$$ICC = \frac{\tau_{00}}{\tau_{00} + \sigma^2} = \frac{0.03036}{0.03036 + 0.33953} = 8.2\%$$

Therefore, 8.2% of the total variance in $OrgC_{ij}$ is from Level 2 and may be caused by the enterprise contextual variables; it is statistically greater than zero with *p*-value less than 0.01. The remaining 91.8% in $OrgC_{ij}$ is from Level 1 and may be caused by variance within groups. This finding suggests that an effect exists between groups, and HLM is necessary to determine the presence of significant differences in intercepts and slopes across enterprises.

Random intercept model was then derived from the Level 1 model. A random intercept model without any Level 2 variable (i.e., contextual variables) was initially constructed. The form of the random intercept model is described as follows:

Level 1 model:

$$OrgC_{ij} = \beta_{0j} + \beta_{1j}CulS_{ij} + \beta_{2j}JobS_{ij} + \beta_{3j}MgtS_{ij} + \beta_{4j}WelS_{ij} + \beta_{5j}Gender_{ij} + \beta_{6j}Age_{ij} + r_{ij}$$

Level 2 model:

$$\beta_{qj} = \gamma_{q0} + u_{qj} \, , \, for \, q = 0, \, 1, 2, 3, 4$$

The effects on age and gender are assumed to be fixed, whereas other variables have between-group effects. In the case of a two-level HLM, the reliability of $\hat{\beta}_{qj}$ refers to the reliability of the estimator as a measure of an unknown Level 1 coefficient β_{qj}. The correlation test showed that β_4 (welfare satisfaction) exhibits high internal correlation with β_1 (culture satisfaction) and β_3 (management satisfaction). However, the variance in the slope of welfare satisfaction is insignificant with *p*-value greater than 0.10 and reliability estimate 0.26. Therefore, the residual for welfare satisfaction μ_4 should be removed. From the results presented in Table 2, the variances of the intercepts and slopes of culture, job, and management satisfaction are significant, with *p* values of less than 0.01. These results indicate that commitment to organizational culture depends on employee satisfaction factors, namely, gender and age, which is consistent with the results of multiple linear regressions. However, compared with the coefficients of multiple linear regressions, certain differences can be observed. Afterward, the reliability of β_q is more than 0.40. Thus, β_0, β_1, β_2, and β_3 for the random intercept and slope models can be maintained.

Table 2. Final estimation of variance components in the random intercept and slope models.

Random Effect	Standard Deviation	Variance Component	df	χ^2	*p*-Value
Intercept 1, μ_0	0.18	0.0320	26	747.94	0.00
CulS slope, μ_1	0.13	0.0157	26	66.55	0.00
JobS slope, μ_2	0.16	0.0247	26	60.79	0.00
MgtS slope, μ_3	0.18	0.0308	26	68.46	0.00
WelS slope, μ_4	0.06	0.0042	26	35.45	0.10
Level 1, *r*	0.37	0.13686	-	-	-
Modified Model					
Random Effect	Standard Deviation	Variance Component	df	χ^2	*p*-Value
Intercept 1, μ_0	0.18	0.0320	26	745.52	0.00
CulS slope, μ_1	0.14	0.0193	26	83.33	0.00
JobS slope, μ_2	0.16	0.0242	26	64.63	0.00
MgtS slope, μ_3	0.15	0.0239	26	62.83	0.00
Level 1, *r*	0.37	0.1374	-	-	-

The squared sum of the residual at Level 1 is 0.1374 (Table 2). The reliability estimates are all greater than 0.45, and the residual u_i is significant.

The variance within the group (i.e., variance of the residual in the Level 1 model) is 0.13686, which is significantly lower than that in the null model (i.e., totally unconditional HLM). When both estimates are used, HLM calculates the percentage of variance (r^2) based on employee satisfaction factors in commitment to organizational culture using the following equation:

$$r^2 = \frac{\sigma^2_{null} - \sigma^2_{random}}{\sigma^2_{null}} = \frac{0.33953 - 0.13736}{0.33953} = 59.69\%$$

The results indicate that culture, job, and management satisfaction explain 59.69% of the variance for commitment to organizational culture, i.e., 59.69% variance in Level 1 can be further explained by adding three Level 1 variables into the random intercept model.

