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Voice Game Between Coworkers with Low Relative Leader-member Exchange

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Abstract: Voice behavior is affected by many factors. We focus on employees with low relative leader-member exchange (RLMX) in workgroups which have been ignored, regarding their voice behaviors. The study aims to investigate the effect of the employees' interaction on voice behaviors. We adopt evolutionary game theory to analyze the interaction process. We develop a voice game model and find three stable voice states by proving three propositions. Numerical simulations results also provide support for the propositions. The initial proportion of choosing to suggest affects the convergence velocity to the equilibrium and the benefits or costs of distinct strategies play different roles under different conditions. The finds indicate that employees with low RLMX would consider more before they take voice behaviors.

Key words: RLMX, voice behavior, evolutionary game, numerical stimulation

INTRODUCTION

The core of Leader-Member Exchange (LMX) theory is that the leader would like to develop differential relationships with different subordinates among their workgroups for their limited resources and energy (Liden *et al*., 2006). On the basis of loyalty and ability, the leader forms high quality LMX relationships with some members and shows partiality for them. The leader also forms low quality relationships with other members in the same workgroup (Jiang and Chang, 2010). According to Heider's balance theory, individuals try to keep positive relationship with those who have similar situations. Therefore, coworkers with low RLMX quality are more likely drawn together while members with high RLMX would like to enhance their cohesion (Henderson *et al*., 2009). For lack of the leader's support, subordinates with low RLMX focus more on the positive relationship with coworkers. Some followers want to promote RLMX, thus demonstrate more Organizational Citizenship Behaviors (OCB) to please the superior to obtain more resources or opportunities. However, their friendly behaviors to the superior may offend other coworkers with low RLMX who are not willing to be obedient and could make them lose support from allies.

Voice behavior is the challenging-promotive OCB. Employees will deliberate about the benefits and risks before they engage in voice behaviors (Chiaburu *et al*., 2008). The benefits and risks depend on the leader's or coworkers' attitudes to voice. Because others' inner attitudes are unstable and difficult to be judged, employees cannot make entirely rational decisions. We have discussed the voice game between the leader and employees (Ran and Xu, 2013) and try to find out some rules about the voice game between low RLMX members in the paper. We analyze replicate dynamic and Evolutionarily Stable Strategies (ESS) based on evolutionary game theory and show the evolutionary trajectories of voice behaviors under different conditions by numerical simulations.

THEORETICAL BACKGROUND

RLMX: The concept of RLMX quality roots in LMX theory. Due to manager's preference, she/he keeps high quality LMX relationships with some employees and low quality relationships with others. Coworkers' relative different status in the relationships with the manager is the core of RLMX. Henderson *et al*. (2008) defined RLMX as 'an employee's LMX quality relative to the average LMX quality within a work group'. Tse *et al*. (2012) consider it as 'the degree to which an individual's LMX differs from the average LMX of other coworkers in a workgroup. High RLMX means that a follower's LMX quality is higher than average LMX level in a workgroup while low RLMX means one's LMX quality is lower than average level.

Researches have revealed that different treatments by the leader may result in employees' unfair perceptions with low RLMX and then lead to their interaction with coworkers of similar RLMX (Sias and Jablin, 1995). Sherony and Green (2002) also confirmed that coworkers would like to develop high interpersonal relationship with those in similar LMX quality. Therefore, employees with

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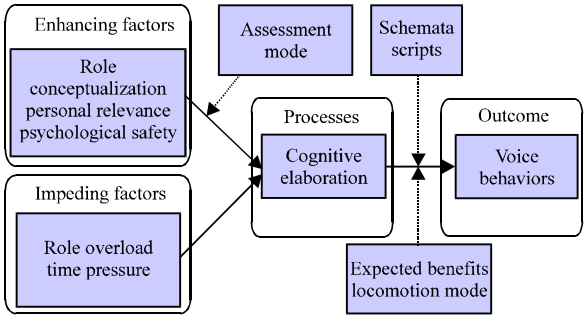

Fig. 1: Chiaburu's model of voice behaviors (2008)

low RLMX are more likely allied to face unfavorable treatment together and obtain psychological security in workgroups.

