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Linking work-related and non-work-related supervisor–subordinate relationships to knowledge hiding: a psychological safety lens

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Abstract

Recent research on knowledge hiding has focused on its interpersonal antecedents, such as co-worker relationships. However, few research has investigated the role of vertical relationships on reducing knowledge hiding behaviors. Extending this line of research, we examined the impacts of work-related (i.e., leader–member exchange, LMX) and non-work-related (i.e., supervisor–subordinate *guanxi*, SSG) supervisor–subordinate relationships on knowledge hiding. Drawing from social exchange and social cognitive theories, we proposed that both LMX and SSG negatively influence subordinates' knowledge hiding through psychological safety. With a three-wave time-lagged design and data collected from 223 employees in China, our results show that (a) both LMX and SSG are negatively related to knowledge hiding; (b) psychological safety fully mediates the impact of LMX on knowledge hiding, whereas it partially mediates the impact of SSG on knowledge hiding. Theoretical and practical implications, research limitations, and promising avenues for future research are discussed.

Keywords Knowledge hiding · Leader–member exchange · Supervisor–subordinate *guanxi* · Psychological safety

Introduction

In recent years, knowledge hiding, which is defined as "an intentional attempt by an individual to withhold or conceal knowledge that has been requested by another person" (Connelly et al. 2012, p. 65), has attracted considerable attention. Prior research has pointed out the destructive impacts of knowledge hiding, including increasing difficulties to realize knowledge transfer (Peng 2013), damaging the work relationship between colleagues (hereby knowledge hider and knowledge seeker),

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and hindering the creativity (Černe et al. 2014, 2017; Connelly and Zweig 2015). However, research on the occurrence mechanisms and respective interventions is still in the nascent stage.

Recently, OB scholars have highlighted the investigation of the interpersonal antecedents of knowledge hiding (e.g., Xiao and Cooke 2019; Zhao et al. 2019) due to the dyadic characteristic of knowledge hiding. Among the limited researches, scholars have mainly focused on the relationships among co-workers (Zhao et al. 2019). However, an individual's tendency to intentionally withhold/conceal knowledge may not only depend on his/her relationship with the co-workers but also the supervisor–subordinate relationship, because supervisor–subordinate relationship is the most important tie among the various relationship networks that individuals are embedded in to accomplish tasks (Chen et al. 2009). Therefore, it has significant theoretical and practical values to examine the correlation between supervisor–subordinate relationship and knowledge hiding. Supervisor–subordinate relationship can be classified into two categories, the so-called work-related leader–member exchange (LMX) and non-work-related supervisor–subordinate *guanxi* (SSG). SSG refers to a dyadic, particularistic, and sentimental subordinate–immediate supervisor personal relationship that arises from informal and implicit social interactions based on mutual interest and benefit beyond the work domain (e.g., dinner invitation, gift-giving, and favor-doing) (Law et al. 2000).

Prior research has mainly focused on the effect of LMX or SSG on knowledge sharing and found that both of them are positively associated with knowledge sharing. However, knowledge sharing and knowledge hiding are not two sides of one coin because they are differentially motivated (Connelly et al. 2012). For instance, Gagné et al.'s (2019) research demonstrated that "knowledge sharing is mainly motivated through meaning and enjoyment" while "hiding knowledge is encouraged through external pressures" (p. 795). Therefore, it cannot be directly concluded that LMX and SSG shall be negatively associated with knowledge hiding based on cues of the positive LMX/SSG–knowledge sharing relation. Our research objective is to differentiate knowledge hiding from knowledge sharing, and have a closer look at the specific influencing mechanisms of LMX/SSG on knowledge hiding.

LMX and SSG are rooted in social exchange theory (SET; Blau 1964) which emphasizes the reciprocity. Prior research has employed the norm of reciprocity to explain the association between LMX/SSG and discretionary behavior (Zhang et al. 2015). Therefore, drawing from SET, we aim to link LMX and SSG directly to knowledge hiding in this study. We suppose that, a high-level LMX/SSG will encourage employees to seek a good reciprocal exchange relationship with their supervisors through reducing unethical workplace behaviors like knowledge hiding.

It is worth noting that LMX and SSG might both directly and indirectly influence knowledge hiding. Thus, our second research objective is to uncover the psychological processes linking LMX/SSG and knowledge hiding. As known, cognition can be used to predict people's behavior (Lee and Allen 2002). Recent research has started to investigate the mediating role of cognition in the relationship between various antecedents and unethical workplace behaviors like knowledge hiding. For example, Xiong et al. (2019) advocated taking the social–psychological lens to understand knowledge hiding within international R&D teams. In particular, psychological

safety (an individual's inner cognition and certainty of a safe interpersonal context), which can exert significant impacts on an individual's attitude and willingness of being helpful (to co-workers and supervisors) in the workplace, is drawing increasing attention. Therefore, focusing on psychological safety theory, which is rooted in Bandura's (1986) social cognitive theory (SCT), we attempt to examine the psychological safety mechanism of knowledge hiding. We expect that LMX and SSG influence individuals' safety cognition of knowledge-related behaviors and subsequently lead to their self-regulation on knowledge hiding tendencies.

