

# An Analysis of the Effects of Firm-government Network on Management Innovation

Zhong Jingjing<sup>1</sup> Gu Guoda<sup>1</sup> Han Jiangping<sup>2</sup>

1 School of Economics, Zhejiang University, Hnagzhou, P.R.China, 310027

2 Institute of Business Administration, Kiel University, Germany, 24118

(E-mail: Guguoda@zju.edu.cn, Benin@126.com, jp\_han@gmx.de )

**Abstract** In this paper we examine the effects of institutions on firms' management innovation. By proposing an externally embedded network perspective on firm performance, we demonstrate how the firms are influenced by the external institutional structure. In the framework of China's economic development, there are strong links between firm and local government, and these links will significantly influence the firms' management innovation ability. Thus, this paper focuses on the firm-government network as a driving force to the firm management innovation ability and behavior. Furthermore, we study the network value of firms' internal and external networks in the effects of firm-government relationship using a simple game-theoretical model. In the end, some implications to the firms' management innovation strategies are proposed in the effect of firm-government relation.

**Key words** firm organization, institutional embeddedness, management innovation, social network

## 1 Introduction

The nature of the firm has explained by institutional theory through a series of socio-institutional framework of rules, conventions and constraints (Oliver, 1996<sup>[1]</sup>; North, 1971<sup>[2]</sup>). In order to be survival and gain success, organizations conform to gain resources and get close to institutions. While management research has accepted the importance of institutions in firm behavior, the role of networks, especially, the political network is becoming more important in China's status quo.

This paper examines the effects of institutions in firms' management innovation, and specifically, we focus on the firm-government network as a driving force to the firm management innovation ability and behavior. By proposing an externally embedded network perspective on firm performance, we demonstrate how firms are influenced by the external institutional structure. Furthermore, we study the network value of firms' local and external networks in the effects of firm-government relationship using a simple game-theoretical model, to show that the value of network power increases in the complexity of external network decreases and if the ability of the communication flow of internal social network increases.

## 2 A Network-based Perspective

### 2.1 Institutional Embeddedness

While neoclassical theory neglects the emergence of incomplete contracts, opportunistic behavior and differing incentive schemes, institutional economics and new institutional economics allow for market imperfections in economic transactions. The introduction of formal institutions leads researchers to investigate and incorporate a focus on informal constraints, principally norms and networks. Norms is a general agreement on conduct, emerging in networks through constant interaction between actors. If there is a general agreement on cooperation being the norm between all members, network contributes to this effect through following ways: a) by communicating, actors can agree on norms or adapt strategies proven successful in transactions, b) actors can communicate experiences and information with other actors, building up actors' reputation in the network, c) actors not keeping to the norms can be sanctioned by other members in the network. These three mechanisms promote the function of norms and constraints which in turn help to maintain the cooperation. Compared with the formal contracts, these instruments are less costly in monitoring and enforcement.

When actors repeatedly interact with each other in social and also economic domains and thereby they might share common knowledge and information about each others' choices can be modeled using game-theoretic approach (Kandori, 1992<sup>[3]</sup>; Bendor and Swistak, 2001<sup>[4]</sup>). Through repeated interactions they generate implicit rules, community norms, emerging as an equilibrium outcome over time. Hence, the emergence of norms is also strongly connected to network structure, which will be discussed in the following section.

### 2.2 Structural Embeddedness

Firms are embedded in the networks of social relationship that may involve the state, families, professions, religion and ethnicity (Granovetter, 1985<sup>[5]</sup>). A number of researchers have incorporated embeddedness into firm behavior and outcomes. The networks have been found positively influencing firm performance, product innovation at the firm level, and enhancing the individual's power and career mobility at the employee level. Research on personal networks of entrepreneurs revealed that entrepreneurs perceive and exploit business opportunities in disconnected networks (Burt, 1992<sup>[6]</sup>), obtain information, advice and social support from network alters, furthermore, networks help to control and manage exchange structures and access financial capital.

From the structure perspective, the networks of relationships interact with institutional influences to underlie the processing of issues and alternatives for answers in organizational moves. The structural networks vary from degrees of strengths and various compositions in society, thus they provide an intriguing opportunity to explore the effect of institutional influences on organizational performance.