Voice behavior: Voice behavior is defined as expressing one's constructive suggestions to improve management and workgroup's performance (Chiaburu *et al*., 2008). Voice is different from complaint. The former reflects employees' goodwill to help the leader promote work and the latter is just to release dissatisfaction. There are voice toward coworkers and voice toward the manager. We focus on speaking up (voice toward the manager) for its complexity. Voice behavior is a kind of challenging extra-role behaviors and it implies criticism though it intends to make better. Figure 1 reveals the influencing factors and cognitive elaboration processes before subordinates engage in voice behavior (Chiaburu *et al*., 2008). Obviously, whether to choose voice relies on many factors. Once any factor changes, employees may turn to keep silence.

RLMX and voice behaviors: In terms of social comparison, RLMX influences employees' job attitudes and behaviors. If an employee's RLMX is high, she/he will be proud of her/his relative status and identify with the leader more (Liu *et al*., 2010). They feel obligated to warn the leader due to the norm of reciprocity (Epitropaki and Martin, 2013). Voice behavior is more like a duty than a strategy for members with high RLMX. However, members with low RLMX concern more about speaking up. Some of them want to speak up to increase RLMX quality, other members choose silence or obedience to favor the leader and the others may revenge for ignored by the leader. They think about not only the leader's possible reaction, but also other coworkers' feelings with low RLMX. According to Chiaburu's Model, psychological safety is an important factor to decide voice behaviors. Other allies' attitudes to voice behaviors will affect the extent to which employees perceive free and openly to express suggestions to the manager. They will line up with the allies in a workgroup unless the benefit of disconformity is greater than that of ally.

Table 1: Payoff matrix of voice game

	Employee B	
Employee A	(B1) Voice	(B2) Silence
(A1) Voice	u_1, u_1	u_3, u_4
(A2) Silence	u_4, u_3	u_2, u_2

ASSUMPTIONS AND EVOLUTIONARY GAME MODEL

Assumptions: When finding problems in work, out-group members have two choices: voice or silence. They may choose to speak up for many reasons, such as supporting the leader's management, speaking for coworkers or just embarrassing the leader. They also have some reasons to keep silence, such as retaliating upon the superior, avoiding displeasing coworkers or feeling low self-efficacy. Whether to speak up or not depends upon the net benefit that each strategy brings and the process that coworkers interact on each other. The evolutionary model from which voice behaviors arise is a dynamic game system. To simplify complicated situations, we make some assumptions as following:

- We suppose member with low RLMX in a work group is more than one, yet the game just happens between two employees both with low RLMX
- The different benefits individual gets in the game have nothing to do with her/his characteristics, just relates to her/his different strategies
- The leader's attitude towards members' voice behaviors with low RLMX is frequently negative, though they welcome members' suggestions with high RLMX

Let u_1 be the net benefit when two employees both suggest, u_2 be the net benefit when they both keep silence. U_3 represents the net benefit from voice behavior and u_4 from silence when the two coworkers' behaviors disaccord. Set $u_1, u_2, u_3, u_4 \geq 0$. The payoff matrix of game is shown in Table 1. There are four strategy combinations: (A1, B1), (A1, B2), (A2, B1), (A2, B2). Their net benefit combinations are correspondingly (u_1, u_1), (u_3, u_4), (u_4, u_3) and (u_2, u_2).

We think the benefit of voice behavior set as R_1 lies in self-expression, pleasure of speaking out or even expectation of superiors' recognitions. The benefit of

silence set as R_2 comes from self-protection or pleasure from retaliation. C_1 is set as the cost of offending the leader and C_2 represents the cost of displeasing the coworker. Generally speaking, employee's silence will not give offense to the superior. The benefit and cost of speaking up alone are both greater than those of speaking up together. When two employees take different actions, they would dissatisfy the other one. The net benefits are calculated as following:

$$u_1 = \frac{R_1 - C_1}{2} \quad (1)$$

$$u_2 = R_2 \quad (2)$$

$$u_3 = R_1 - C_1 \quad (3)$$

$$u_4 = R_2 - C_2 \quad (4)$$

Duplicated dynamics equation and ESS: Employees' proportion of voice behavior is p and keeping silence is 1-p. According to the payoff matrix above, the duplicated dynamics equation is as follows:

$$F(p) = p(1-p)[p(u_1-u_4)+(1-p)(u_3-u_2)] \quad (5)$$

Substitute (1-4) into (5):

$$F(p)=p(p-1)[p*\frac{R_1-C_1-2C_2}{2}-(R_1-C_1-R_2)] \quad (6)$$

There are three stable states at most:

$$p_1^*=0,\ p_2^*=1,\ p_3^* = \frac{2(R_1 - C_1 - R_2)}{R_1 - C_1 - 2C_2}$$

Only as $F'(p^*)<0$, the point p^* is the ESS (Zhu and Dou, 2007).

Proposition 1: When $R_1-C_1<2C_2<R_2$, $p_1^* = 0$ is the ESS of the game:

- Prove: If $R_1-C_1<2C_2<R_2$, then $F'(0)<0$, $F'(1)>0$ and $F'(p_3^*)>0$
- $\because$ Only $F'(0)<0$
- $\because$ $p_1^* = 0$ is the ESS

Proposition 1 indicates that if employees find the net benefits of silence are greater than those of voice, all rational employees wouldn't scruple to keep silence. The phase diagram of (6) is shown in Fig. 2.

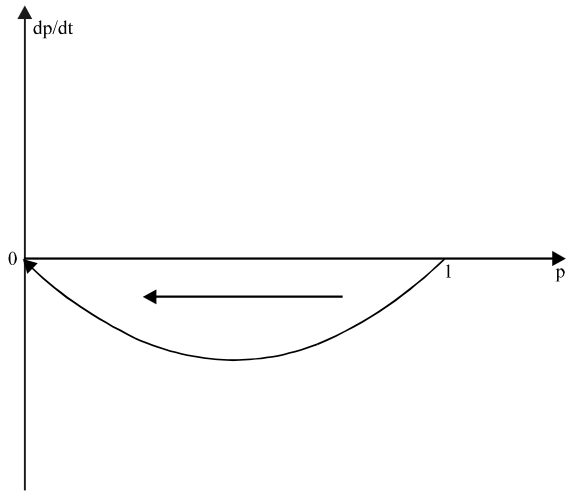

Fig. 2: Phase diagram of proposition 1

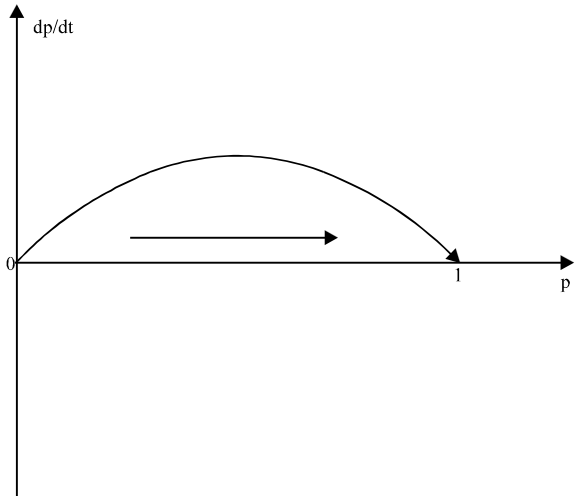

Fig. 3: Phase diagram of proposition 2

Proposition 2: When $R_1-C_1>2C_2>R_2$, $p_2^* = 1$ is the ESS of the game:

- Prove: if $R_1-C_1>2C_2>R_2$, then $F'(0)>0$, $F'(1)>0$ and $F'(p_3^*)>0$
- $\because$ Only $F'(1)>0$
- $\because$ If $R_1-C_1>2C_2>R_2$, p_2^* is the ESS

We can conclude that $u_3>u_2>u_4$ and $u_1<u_3$, the maximum benefit comes from speaking up when the other member keeps silence. However, proposition 2 tells us that the game would evolve to the state of (A1, B1) due to two players' maximizing their own benefit. The phase diagram of (6) is shown with in Fig. 3.