This research has twofold contribution to theory development. First, this research is in response to scholars' (e.g., Zhao et al. 2016) call for additional research on the antecedents of knowledge hiding. To our knowledge, prior research has mainly investigated the triggers of knowledge hiding. But we have little knowledge on what factors will reduce knowledge hiding. Therefore, our research sheds light on the potential role of supervisor–subordinate relationships in inhibiting knowledge hiding. Moreover, by examining the socio-cognitive processes of knowledge hiding, we offer a new perspective (i.e., psychological safety perspective) to study the supervisor–subordinate relationships—knowledge hiding linkage. We also further develop the interventions (i.e., underlying mechanisms) to reduce and/or avoid knowledge hiding. The second contribution of this research concerns the investigation on "the related but distinct roles supervisor–subordinate *guanxi* and LMX play in the workplace" (Zhang et al. 2017, p. 1025). Indigenous research on knowledge hiding has mostly followed western-based research, and very few research has considered the unique impact of Chinese culture on knowledge hiding (Xiao and Cooke 2019). By examining how the Chinese culture-specific concept of SSG differ from the Western concept of LMX in influencing employees' knowledge hiding behaviors, the present work has connected knowledge hiding research and cross-cultural studies together.

Theoretical background and hypotheses development

LMX and knowledge hiding

LMX refers to the work-related ties between an employee and his/her direct supervisor (Wayne et al. 1997), which could be further described by "in-group" and "out-group" relationships. The "in-group" LMX represents a high-quality relationship that is based on mutual trust, loyalty, respect, and fellowship. The "out-group" LMX represents a low-quality relationship and it is supported by formal rules, policies, and authority (Wayne et al. 1997). In the high-quality LMX context, supervisors provide exchange resources to subordinates and let employees believe that their contributions are valuable and they have the well-being (Dysvik et al. 2015).

From the perspective of SET, subordinates who gain the favor/rewards from their supervisors would feel a reciprocal obligation to repay it in unspecified time by sharing their supervisors' task burden and exhibiting constructive behaviors toward the organization (Zhang et al. 2015). They are more likely to reciprocate their supervisors by showing voluntary pro-organizational behaviors (Graen and Uhl-Bien 1995). Knowledge sharing has been widely recognized as one of the most important

discretionary and voluntary behaviors that may contribute to an organization's innovation or benefit a supervisor's performance (Volmer et al. 2012). In this sense, offering high-quality knowledge is the most immediate and effective way to support supervisors. Hence, being requested for a help (hereby knowledge) at work, employees that value high LMX would provide help rather than withhold knowledge through making excuses, pretending not to have enough knowledge, or even providing deceptive information (Webster et al. 2008). By contrast, a low LMX will make employees feel less obligated to perform voluntary roles and thereby largely reduce their extra-role behaviors. The "out-group" employees who are expected to receive negative treatment or limited resources from their supervisors may decide to put in less effort for their knowledge contributing which involves efforts and costs.

Recent research has started to look at the critical role of LMX in making decisions to discretionary behaviors (e.g., knowledge hiding). Tsay et al. (2014) proposed that employees' knowledge withholding intentions are significantly influenced by the social exchange relationships formed in the workplace such as LMX. Cropanzano et al. (2017) suggested that in circumstances when LMX differentiation is high, employees with low-quality LMX will feel unfair, develop negative affect, and attempt to resort to retaliating behaviors like knowledge hiding. Zhao et al. (2019) have recently drawn on the organizational identification lens to link LMX to reduced evasive hiding and playing dumb. According to Černe et al. (2014), in teams where leader–follower relationships are characterized by social LMX, individuals are expected to stop or avoid hiding knowledge. Babič et al. (2019) argued that LMX (especially, social LMX) may affect the level of knowledge hiding by employees to their colleagues. Accordingly, we propose:

Hypothesis 1 LMX will be negatively related to employees' knowledge hiding behaviors.

SSG and knowledge hiding

Chinese supervisors often differ in their attitudes and responses to subordinates based on *guanxi* closeness (He et al. 2019). As such, SSG exerts pivotal impact on supervisors' attitudes and decisions (e.g., resources allocation) toward their subordinates (Law et al. 2000) and therefore significantly affects subordinates' attitudes and behaviors (Kong and Qian 2015). A better communication and exchange *guanxi* provide a supportive condition for subordinates to be accepted by their supervisors (Wei et al. 2010) and hence acquire more desirable resources (e.g., information, power, and advancement opportunities) (Cheung and Wu 2011) which can further gain them distinct competitive advantages. According to Gao and He (2019), interpersonal relationships are key resources for employees in the workplace. Individuals with more resources in terms of social relations are more willing to increase resources by sharing knowledge resources. From this perspective, a high-quality SSG should weaken employees' willingness to hide knowledge from their colleagues.

Furthermore, according to SET, interpersonal behavior is based on mutual trust. SSG involves supervisor–subordinate emotional closeness and helps to develop top-down and bottom-up trust. Therefore, in the high-quality SSG context, social exchange increases and cooperative interaction flourishes, and employees' knowledge hiding is expected to be reduced correspondingly. At least, enjoying a harmonious SSG can help to minimize undesirable down-top knowledge hiding. Recently, scholars show interests to relationship between close personal ties and knowledge hiding. Xiao and Cooke (2019) suggested that expressive ties are likely to restrain employees' knowledge hiding via affect-based trust. Wang et al. (2019) and Zhao and Xia (2019) indicated that interpersonal trust (distrust), which represents a major criterion in evaluating interpersonal relationships quality, negatively (positively) influences knowledge hiding. Abdullah et al. (2019) also anticipated that interpersonal relationship based on high level of trust and affection will discourage employees' deceptive and opportunistic intentions and hence reduce their knowledge hiding.