Organizational variables in the management theory are differentiating, describing the degree of unit's specialization, intensity of inter-firm interdependence, depending on asset specification, uncertainty, frequency and complexity of interdependent activities. From this point, for a firm in business, the networks could be built partly upon their senior executives' private and professional working relationships, and partly through their expanding market exchange relationships and organizational routines. Firms differ in the nature and strength of their social ties and connections with others in an institutional framework. The firms under embedding in different institutional environments could behave extreme differently, furthermore, different degrees of institutional relationship define the extent to which firms are related to, and the outcome that firms could yield.

Specifically, as "institution" is a multidimensional concept, we specify the firm-government relationship as network norms and structures in our research. According to the above arguments, we emphasize the institutional embeddedness, specifically, the firm-government network in the firms' performance, and we will demonstrate our arguments using a simple game-theoretic approaching in the following section.

### 3 The Value of Firm-government Network

#### 3.1 A Simple Model

As the above arguments indicate, the firm-government relationship in China could be divided into formal relation, who describes the routine business between firm and local governments, and informal relation, which casts light on the personal relationship between the managers of firm and political officers. Furthermore, as the officers of local government try best to maximize their own payoffs, they set up the relationship with upper level officers, seeking for the high chance of promotion. For the firms, they will not only be willing to get support from local jurisdiction, but hope to find more business opportunities for expansion or other beneficiaries.

We consider one specific trade between the local government (G) and a local firm (F). Local administrations have to make efforts or issue contract with firms to accommodate demands for more land, tax reduction or other politically controlled resources by firms. If the two players are able to reach the agreement, the local government could get political support and community support from local firms, the firms in other side, intent on exploiting different local incentives, tend to have economical support. The following strategic form (Tab. 1) describes the two-player infinitely repeated game, where each player can either cooperate (c) or defect (d). Due to the position of local government and firm, we assume they cooperate when they agree to sign the contract on specific issue, defect of firm comes from the situation where firm would not obey the contract as signed; defect of the local government means corruption and other related behavior from the political bureaus.

**Table 1 Infinitely Repeated Two-Player Matching Game**

	Firm		
	C	D	
Local Government	C	$(R_m, R_m)$	$(b, a)$
	D	$(a, b)$	$(0,0)$

Where  $m \in \{h, l\}$ , the payoff in the game satisfy  $a > R_h > R_l > 0 > b$  and  $a + b \leq 2R_l$ . Besides, following Annen (2003) individuals have a discount factor  $\delta \in (0,1)$ , which is assumed to be the same for both players. As the status of nature, players have no social connections, individuals are not able to recognize themselves in different stages of the game, and defection in each stage is the dominant

strategy. Prison's dilemma and the equilibrium would be both players choose defection. Under this situation, no long-term trade and cooperation occurs.

Now we consider the firm and local government have integrated in a social network, as defined earlier, individuals are able to build themselves reputation within the network. If a network can provide information about an individual's history, individual cares for his reputation, which may induce them to behave cooperatively. Any defection is possibly punished in the network. We argue the incentives for each of the player to cooperate are influenced by both the external social network (ESN) and internal social network (ISN).

### 3.1.1 Internal social network (ISN)

Before the privatization, the government's non-financial interests in firms and firm's dependence on government for bailouts and subsidiaries create a mutual dependence between government and firm. It refers to the information sharing among social actors which is facilitated by a high degree of relational embeddedness in the social network. As *Local Corporatism* theory strengthens, the mutuality describes the government's dependence upon firms for physical output and the provision of employment and social welfare constraints its ability to discipline firm with the threat of closure, thus the member of Chinese community is more likely to be obtained information and hope to gain exchange benefits from acquaintances and families, which is demonstrated by Granovetter (1973) as "strong ties" and "weak ties" respectively. As Krackhardt (1992) argues that in an organizational domain, information exchange is highly dependent on the degree of emotional closeness among social actors, the members of local community still have strong ethnic and emotional connections between each other. Thus, for individual player in the local community, either local bureau or the local firm has the opportunity to form an internal network in favor of his own interest. The communication and specifically, the quality of information transmission in the network lead to the quality of performance.