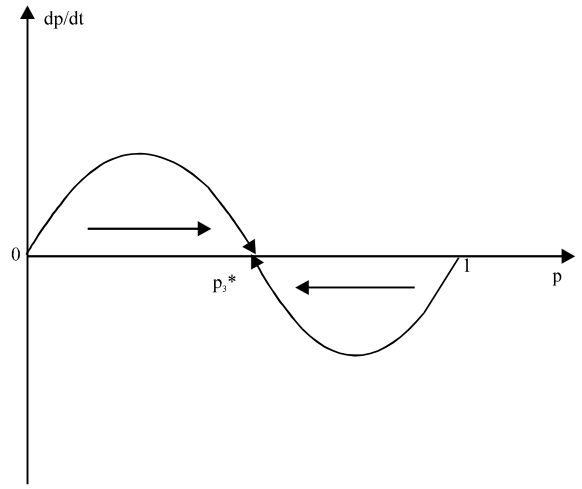

Fig. 4: Phase diagram of proposition 3

Proposition 3: When $R_2<R_1-C_1<2(R_2-C_2)$:

$$p_3^*=\frac{2(R_1-C_1-R_2)}{R_1-C_1-2C_2}$$

is the ESS of the game.

- Prove: If $R_2<R_1-C_1<2(R_2-C_2)$, then $F'(0)>0$, $F'(1)>0$, only $F'(p_3^*)<0$
- ∵ Only $F'(p_3^*)<0$
- ∵ $p_3^*=\frac{2(R_1-C_1-R_2)}{R_1-C_1-2C_2}$ is the ESS

Proposition 3 shows us under the condition of $R_2<R_1-C_1<2(R_2-C_2)$,that is $2u_4>u_3>u_2$, some employees choose to speak while others choose silence. The proportion of speaking up will evolve to:

$$\frac{2(R_1-C_1-R_2)}{R_1-C_1-2C_2}$$

and the proportion of keeping silence will evolve to:

$$1-\frac{2(R_1-C_1-R_2)}{R_1-C_1-2C_2}$$

The phase diagram is shown in Fig. 4.

Based on the above analysis, we conclude there are three stable states: (0, 0), (1, 1) and:

$$(\frac{2(R_1-C_1-R_2)}{R_1-C_1-2C_2},1-\frac{2(R_1-C_1-R_2)}{R_1-C_1-2C_2})$$

NUMERICAL SIMULATION OF DYNAMIC EVOLUTION

With MATLAB 7.1, we analyze how different initial value points develop to equilibrium points and how the benefits and costs influence evolution tracks by numerical simulation. X axis shows time and y axis represents p.

Influence from initial value points: The initial proportions of employees taking voice behavior are valued as 0.3 and 0.7. Under the above three preconditions, the evolution tracks are concordant with our propositions.

With proposition 1, we set $R_1 = 5$, $R_2 = 5$, $C_1 = 3$ and $C_2 = 2$ to meet the precondition $R_1-C_1<2C_2<R_2$. In Fig. 5a, we can find that the initial proportion of voice is greater ($p_0 = 0.7$), the speed approaching to the equilibrium point $p_1^* = 0$ is faster. On the contrary, the initial proportion is smaller ($p_0 = 0.3$), the evolution curve is more gentle to $p_1^* = 0$.

With proposition 2, we assign R_1, R_2, C_1 and C_2 as 8, 3, 3, 2 to meet the precondition $R_1-C_1>2C_2>R_2$. Figure 5b shows us the evolution tracks to the equilibrium point $p_2^* = 1$. Smaller the initial proportion is, steeper the evolution curve is. The curve $p_0 = 0.3$ approaches $p_2^* = 1$ faster than the curve $p_0 = 0.7$.

With proposition 3, let $R_1 = 12$, $R_2 = 8$, $C_1 = 3$ and $C_2 = 2$ to meet the precondition $R_2<R_1-C_1<2(R_2-C_2)$. Figure 5c shows the evolution tracks from both sides towards the equilibrium point:

$$p_3^*=\frac{2(R_1-C_1-R_2)}{R_1-C_1-2C_2}$$

If the original employee proportion of choosing voice is less than p_3^*, the proportion will rise to p_3^*. And the original proportion p_0 will drop to p_3^* when it is greater than p_3^*. The more different p_0 and p_3^* are, the faster the proportion approaching to p_3^*. Otherwise, the less different p_0 and p_3^* are, the slower the proportion approaching to p_3^*.