Conversely, employees who lack the relationship resources will strengthen the awareness of resource protection. They have a strong awareness of preventing resources loss by hiding knowledge, which leads them to conceal knowledge when others request it (Gao and He 2019). Besides, low-quality SSG will harm employees' affective attachments/bonds to their supervisors. As time goes by, employees who received less support and resources from their supervisors may exhibit more negative behaviors toward their supervisors and organizations, such as withholding knowledge from their supervisors or co-workers in reciprocation. A lack of close personal ties may also make subordinates selectively hiding knowledge (similar to the defensive silence) (He et al. 2018) from their supervisors to protect themselves. Butt and Ahmad's (2019) research in United Arab Emirates showed that poor personal relationships (such as personal dislikes and distrust) between senior managers and their managers could predict knowledge hiding in buying and supplying firms. We thus propose the following:

Hypothesis 2 SSG will be negatively related to employees' knowledge hiding behaviors.

The mediating role of psychological safety

Psychological safety is an integrated multilevel social and cognitive construct (Edmondson 2002). On the individual level, it refers to "the sense of being able to show and employ one's self without fear of negative consequences to self-image, status, or career" (Kahn 1990, p. 708). Interpersonal relationship could be used to predict self-perceived psychological safety in relation to workplace social interactions (Ling et al. 2010). Leaders at different organizational levels control the key resources and thus have unique roles and spheres of influence and can determine the future of the employees. As a result, among all factors that may affect employee psychological safety, the supervisor–subordinate relationship is of the utmost importance (Edmondson 1999). For instance, Kahn (1990) argued that employees'

psychological safety can be improved when a good leader–member relationship is maintained. Song et al. (2017) also argued that employees' perception of psychological safety is "formed based on long-term interpersonal interaction between employees and leaders" (p. 445).

Psychological safety relies on high levels of interpersonal support, trust, respect, and fellowship (Edmondson 1999; Hu et al. 2018; Kahn 1990). The perceptions of supervisory support and trust could lead to employees' feeling of a safety climate in the organization. Specifically, as aforementioned, in the high LMX context, the supervisors will take the initiative to construct a supportive work environment for their subordinates. This will enhance employees' internal identity recognition, which usually endows employees to perceive discretionary behaviors positively. In addition, a high-quality LMX relationship can help employees obtain information and eliminate uncertainty in work (Ling et al. 2010). The lower the risk employees feel in their work, the higher the level of their psychological safety. In contrast, low-level LMX relationships are more likely to cause supervisor ostracism, which often send negative signals to the subordinates that they are not valued and trusted by their supervisors (Li and Tian 2017). It can largely hinder the formation of employees' psychological safety. Therefore, we speculate that LMX helps to increase employees' psychological safety.

SSG emphasizes the mutual contribution, sharing and obligation based on supervisor–subordinate affective bonds. In Chinese organizations, supervisors are usually more attentive to those subordinates with whom they have close ties, preferring to interact with them in informal activities. The frequent contact and interaction could undoubtedly enhance the mutual trust between the supervisors and their subordinates (Farh et al. 1998). Li and Yan (2007) argued that subordinates' trust in their supervisors can reduce their perception of threats and hostility in the organization, thereby improving their psychological safety. Moreover, a good SSG relationship can improve the accessibility of supervisors (Li et al. 2015). Edmondson (2004) and Kahn (1990) showed that a nonthreatening and predictable work environment induced by the accessibility of the supervisor could enhance subordinates' psychological safety. By contrast, low-level SSG makes it difficult for the supervisors and subordinates to form, in addition to the relationship established by the official and simple work contract, an intimate emotional connection (Li et al. 2015). Because there is no "natural" protection mechanism for subordinates and a lack of necessary emotional communication, low-level SSG may negatively influence the subordinates' psychological safety. Thus, we argue that SSG has a positive impact on employees' psychological safety.

Further, scholars have highlighted that psychological safety is one of the preconditions to employee discretionary behaviors (Hu et al. 2018). Psychological safety theory assumes that individuals need to assess the potential interpersonal risk before engaging in discretionary behaviors. The perception of the risks and uncertainties of providing knowledge has a profound impact on the individual's knowledge-related behavior. Specifically, knowledge providers will conduct an implicit analysis for their knowledge providing behaviors (Zhang et al. 2011). For example, knowledge providers might want to ascertain whether their status in the organization would be decreased by providing knowledge to others or whether

they would be laughed at or would fall into an awkward situation if the shared knowledge was wrong or premature (Zhang et al. 2011). According to SCT, harmony workplace relationship could make individuals feel psychological safety, and thus be more willing to share his/her thoughts and opinions (Kahn 1990). Under such circumstances, individuals no longer conceal advanced knowledge and experience as private exclusive assets; instead, knowledge and experience are freely exchanged and communicated among members. In contrast, when employees' psychological safety is low, they are more prone to mutual suspicion and competition, and the knowledge resources that are the key competitive resources in the workplace are more likely to be retained by them. According to Edmondson (1999, 2002), a lack of psychological safety often leads employees to be more inclined to adopt knowledge hiding behavior, which ultimately hinders the free flow of knowledge. Based on these, we speculate that psychological safety is the key cognitive factor that drives employees to share knowledge and inhibit their involvement in knowledge hiding behaviors.