**Definition 1.** Communication in the internal network is reliable with probability of  $q(n_i, \theta)$ , where  $q(n_i, \theta)$  depends on the inclusiveness of the internal network  $n_i$  and the communication level  $\theta$ .  $\partial q(n_i, \theta) / \partial n_i < 0$ ,  $\partial q(n_i, \theta) / \partial n_i \partial n_i > 0$ ,  $\partial q(n_i, \theta) / \partial \theta > 0$ . It defines the probability of being discovered in next period,  $1 - q(n_i, \theta)$  is the probability of not being discovered in the next stage.

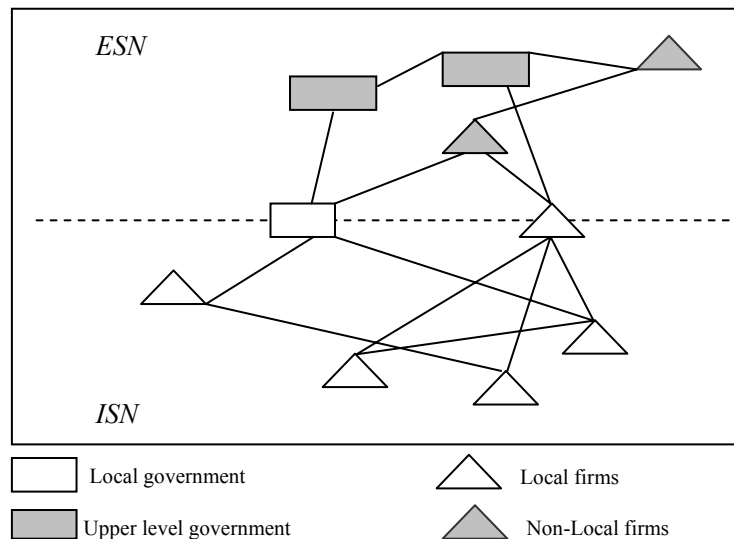


Figure 1 Illustration of ISN and ESN

From the definition above, probability of not being discovered after defection decreases as the size of the internal network increases, it is compatible with the reality that, when the business organization become much more in the jurisdiction and the local government seeks the most possibility of attracting the investment, local government has less interest on controlling the existed rural enterprises, thus increase the probability of being detected for firm's defection behavior. Another important factor affecting the probability is communication, the higher the communication level is, the higher the

probability of being detected will be. This definition argues the relational embeddedness should enhance the information utilization and reduce the opportunity behavior .

### 3.1.2 External social network (ESN)

Tian (2001) develops a theoretical framework to capture the external management of TVE managers to highlight his public-relation ability, and write the external ability into firms' production function. Extending Tian's notion on external management ability, we argue the external social network (ESN) of individual player. The external network of rural firm managers is the capacity to negotiate with non-community political bureaus and other business suppliers or customers outside the community. As a whole, ESN states the connections outside the community. On the way of achieving the organizational objectives, information acquisition is not a discrete event, but rather a part of multi-stage multi-level process. We assume the effect of ESN is constrained through the complexity of the exchange setting. The definition below captures the fact that in the exchange relationship of external network either "high-match" or "low-match" are being considered when the two players agree to cooperate, here the cooperative payoff of matching are written as  $R_h$  and  $R_l$ , where  $R_h > R_l$ .

**Definition 2.** Suppose complexity in the external network is reliable with probability of  $p(n_E, \phi)$ , where  $p(n_E, \phi)$  depends on the size of external social network of players and the complexity of the exchange setting  $\phi$ . The probability of low payoff is twice differentiable function as well,  $\partial p(n_E, \phi) / \partial n_E < 0$ ,  $\partial p(n_E, \phi) / \partial n_E \partial n_E > 0$ ,  $\partial p(n_E, \phi) / \partial n > 0$ . The probability of high-match is given with probability  $1 - p(n_E, \phi)$ .

It states the probability of a low payoff increases as complexity of the external exchange setting increases. For instance, Berliant et al. (2001) emphasize that the size of a city influence the efficiency of knowledge exchange. That is, for the local government, when it is intervened by the upper level the government, his incentive to behave well in the local community would be impacted; for the local firm, the more ties can be regarded as an opportunity set for firms as a lubricant to reduce transaction costs. When there is complicated external network existed, this means, the possibility for him to invest in this local area will affected, and thus the probability of low payoff increases. Note the complexity is determined externally to the network, it is a feature of the whole exchange setting in which the network operates.