The influence from benefits and costs: The initial propositions in Fig. 6a-c are still 0.3 and 0.7 for contrast. We can find the variations of benefits and costs affect the evolution curves' steepness.

Under the condition of proposition 1, we double the benefit R_2 and cost C_2 of silence. $R_1 = 5$, $R_2 = 10$, $C_1 = 3$ and $C_2 = 4$. Figure 6a reveals the evolution curves. We compare Fig. 6a with Fig. 5a and find the curves become cliffy apparently, which means p approaches zero more rapidly. Apparently, the benefit of silence has greater impact on employees than the cost of silence.

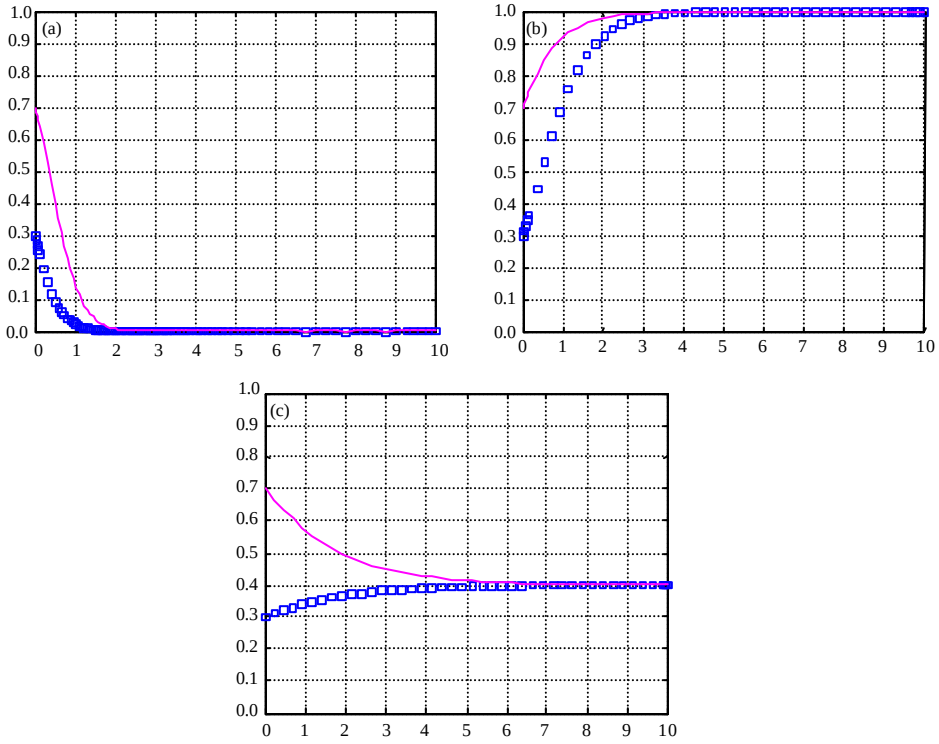

Fig. 5(a-c): Effects from initial proportions, (a) Proposition 1, (b) Proposition 2 and (c) Proposition 3