Taken together, we argue that when employees keep a good relationship (LMX and/or SSG) with their supervisors, their perceptions of psychological safety and positive expectations related to providing knowledge requested by the co-workers could be largely improved, and thus they will tend to reduce or suppress their knowledge hiding behaviors. Ergo, following this line of reasoning based on SCT, we put forward:

Hypothesis 3 Psychological safety will mediate the relationship between LMX and employees' knowledge hiding behaviors.

Hypothesis 4 Psychological safety will mediate the relationship between SSG and employees' knowledge hiding behaviors.

In summary, drawing from SET and SCT, this research examines the relationship between supervisor–subordinate relationships and knowledge hiding, focusing on the mediating role of psychological safety (see Fig. 1).
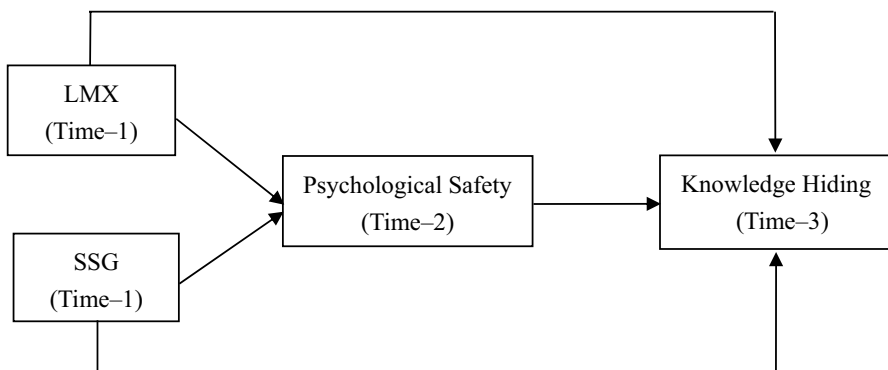

Fig. 1 Proposed theoretical model

Methods

Participants and procedure

Data were collected from the employees of service industry in eastern China. According to Podsakoff et al. (2012), in order to reduce the potential common method biases, the surveys were conducted in three different phases, each separated by approximately 4 weeks. HR manager prepared a list of randomly selected employees and offered the codes to let participants select the codes they prefer. Participants should mention the same codes during the three-phrase surveys. We used the online survey system (www.wjx.cn) for data collection. The researchers sent the questionnaire link to the HR manager via WeChat. The HR manager then forwarded it to participants in the same way and informed participants to enter the ID number before filling out the questionnaire. To increase participants' willingness to share their real thoughts, we explained the research purpose and how survey is organized in three stages on the front page of the questionnaire. The voluntary nature of the participation is highlighted on the front page, too. In addition, participants were assured that only the researchers can get the data and we respect strictly the anonymity. For any question related to the questionnaire, participants could reach first author, whose email and cell phone number are put on the front page of the survey.

In phase 1, 300 questionnaires were distributed to the employees. Respondents were required to report their perceptions of LMX and SSG and demographic characteristics, and 284 completed questionnaires were returned (94.67%). In phase 2, respondents who had completed the whole questionnaire in phase 1 were required to assess the level of psychological safety, and 259 respondents returned their completed questionnaires (86.33%). In phase 3, we asked these 259 respondents to report their knowledge hiding behaviors. Finally, 223 respondents returned their completed surveys, representing a response rate of 74.33%.

Measures

Guided by Brislin's (1980) translation and back-translation procedure, we verified each measurement item. Except for control variables, all items were rated on a 5-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*.

Leader–member exchange (LMX)

We assessed Time-1 LMX using three items from the 7-item scale developed by Graen and Uhl-Bien (1995). An example item is: "My supervisor understands my problems and needs." The Cronbach's α was 0.80.

Supervisor–subordinate *guanxi* (SSG)

We measured Time-1 SSG using Law et al.'s (2000) 6‑item scale. A sample item is: "During holidays or after office hours, I would call my supervisor or visit him/her." The Cronbach's α was 0.81.

Psychological safety

Psychological safety was assessed with 5 items adapted from Edmondson (1999) and Liang et al. (2012). These items assessed "whether individuals felt safe to be themselves or comfortable to be involved in interpersonal interaction or felt the existence of a threatening environment" (Jiang et al. 2019, p. 805). A sample item is "Nobody in my unit will pick on me even if I have different opinions." The Cronbach's α was 0.91.

Knowledge hiding

We used a 12-item scale developed and validated by Connelly et al. (2012) to measure knowledge hiding. Sample items include "agreed to help him/her but never really intended to" (evasive hiding), "pretended that I did not know the information" (playing dumb), and "explained that I would like to tell him/her, but was not supposed to" (rationalized hiding). The Cronbach's α was 0.72.

Control variables

As stated by prior knowledge hiding research (e.g., Huo et al. 2016; Men et al., 2018; Zhao et al. 2019), employees' gender, age, education, tenure in the organization, and working time were included as control variables in the analysis. Gender was coded: 0 = male, 1 = female. Education was coded: 1 = below college, 2 = college, 3 = bachelor, 4 = master or above. We used years to measure age and organizational tenure, and number of hours to measure average working time per week.

Data analytical strategy

We first use AMOS 17.0 to conduct confirmatory factor analysis (CFAs), testing the convergent and discriminant validity of the study constructs, examining whether the four variables are distinctive constructs. We assessed the model fit by processing the chi‑square (χ^2), RMSEA, CFI, and TLI. For a reasonable model fit, χ^2/df should be $1 < \chi^2/\text{df} < 3$, RMSEA should be below 0.08, and both CFI and TLI should be above 0.90 (Bentler and Bonett 1980).