Random intercept and slope models. In HLM, if the variance has a significant value after conducting the chi-square test, then other Level 2 variables can be added to predict this variance [44]. Before HLM is developed, 4 variables from 15 contextual variables of enterprises were selected and inserted into the random intercept model based on management experience and retesting.

The appropriate enterprise contextual variables were selected according to the nature of the variables and practical experience. The variance in the Level 1 intercept is predicted by comprehensive management ($CompM_j$). The variance in the Level 1 slope of culture satisfaction is predicted by capacity-load ratio ($CapaLR_j$). The variance in the Level 1 slope of culture satisfaction is predicted by energy intensity ($EneInt_j$) and capacity-load ratio ($CapaLR_j$). The variance in the Level 1 slope of culture satisfaction is predicted by cost-income ratio ($CostIR_j$) and capacity-load ratio ($CapaLR_j$). The random intercept and slope models with Level 2 variables are expressed as follows:

Level 2 model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\left(CompM_j\right) + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + \gamma_{11}\left(CapaLR_j\right) + u_{1j}$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21}\left(EneInt_j\right) + \gamma_{22}\left(CapaLR_j\right) + u_{2j}$$
$$\beta_{3j} = \gamma_{30} + \gamma_{31}\left(CostIR_j\right) + \gamma_{32}\left(CapaLR_j\right) + u_{3j}$$
$$\beta_{4j} = \gamma_{40}$$
$$\beta_{5j} = \gamma_{50}$$
$$\beta_{6j} = \gamma_{60}$$

The mixed model is then

$$
\begin{aligned}
OrgC_{ij} = \gamma_{00}+ \quad & \gamma_{01}\left(CompM_j\right) + \gamma_{10}\left(CulS_{ij}\right) + \gamma_{11}\left(CapaLR_j\right)\left(CulS_{ij}\right) + \gamma_{20}\left(JobS_{ij}\right) \\
& +\gamma_{21}\left(EneInt_j\right)\left(JobS_{ij}\right) + \gamma_{22}\left(CapaLR_j\right)\left(JobS_{ij}\right) + \gamma_{30}\left(MgtS_{ij}\right) \\
& +\gamma_{31}\left(CostIR_j\right)\left(MgtS_{ij}\right) + \gamma_{32}\left(CapaLR_j\right)\left(MgtS_{ij}\right)+\gamma_{40}\left(WelS_{ij}\right) \\
& +\gamma_{50}\left(Gender_{ij}\right) + \gamma_{60}\left(Age_{ij}\right) + u_0 + u_1\left(CulS_{ij}\right) + u_2\left(JobS_{ij}\right) \\
& +u_3\left(MgtS_{ij}\right) + r_{ij}
\end{aligned}
$$

The results indicate that parameter correlations are low and the reliability estimate of β_q is more than 0.40. Table 3 shows that each selected contextual variable is statistically significant (p-value < 0.05), and thus, can be included.

CompM can influence an intercept in Level 1, with a significantly positive coefficient of 1.60 under a 1% significance level.

For the slope of culture satisfaction in Level 1, *CapaLR* can predict its variance with a coefficient of 0.47 at the 5% level, given that the p value is less than 0.04. *EneInt* and *CapaLR* influence the slope of job satisfaction in the Level 1 model. Their effects differ. Energy intensity (*EneInt*) enhances the value of the slope of job satisfaction with the positive coefficient of 0.06, whereas the effect of capacity-load ratio is negative with a coefficient of −1.13. Both slope values are statistically significant.

The slope of management satisfaction can be predicted by *CostIR* and *CapaLR* under different directions, *CapaLR* has a positive effect, whereas *CostIR* has a negative effect. Both slope values are significant at the 5% level.

Table 3. Final estimation of fixed effects in the model with fixed and random effects.