### 3.2 The Strategic Performance

Following from the definition described above, the strategy to cooperate in each stage  $t$  for both players is a sub-game perfect equilibrium if and only if

$$\pi_i(c_i^t, c_{-i}^t) \geq \pi_i(d_i^t, c_{-i}^t) \quad i \in \{G, F\}, \forall t \quad (1)$$

Where  $\pi_i$  is the discounted payoff of player  $i$  of the infinitely repeated game and  $c_i^t, d_i^t$  denote the actions cooperate and defect in each stage respectively. Considering both the communication in internal social network and the complexity structure of external network, the self-enforcing condition (1) holds, if

$$\frac{[1 - p(n_E, \phi)]R_h + p(n_E, \phi)R_l}{1 - \delta} \geq a + \frac{\delta[1 - q(n_I, \theta)][(1 - p(n_E, \phi))R_h + p(n_E, \phi)R_l]}{1 - \delta} \quad (2)$$

The inequality above denotes the expected discounted payoff of one individual when cooperating on the left-hand side and the expected payoff when defecting on the right-hand side. The transformation of the equality leads to the network positive enforcing power as follows:

$$S(n_I, n_E, \theta, \phi) = \frac{[(1 - p(n_E, \phi))R_h + p(n_E, \phi)R_l][1 - \delta + q(n_I, \theta)] - a(\delta - 1)}{1 - \delta} \geq 0 \quad (3)$$

In order to sustain the cooperative equilibrium given the structure of the game above, we need firstly set the discount factor  $\delta$  to be high. Besides, it is clear to see that positive enforcing power of whole network  $S$  in an increasing function of communication embeddedness of internal social

network  $q(n_i, \theta)$ , and a decreasing function of complexity of external network  $p(n_e, \phi)$ . The value of network power increases in the complexity of external network decreases and if the ability of the communication flow of internal social network increases. As expanding theoretical definitions of Annen (2003) [7], we put the network game theoretic performance analysis in the framework of local government and local firms, emphasizing the network effect of intern-organizational relationship. The same as the theoretical study, we find the relevant empirical observations discussed below.

## 4 Conclusions

### 4.1 Local-oriented Business Strategy

As the theoretical model implies, a local oriented business strategy would increase the network management innovation ability of specific firm. Although China is approaching to the market economy, the long history of local corporatism is still dominating the social norms; the dynamics of network evolution are path-dependent. Those with higher initial social position are likely to have more high status and resource rich players in their network, and these network clusters may function as closed societies.

Embedded local ties are those with which an actor has a high proportion of exchanges and close interaction, as opposed to less frequent, less close arm's-length ties. Network ties transmit information and are thought to be especially influential information conduits because they provide salient and trusted information that is likely to affect behavior. To this extent, the internal networks with close ties help to speed up the communication and transparency in the local community, thus help to overcome the uncertainty of the imperfect institutional market. From these arguments, we suggest the firms to attain a close networks with local organizations and local firms, to search for a more effective collaboration.

### 4.2 Serious Attention on the 'Go out' Strategy

As many firms and local government emphasize the 'go out' management innovation strategy, it is skeptical to challenge with this slogan regardless of the business overall performance. According to the theoretical analysis, the complexity of the external network will decrease the player's network value, and decrease the success probability of the management innovation.

Thus, the external management should be organized to "small-world" principles (Watts, 1999<sup>[10]</sup>). The best network has local clustering into dense sub-networks, short paths between all actors, and relatively few ties. We believe those strategic conceptions helpful implications for the firm management, that is, firms are highly constrained in their ability to form a network that is maximally efficient with respect to some property, the firms should be pay more attention on the 'go out' strategy. As the figure below indicates, for the local actors, they are confronted with a field of tension of regional and local orientation which has great importance for future development, the openness reform helps local actors to face with the communication radius widen on a regional scale. Interpersonal relations tend to be woven more and more in unlimited loose and open network structures with complexity. If the firms are used to the local orientation strategy, based on spatial closeness and mutual dependency, they confront with the regional competition with more challenges.

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