The mediation hypotheses were tested through two approaches. First, guided by the work of Baron and Kenny (1986), we performed hierarchical multiple regressions to establish a mediation model. Second, we employed Preacher and

Hayes's (2004) bootstrapping method to evaluate the statistical significance of the indirect effect of LMX/SSG on knowledge hiding through psychological safety.

Results

Confirmatory factor analyses

As shown in Table 1, our hypothesized four-factor measurement model yielded an acceptable model fit to the data ($\chi^2 = 584.95$, df$= 293$, $p < 0.01$, RMSEA$= 0.07$, CFI$= 0.90$, TLI$= 0.90$), with all standardized factor loadings significant at the $p < 0.01$ level. We also tested three alternative models with combinations of focal variables in the proposed mediation model. Specifically, the three-factor model combined LMX and SSG; the two-factor model combined LMX, SSG, and psychological safety; and the single-factor model combined all the four focal variables. The CFA results showed that the alternative models had significantly poorer fits to the data than the hypothesized measurement model. In addition, following Bentler and Bonett (1980), we also conducted the χ^2 difference ($\Delta\chi^2$) test to confirm the discriminant validity of the constructs. Our results showed that, the baseline four-factor model produced a significant improvement in χ^2 over the three-factor model, $\Delta\chi^2(3) = 387.83$, $p < 0.01$; the two-factor model, $\Delta\chi^2(5) = 523.83$, $p < 0.01$; and the single-factor model, $\Delta\chi^2(6) = 1086.05$, $p < 0.01$, indicating that the four focal variables can be distinguished from one to another in data analyses.

Descriptive statistics and correlations

The means, standard deviations, and correlations among the study variables are presented in Table 2. As expected, LMX ($r = -0.27$, $p < 0.01$) and SSG ($r = -0.69$, $p < 0.01$) were negatively and significantly correlated with knowledge hiding. Meanwhile, LMX ($r = 0.68$, $p < 0.01$) and SSG ($r = 0.19$, $p < 0.01$) were positively and significantly related to psychological safety, which was negatively and significantly associated with knowledge hiding ($r = -0.31$, $p < 0.01$).

Table 1 Results of confirmatory factor analysis of the measurement models

	χ^2	df	$\Delta\chi^2$	Δdf	RMSEA	CFI	TLI
Four-factor model: LMX, SSG, PS, KH	584.95	293	–	–	0.07	0.90	0.90
Three-factor model: LMX + SSG, PS, KH	972.78	296	387.83**	3	0.10	0.75	0.72
Two-factor model: LMX + SSG + PS, KH	1108.78	298	523.83**	5	0.11	0.70	0.67
Single-factor model: LMX + SSG + PS + KH	1671.00	299	1086.05**	6	0.14	0.48	0.44

N = 223

$\Delta\chi^2$ Chi-square change, *Δdf* degree-of-freedom changes were against the four-factor model, *RMSEA* root mean square error of approximation, *CFI* comparative fit index, *TLI* Tucker–Lewis index, *LMX* leader–member exchange, *SSG* supervisor–subordinate *guanxi*, *PS* psychological safety, *KH* knowledge hiding

**$p < 0.01$

Table 2 Means, standard deviations, and correlations for the study variables

Variables	Mean	SD	1	2	3	4	5	6	7	8
(1) Gender	0.51	0.50								
(2) Age (years)	33.20	10.58	0.03							
(3) Education	2.47	0.91	0.12	−0.17*						
(4) Organizational tenure (years)	2.90	1.90	−0.06	0.25**	−0.20**					
(5) Average working time per week (h)	58.23	15.45	−0.10	0.19**	−0.01	0.16*				
(6) LMX	3.83	0.90	−0.04	0.15*	−0.06	0.19**	0.06			
(7) SSG	3.70	0.65	−0.02	0.09	0.06	0.13	0.16*	0.23**		
(8) Psychological safety	3.68	0.92	0.01	0.16*	−0.05	0.23**	0.03	0.68**	0.19**	
(9) Knowledge hiding	2.19	0.53	−0.03	−0.11	−0.01	−0.16*	−0.17*	−0.27**	−0.69**	−0.31**

$N = 223$

LMX leader–member exchange, *SSG* supervisor–subordinate *guanxi*

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

Hypotheses testing

Hypotheses 1 and 2 proposed a negative relationship between LMX/SSG and knowledge hiding. As shown in Table 3, we found that both LMX and SSG had a negative direct impact on knowledge hiding (Model 3: $\beta = -0.14$, $p < 0.01$; Model 4: $\beta = -0.56$, $p < 0.01$). Therefore, Hypotheses 1 and 2 were supported.

Hypotheses 3 and 4 predicted a mediating effect of psychological safety on the LMX/SSG–knowledge hiding relationship. Table 3 presents the results for these two mediation hypotheses. First, as above-mentioned, Models 3 and 4 showed that both LMX and SSG are negatively associated with knowledge hiding. Second, Models 1 and 2 showed that both LMX ($\beta = 0.67$, $p < 0.01$) and SSG ($\beta = 0.23$, $p < 0.01$) are positively related to psychological safety. Third, Model 5 showed the negative relationship between psychological safety and knowledge hiding ($\beta = -0.17$, $p < 0.01$). Last, in Models 6 and 7, we regressed knowledge hiding on psychological safety with the effect of LMX or SSG controlled. The results in Model 6 showed that the negative relationship between psychological safety and knowledge hiding remained significant ($\beta = -0.13$, $p < 0.05$) whereas the negative effect of LMX on knowledge hiding was not significant ($\beta = -0.04$, *ns*).