Fixed Effect	Coefficient	Standard Error	T Ratio	df	p-Value
For intercept 1, β_0					
Intercept 2, γ_{00}	4.54	0.04	128.70	25	0.00
CompM, γ_{01}	1.60	0.33	4.81	25	0.00
For *CulS* slope, β_1					
Intercept 2, γ_{10}	0.30	0.03	10.70	25	0.00
CapaLR, γ_{11}	0.47	0.21	2.18	25	0.04
For *JobS* slope, β_2					
Intercept 2, γ_{20}	0.11	0.03	3.57	24	0.00
EneInt, γ_{21}	0.06	0.02	2.80	24	0.01
CapaLR, γ_{22}	−1.13	0.25	−4.53	24	0.00
For *MgtS* slope, β_3					
Intercept 2, γ_{30}	0.34	0.04	8.47	24	0.00
CostIR, γ_{31}	−0.09	0.03	−3.01	24	0.01
CapaLR, γ_{32}	0.43	0.19	2.25	24	0.03
For *WelS* slope, β_4					
Intercept 2, γ_{40}	0.13	0.02	5.58	3016	0.00
For *Gender* slope, β_5					
Intercept 2, γ_{50}	0.03	0.01	2.24	3016	0.03
For *Age* slope, β_6					
Intercept 2, γ_{60}	0.03	0.01	2.99	3016	0.00

Four Level 2 contextual variables are identified in the HLM model. Compared with the results of the random intercept and slope models, all variances at Levels 1 and 2 decreased at a certain degree, resulted from the introduction of contextual variables. Table 4 compares the results of the calculated proportion of the explained variance and those of the random intercept and slope HLM.

Table 4. Effect of the two-level HLM on the model with fixed and random effects.

Variance Component	INTRCPT	CulS	JobS	MgtS	Residual
Random intercept model	0.0320	0.0193	0.0242	0.0239	0.13736
Random intercept and slope model	0.0294	0.0159	0.0117	0.0230	0.13711
Proportion of the variance explained	8.13%	17.62%	51.65%	3.77%	0.22%

When the hierarchical variable is added, the variance component for each random factor decreases. Although the original variables at Level 1 do not change, the residual does not significantly improve because only the Level 2 variance between groups takes effect.

The addition of *CompM* to the intercept will improve the proportion of variance explained by 8.13%. The proportion of variance explained will improve by 17.62% if *CapaLR* is added to the culture satisfaction factor, by 51.65% if *EneInt* and *CapaLR* are added to job satisfaction, and by 3.77% if *CostIR* and *CapaLR* are added to the management satisfaction factor. All the aforementioned results prove that contextual variables associated with comprehensive management, energy intensity, cost-income ratio, and capacity-load ratio can considerably explain the variance of commitment to organizational culture.

Finally, the HLM results show that the interaction is significant, thereby supporting cross-level interaction between the predictors of Levels 1 and 2.

5. Discussion

5.1. Application and Suggestion

Through HLM analysis, four contextual variables of enterprises were identified to explain 8.2% of the variance between groups for commitment to organizational culture. The four variables are as follows.

Comprehensive management measures the organizational management. Improvement in the management level contributes positively to employee commitment to organizational culture. Employee commitment to organizational culture increases by 1.60 point per unit increase of the comprehensive management measure.

Energy intensity measures energy intensity and efficiency. With a one unit decrease in energy intensity, job satisfaction decreases by 0.064 point. This observation indicates that a high level of energy management will pose a high demand for employees, both in terms of working standard and work pressure. However, such increase in demand may impose a negative effect on employee satisfaction through higher demand. If energy management level increases, managers should adopt other measures to reduce the negative effect on employee satisfaction and on the commitment to organizational culture.

Cost-income ratio measures profit level and cost control in an organization. With a one-point decrease in cost-income ratio, management satisfaction increases by 0.09 point. This observation indicates that a high profit and cost control will lead to an increase in employee satisfaction and an increase in the level of commitment to organizational culture. Thus, profit and cost control levels are positive measures for improving employee satisfaction and commitment to organizational culture.