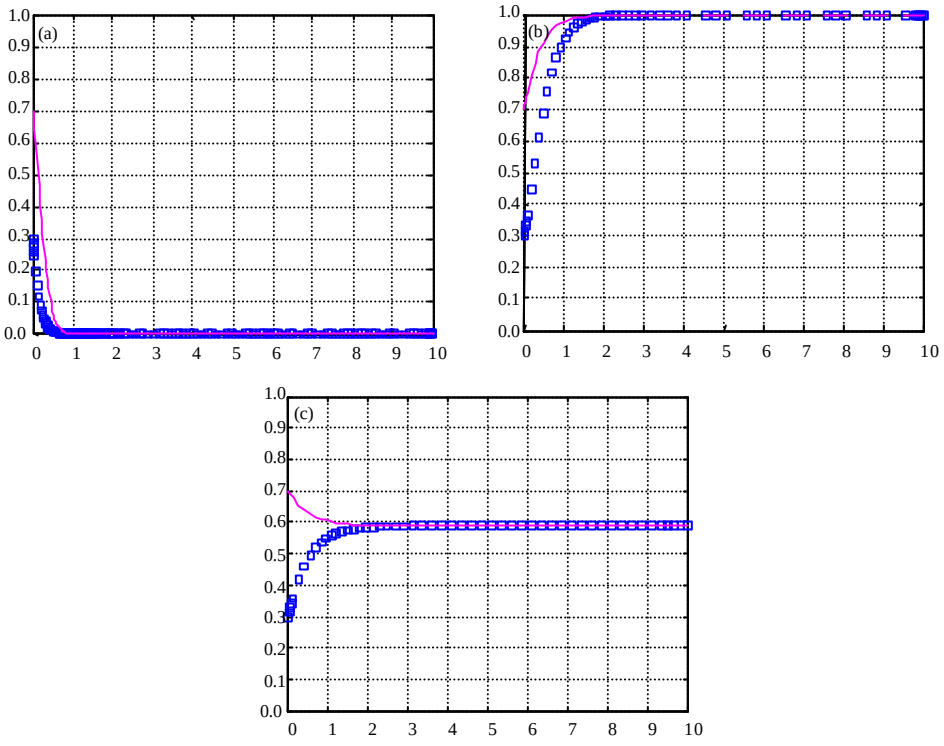

Fig. 6(a-c): Effects from benefits and costs with, (a) Proposition 1, (b) Proposition 2 and (c) Proposition 3

With proposition 2, we assign the value two times to all parameters: $R_1 = 16$, $R_2 = 6$, $C_1 = 6$ and $C_2 = 4$. Comparing Fig. 6b with Fig. 5b, the convergence velocity of the evolution curves in Fig. 6b is faster than that in Fig. 5b. The impact of R_1 is greater than other parameters under the condition of R_1-C_1>$2C_2$>R_2.

In proposition 3, we are well aware of the effects of all parameters for:

$$p_3^* = \frac{2(R_1 - C_1 - R_2)}{R_1 - C_1 - 2C_2}$$

As R_2 increases or C_2 decreases, fewer employees will choose voice strategy. As R_1 or R_1-C_1 increase, more employees will speak up. To understand the integral effects as R_2, R_1 or R_1-C_1 increase simultaneously, we set $R_1 = 24$, $R_2 = 16$, $C_1 = 3$ and $C_2 = 2$. C_1 and C_2 are the same as those in Fig. 5c, while the values of R_1 and R_2 are doubled. Compared with Fig. 5c, the stable state in Fig. 6c shift up to about 0.6 and the rapidity of convergence becomes much faster. We can find the impact of R_1 is greater than that of R_2 with the condition of proposition 3.

CONCLUSION

Voice behavior is challenging and subordinates will engage in more cognitive effort before they decide which issues to speak up. We choose employees with low RLMX as the object of the study and probe the game between two individuals on voice behavior. On the basis of assumptions and the payoff matrix, we build up the duplicated dynamics equation and prove three propositions to find out three evolutionarily stable strategies under different conditions. Numerical simulation results confirm the propositions and show us the parameter effects. Empirical study need be carried out to test our model and propositions in reality.

Previous studies have discussed voice behavior's situational cognitive factors including management style, LMX, citizenship pressure and organizational voice climate (Duan and Zhang, 2012). Little attention has been paid to coworkers' role. Our findings may expand future studies on voice behavior and silence. Individuals in collectivism culture concern interpersonal relationship more between coworkers when making decisions. It reminds the leader in a workgroup that subordinates with low RLMX will consider more carefully before speaking up and be easier to keep silence. The leader need shorten psychological distance with them or create group climate favorable for voice to listen. Certainly, actual situation is more complicated than that in our study. Many factors combine together simultaneously. Future research could address how the leader's and coworkers' attitudes play role jointly. Future study can also measure the effects of some localized factors in Chinese community such as guanxi or face on voice behavior.

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