The results in Model 7 showed that psychological safety remained negatively related to knowledge hiding ($\beta = -0.10$, $p < 0.01$) whereas the negative effect of

Table 3 Results of hierarchical regression analysis of mediation hypothesis

Variables	Psychological safety		Knowledge hiding				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Control variables							
Gender	0.08	0.04	−0.06	−0.06	−0.04	−0.05	−0.05
Age	0.00	0.01	−0.00	−0.00	−0.00	−0.00	0.00
Education	0.01	−0.01	−0.02	0.01	−0.02	−0.02	0.01
Organizational tenure	0.04	0.09	−0.03	−0.02	−0.02	−0.02	−0.01
Average working time per week	−0.00	−0.00	−0.00	−0.00	−0.01	−0.01	−0.00
Independent variables							
LMX	0.67**		−0.14**			−0.04	
SSG		0.23**		−0.56**			−0.53**
Mediator							
Psychological safety					−0.17**	−0.13*	−0.10**
R^2	0.60	0.09	0.11	0.49	0.13	0.13	0.52
ΔR^2	0.54**	0.02**	0.06**	0.44**	0.08**	0.02*	0.03**
F	53.83**	3.42**	4.43**	34.35**	5.33**	4.63**	32.98**
ΔF	289.22**	5.73**	13.71**	183.73**	18.86**	5.32*	13.18**

$N = 223$

LMX leader–member exchange, *SSG* supervisor–subordinate *guanxi*

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

SSG on knowledge hiding was slightly reduced ($\beta = -0.53$, $p < 0.01$). Therefore, according to Baron and Kenny (1986), there are a full mediation effect of psychological safety on the LMX–knowledge hiding relation, and a partial mediation effect of psychological safety on the SSG–knowledge hiding association. Hence, we have initial evidence supporting Hypotheses 3 and 4.

Based on the regression estimates, we computed the mediators' bias-corrected CI using the PROCESS macro in SPSS version 19.0. Results of the bootstrapping test for Hypothesis 3 (see Table 4) showed that Point estimate $= -0.11$, SE $= 0.04$, with the 95% bias-corrected CI as -0.19 and -0.02, supporting that CI did not contain zero and thereby suggesting an indirect effect of LMX on knowledge hiding via psychological safety ($p < 0.05$). Meanwhile, results of the bootstrapping test for Hypothesis 4 (see Table 4) showed that Point estimate $= -0.03$, SE $= 0.02$, with the 95% bias-corrected CI as -0.07 and -0.01, supporting that CI did not contain zero and thereby indicating that the indirect effect of SSG on knowledge hiding through psychological safety was statistically significant ($p < 0.05$). Thus, Hypotheses 3 and 4 were fully supported.

Discussion

In this study, we explored how supervisor–subordinate relationships can restrain employees' knowledge hiding, the so-called dysfunctional behavior that is detrimental to the organization and the employees themselves (Černe et al. 2014), by using three-phase data collected in China. The results showed that (1) both LMX and SSG had a negative correlation with knowledge hiding, (2) employees' psychological safety fully mediated the influence of LMX on knowledge hiding, whereas partially mediated the influence of SSG on knowledge hiding, and (3) the indirect effect of LMX on knowledge hiding through psychological safety is much stronger and more significant rather than that of SSG (see Table 4).

Our results reveal that, in China's service organizations, high-quality LMX does not directly reduce employees' knowledge hiding behaviors but greatly improves their psychological safety, thus effectively inhibiting their motivation/intention to hide knowledge at the more profound psychological level. In contrast, a high-quality SSG can have a more obvious "immediate" mitigating effect on employees'

Table 4 Results for the indirect effect of LMX and SSG on knowledge hiding through psychological safety

The path model of mediating effect	Bootstrap for the indirect effect			
	Point estimate	SE	LL 95% CI	UL 95% CI
LMX → psychological safety knowledge hiding	−0.11	0.04	−0.19	−0.02
SSG → psychological safety → knowledge hiding	−0.03	0.02	−0.07	−0.01

$N = 223$. Bias-corrected CI is reported. Bootstrap sample size $= 5000$

LMX leader–member exchange, *SSG* supervisor–subordinate *guanxi*, *LL* lower limit, *UL* upper limit, *CI* confidence interval

knowledge hiding behaviors. This difference may be because (1) LMX and SSG contribute to different aspects of employee performance (Zhang et al. 2015). Specifically, LMX is based primarily on leader–follower task-related exchanges and thereby generally promotes employees' task-related activities and enhances their task performance (Graen and Uhl-Bien 1995), whereas SSG places more emphasis on high-quality supervisor–subordinate non-work social interactions and personal affective communication, which can more directly stimulate employees' reciprocal exchange of positive extra-role behaviors (e.g., helping) aimed at constructing favorable interpersonal relationships at work (Zhang et al. 2015). Thus, SSG will directly encourage employees to reciprocate their supervisors and organizations by providing knowledge and reducing knowledge hiding; (2) LMX is based on a formal employment contract, and a high-quality formal work-related exchange relationship established by supervisors and subordinates in accordance with the formal employment contract is more conducive to employees obtaining sufficient job resources from formal channels within the organization, thereby enhancing their psychological safety, whereas, in the high-quality SSG context, psychological safety is not necessarily a prerequisite for employees, who pursue social–emotional goals, to decide to provide or not provide knowledge when requested by a colleague. Therefore, it is not surprising that when integrating LMX and SSG into a model, SSG has a significant and direct influence on knowledge hiding and suppress the direct influence of LMX.