Capacity-load ratio measures standard production through production capacity and influences the culture, job, and management satisfaction of employees. With a one-point increase in capacity-load ratio, culture satisfaction increases by 0.47 point, job satisfaction decreases by 1.13 points, and management satisfaction increases by 0.43 point.

When the annual production capacity is assumed to be fixed, increases in the product schedule will lead to increases in the profit and income of employees, and ultimately, to the improvement of employee satisfaction level. However, profit increases do not typically lead to pay increases for employees because the pay level for Chinese SOEs is relatively stable [49]. As an employee works for longer working hours and experiences increased work pressure, employee satisfaction will decrease and lead to a further decrease in employee commitment to organizational culture. Less pressure at work and may improve employee satisfaction in a short term. However, the resulting lower profit level will lead to a decrease in culture and management satisfaction, and ultimately, to a reduction in employee commitment to organizational culture.

In comparison, culture and management satisfaction have a more significant effect on commitment to organizational culture than job satisfaction. With a one-point increase in capacity-load ratio, culture satisfaction increases by 0.47 point and commitment to organizational culture increases by 0.12 point. Meanwhile, as management satisfaction increases by 0.43 point, employee commitment to organizational culture increases by 0.21 point; as job satisfaction decreases by 1.13 points, commitment to organizational culture decreases by 0.04 point. With a one-point increase in capacity-load ratio, employee commitment to organizational culture increases by 0.29 point (Table 3).

However, at a high capacity-load ratio, production and the production load capacity of equipment and the health of equipment are negatively affected. Chou et al. proved the related stress is destructive to employee well-being [50]. Moreover, the failure rates of equipment and operational risks will increase. Thus, setting an appropriate level of production volume is critical in enhancing commitment to organizational culture. The feedback of the enterprise's production and management indicators, employee satisfaction and employees' work behaviors are significantly related to their commitment to organizational culture. The efficiency and achievement of the enterprise should be highly consistent with the employee's behavior, which is also verified by the social exchange theory.

5.2. Summary

This study conducts descriptive and variance analyses of employee commitment to organizational culture. The results show that among the 27 sampled enterprises, the effects between groups influence commitment to organizational culture. To model this effect, HLM was applied to investigate the source of the effects between groups at a high level of hierarchy.

HLM was constructed based on the multiple linear regressions of commitment to organizational culture and the selection of Level 2 contextual factors of enterprises. The total unconditional model test showed that 8.2% of the variance was explained between groups for commitment to organizational culture. Then, 4 contextual variables were selected from 15 enterprise indicators using the random intercept model and the random intercept and slope model to construct HLM, which regarded comprehensive management, energy intensity, cost-income ratio, and capacity-load ratio as variables.

The addition of the hierarchical method reduces the variance component and improves the explanatory power of each variable. For example, the proportion of variance explained by job satisfaction is improved by 51.7%, thereby implying that the contextual variables of Level 2 enterprises must be considered to further improve employee satisfaction and commitment to organizational culture. Hantula regarded job satisfaction as an ethical imperative that results from organizational and management practices that emphasize positive reinforcement instead of aversive control [51].

6. Conclusions

Employee satisfaction and organizational culture are significant factors that influence the management of Chinese SOEs. Through in-depth investigations and relevant literature review, this study showed the influence of employee satisfaction factors on organizational culture using HLM. A two-level HLM was developed to predict employee commitment to organizational culture while considering a number of contextual variables apart from the four employee satisfaction factors. The results show that HLM can significantly reduce variance among enterprises, thereby improving the explanatory power of the predictive variables. The effects of employee satisfaction factors on commitment to organizational culture are further explained by nested enterprise contextual variables. Four contextual variables, namely, comprehensive management, energy intensity, cost-income ratio, and capacity-load ratio, are determined to be statistically significant in serving as Level 2 variables in HLM. This study expands the literature on human resource management for Chinese SOEs and verifies the relationships and effects of employee satisfaction factors on commitment to organizational culture.

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