It is also noteworthy that there are two key elements of knowledge hiding—an intent to hide and a response to a specific request for knowledge sharing. Thus, knowledge hiding cannot be simply equal to knowledge protecting. In fact, knowledge protecting is merely one of the possible motives for knowledge hiding. In other words, knowledge protecting is just an expression or explanation as to why knowledge hiding occurs. Although knowledge protecting is very similar to one of the components to knowledge hiding (i.e., rationalized hiding) and it is not difficult to speculate that a high-quality LMX/SSG may facilitate knowledge protecting for the interests of the organization, data analytical results did not provide support for the positive LMX–rationalized hiding association ($\beta = -0.08$, *ns*) or between SSG and rationalized hiding ($\beta = -0.01$, *ns*). Therefore, future scholars should investigate more in depth the differences between knowledge hiding (or rationalized hiding) and knowledge protecting.

Theoretical implications

Our findings have several theoretical implications. First, our research has contributed to the knowledge hiding literature by identifying its new interpersonal antecedents. Among the few past research on the interpersonal antecedents of knowledge hiding, most tended to focus on co-worker relationships while omitting leader–follower relationships. Drawing on SET and SCT, this research confirmed that both supervisor–subordinate relationships inside and outside of work negatively and significantly impact employees' knowledge concealment. In this way, the present research has enriched the knowledge hiding literature by shifting the focus of its interpersonal

antecedents from horizontal relationships to vertical relationships and from driving factors to interfering factors.

Second, this research has also contributed to the supervisor–subordinate relationship literature by putting non-work ties to work and examining whether the traditional Western-based theories of LMX and the indigenous Chinese construct of SSG are not the same. Although scholars have already realized the multi-dimensional nature of leader–follower relationships and called for an integration of work ties and non-work ties (e.g., Boyd and Taylor 1998), very few empirical research has been conducted. This research is one of the first we know of that explicitly investigates the differential impacts of work and non-work supervisor–subordinate dyadic relationships on knowledge hiding. Our findings verify and echo previous research (e.g., Zhang et al. 2015, 2017), which advocated that LMX and SSG are interrelated and different from each other. Moreover, consistent with prior research (e.g., Guan and Frenkel 2019), we proved that the close supervisor–subordinate off-work relationship impact employee effectiveness at work, in that a good SSG can be an important and beneficial supplement to a high-level LMX, and the effective integration of the two can minimize knowledge hiding within the organization by different means.

Third, the present work has partially opened the black box of the psychological processes linking LMX/SSG to knowledge hiding. Little research has investigated a mediating mechanism in the association between supervisor–subordinate interactions and knowledge hiding. To make up the limitations in the literature, we explored the mediating effect of psychological safety in this relation. In doing so, this research makes another contribution by introducing SCT to the knowledge withholding research and successfully linking psychological safety to employees' discretionary behaviors. Although prior research has often explained individuals' knowledge sharing behaviors by applying SCT, it is rarely used to provide theoretical lens to the research of knowledge hiding. The present research has bridged the gaps and enriched the understanding of the underlying psychological mechanisms of knowledge hiding.

Practical implications

Our findings offer several managerial implications to avoid knowledge hiding between co-workers in the organizations. First, organizations are encouraged to build and maintain high-quality LMX relationship. On the one hand, the organizations need to strengthen leadership development through selecting or re-assigning leaders that is accepted by employees. On the other hand, a high-quality formal and work-related exchange relationship will be achieved when the organizations can provide proper training to develop constructive leadership behaviors. Specifically, managers should be trained to encourage employees to be creative and arrange some challenging tasks for them, take care of employees' needs and provide them with more job resources, establish good communication channels with employees and provide timely, candid and constructive performance feedback to them, and assist employees in solving work-related problems. In addition, organizations should also strive to enhance the flexibility of the organizational structure and develop work process

which allows more exchanges and cooperation between subordinates and managers. For example, initiatives could be implemented to improve supervisor–subordinate task interdependence. This will promote more frequent and meaningful supervisor–subordinate dialogue regarding daily work.

Second, our results showed that SSG can spill over into the workplace and effectively reduce employees' knowledge hiding behaviors. Therefore, Chinese supervisors should try to develop supportive, trusted, and friendly *guanxi* with their subordinates. To improve supervisors' abilities on constructing and managing close personal ties with their subordinates, organizations can provide training workshops or courses on leadership skills and traditional Chinese *guanxi* cultures and provide examples of leaders in cultivating good SSG. Based on these, supervisors are expected to strengthen the supervisor–subordinate ties that arise from non-work domain (e.g., home visits, caring subordinates for their work activities and private lives).

Third, our results support that psychological safety plays a dominant role in mediating the relation between LMX/SSG and knowledge hiding. Therefore, organizations should build the working environment that is filled with psychological safety and reduce the internal psychological pressures and external interpersonal risks of employees in providing knowledge. We suggest that cultivating an open, honest, trustful, and harmonious atmosphere in the organization is necessary to minimize knowledge hiding. In this respect, organizations should emphasize the learning culture, skill development, communication, cooperation, and mutual trust (Černe et al. 2014) that may help to enhance the employees' psychological safety during knowledge sharing. Because, under this climate, team members would treat continuously surpassing themselves, contributing knowledge, and helping others as the most important criteria of success, while the comparison among individuals is less important (Ma 2016). As such, organizations can promote in-depth cooperation and information exchange among team members and can reduce or inhibit their motivation to undermine their colleagues' access to knowledge (e.g., hiding knowledge) by creating a mastery climate. Specifically, organizations must further clarify the standards of rewards and punishments, provide quality learning and skills development programs and platforms for employees, and vigorously advocate prosocial motivation and cultural values and value co-creation and cooperation.

Last, our findings also have implications for international and cross-cultural HRM practices. Organizations should pay attention to national cultures and societal traditions when managing employees' knowledge hiding behaviors. Especially, for foreign companies that operate business in China, they face cultural challenges (Froese et al. 2019) and thus should consider *guanxi*-related HRM practices (Lee and Zhong 2020), by using managers and employees that have the cultural intelligence to cope with Chinese *guanxi*. These organizations could also enhance supervisor–subordinate mutual understanding on each other's cultural background and thereby reduce their status distinctions. When Chinese employees know their foreign supervisors' cultural specifics at a deeper level and feel easily approach them, supervisor–subordinate friendships and a climate of psychological safety will be created. Such efforts would make Chinese employees in multinational companies that reduce and/or avoid knowledge hiding.

Limitations and future research

Although this research has offered several contributions, it also has limitations. The first limitation concerns the potential common method bias caused by our single-source data. Future research needs to further reduce the risks of our self-reported measures by collecting longitudinal supervisor–subordinate dyadic data. In addition, an experimental design is known to help provide more conclusive empirical evidence on the causal relationships among the variables. Future research could adopt an experimental design in which LMX and SSG are manipulated to observe changes in employees' psychological safety and knowledge hiding tendency.

Second, our focus on psychological safety as a mediator based on SCT only partially revealed the underlying mechanisms linking supervisor–subordinate relationships and knowledge hiding. Future research would benefit from employing other mediators and theoretical perspectives. For example, knowledge has long been seen as a kind of crucial personal resource. According to conservation of resources (COR) theory, people "strive to retain, protect, and build resources" (Hobfoll 1989, p. 516). Thus, employees might hide their knowledge to have more resource surpluses and/or avoiding resource loss. Drawing on COR theory, future research can develop a model that explain how LMX and SSG impact subordinates' job resources and thereby mitigate their propensity to knowledge hiding.

Third, we did not explore the plausible variables that play moderating roles in the LMX/SSG–knowledge hiding relation. In fact, relative LMX/SSG (the manifestation of LMX/SSG's social comparison at the individual level) and LMX/SSG differentiation (the manifestation of LMX/SSG's social comparison at the group level) (Zhao et al. 2019) may also enhance the level of employees' psychological safety and thereby act as a "buffer" in alleviating the tendency of employees' engagement in knowledge hiding. Consequently, future scholars are encouraged to consider the relative LMX/SSG and LMX/SSG differentiation as potential moderators in this mediated model. Another important moderator that attracts future research attention could be unit-level knowledge leadership, which has been proved to have positive impacts on knowledge sharing (Lakshman and Rai 2019) and thus may lead employees to abandon knowledge hiding behaviors.

Fourth, our research did not consider the different facets (i.e., evasive hiding, playing dumb, and rationalized hiding) of knowledge hiding. Therefore, future research should further examine whether LMX/SSG exerts different impacts on the three sub-dimensions of knowledge hiding. Moreover, future research could shed light on this research area by exploring the unique antecedents of rationalized hiding. In particular, in consideration of the protecting information confidentiality or the third party's interests motivations and the ethical-oriented characteristic of rationalized hiding (Zhao et al. 2019), future research should pay attention to those morality-related (e.g., moral awareness, moral attentiveness, moral sensitivity, moral identity and moral disengagement) and responsibility- and-commitment-based (e.g., professional commitment) individual differences in predicting rationalized hiding.

Last but not least, our results indicated that close supervisor–subordinate relationships offer greater psychology safety to subordinates, and this kind of tie has a spillover effect as it may not only mitigate subordinates' non-sharing to their supervisors

but also decrease non-sharing behaviors to their co-workers or the organization. As such, our research echoes Babič et al.'s (2019) and Zhao et al.'s (2019) research, which advocated that LMX can affect how much an employee hides knowledge from his/her colleagues. However, in view that previous research has "focused primarily on knowledge hiding in dyads or without a clearly specified target" (Babič et al. 2019, p. 1514), we advise researchers to extend our model by considering the potential different influences of LMX/SSG on vertical (including top-down and down-top) (Butt 2019; Butt and Ahmad 2019) and horizontal (i.e., targeted at the co-workers) knowledge hiding.

Conclusion

In this research, we demonstrate that both LMX and SSG can boost employees' willingness to help colleagues acquire knowledge through reducing knowledge hiding behaviors. Furthermore, we also provide initial evidence for the crucial role of psychological safety in mediating the functionality of LMX and SSG on knowledge hiding. We suggest that organizations should emphasize internal harmonious relationships between supervisors and subordinates, provide formal and informal exchange platforms and communication channels, and improve employees' psychological safety by establishing a psychological secure environment and a trustful climate. Our findings contribute to the literature by simultaneously considering formal and informal vertical relationships as determinants of knowledge hiding between co-workers.

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