

# **Is The Structural-Hole Thesis Culturally Parochial? A Formal Approach\***

**Sun-Ki Chai and Mooweon Rhee, University of Hawai`i**

## **Abstract**

Being intrigued by a disproportionately small number of empirical studies on Burt's (1992) structural-hole thesis, as well as the contention that the predictive accuracy of the thesis differs across cultural contexts, this note develops a formal model that helps understand the relationship between culture, social norms, and structural holes. We first present a network model that features cooperation in a closed group and the effects of an actor's initiation of ties with out-group members. We then discuss how our model addresses the cultural variation in the outcome of structural holes.

Social networks in various levels of human society have been shown to serve as an important form of social capital, providing network members with economic returns and social gains (Lin, 2001). Network scholars in the disciplines of organizational sociology and organizational management have long focused on social capital stemming from an actor's advantageous structural position in networks (e.g., Burt, 1982, 1992; Coleman, 1990; Podolny 2005). In particular, Burt's (1992) theory of structural holes provides an innovative and provocative proposition over the benefits of an actor's network location in accessing social capital. Burt extends Granovetter's (1973) notion of the "bridge in the network" and suggests that actors located in networks rich in structural holes, which exist between two unconnected contacts, are blessed with two types of benefits: information benefits and control benefits. Non-redundant contacts offer more unique, diverse, and timely access to information benefits, while brokering the connection presents opportunities for greater bargaining power and control benefits over resources or outcomes. Burt's structural-hole thesis is supported by abundant empirical evidence, along with findings of contingency factors that affect the strength of association between structural holes and information/control benefits (see Burt, 2000 for a review), including the number of peers (Burt, 1997), network content (e.g., Podolny and Baron, 1997), network updating (Rhee, 2004), balance between knowledge and power (Reagans & Zuckerman, 2006), and direct versus secondhand brokerage (Burt, 2007)

Despite numerous corroborative studies on the benefits of structural holes in the U.S., however, we observe little research supporting the structural-hole proposition outside of the U.S., particularly, in the Asian settings. There are only a few studies that have attempted to test for the proposition using an Asia-based dataset. Perhaps the most notable is Xiao and Tsui's (2007) recent study, which finds strong evidence of a *negative* return to individuals who occupy

structural holes in “high commitment” Chinese organizations. Bian’s (1997) study of job search in Tianjin, China also shows that in contrast to the structural hole thesis, ties formed with disconnected others are more likely to be strong than weak.

Our review of the publications in an Asia-focused journal (*Asia Pacific Journal of Management*) and a global-oriented journal (*Journal of International Business Studies*) shows, for example, that there have been 11 empirical studies on social networks, of which nine papers discuss Burt’s (1992) structural-hole theory to a varying extent. However, no studies present empirical tests for the structural-hole hypotheses. One may attribute such lack of empirical studies to a disproportionately small number of network scholars in the Asian (non-Anglophone) countries. According to our personal conversations with three Chinese and Korean scholars who were Burt’s doctoral students at the University of Chicago, however, it seems that structural holes in Asian society operate in different, even opposite, ways. Our research note begins with a theoretical question of whether the structural-hole argument is limited to American (or Western) society.

The purpose of this paper is to establish the beginnings of a formal apparatus that could be used to investigate the structural-hole thesis, one that furthermore could provide a means to investigate cultural differences in norms relating to behavior in networks. This, we believe, helps provide a more generalized form of propositions on structural holes. In their comparative study of French manager and American managers, Burt, Hogarth, and Michaud (2000) find that French managers are less comfortable with bridge relationships to colleagues not close to one another. Although their finding is recognized as a first attempt to discuss national culture as a significant contingency factor in the operation of structural holes, however, we have little knowledge of the generic, as well as more comprehensive, mechanism by which national culture

affects actors' networking tendencies leading to variation in the valuations of structural holes (Galaskiewicz, 2007; Kilduff and Tsai, 2003). Obtaining such knowledge also contributes to studies of national culture in that it helps incorporate an important relational construct, structural holes, into subjectivist cultural models, such as individualism-collectivism (Morris, Podolny, and Ariel, 2000).

Prior research has hinted that three dimensions of actors' networking tendencies can be considered in order to understand cultural variations of structural holes. The first dimension is cultural variation in the pressures of a structural hole on the holder (i.e., ego) of the structural hole. Podolny and Baron (1997) and Krackhardt (1999) show that a structural hole constrains ego to appease different, competing norms from two disconnected contacts (i.e., alters). It is possible that cultural variation in the level of tolerance of facing competing norms may result in variation in the control effect of structural holes (cf. Galaskiewicz, Bielefeld, and Dowell, 2006). The second dimension of cultural variation concerns the extent to which ego is punished or invites retaliation by alters (and other actors eventually). Cultural variation in treatment toward an ego who takes advantage of brokerage position may lead to variation in the expected information and control benefits of structural holes. It is more likely in the Far East than in the West that "interactions will be repeated and that alienating network contacts for short-term gains may undermine transactions later on" (Galaskiewicz, 2007: 7). For example, there is substantial anecdotal evidence from East Asian corporations showing that individuals who seek to develop ties across company borders or even departmental units are looked on with great suspicion, and are rarely promoted to high positions. Finally, the literature also spotlights the possibility of cultural variation in the extent to which a structural hole is likely to be closed. Actors attempt to take various strategies in order secure structural holes (Burt, 2005), yet it is obvious that a

structural hole does not endure permanently (Burt 2002; Johnson 2004). A short-lived structural hole may be less beneficial to actors given the cost of creating the structural hole.

In this paper, we start by exploring the effects of closure and structural holes on the individual and collective welfare of members of a group. We find that, in general, groups with fewer structural holes can sustain higher levels of cooperation, but that actors who occupy structural holes in a group that is otherwise closed will, under a variety of circumstances, do better than their counterparts in the group. This in turn implies is thus a tradeoff between individual and collective welfare in groups, under conditions where positive effects of information diversity is not directly factored into the model. We then briefly explore the possible ways in which such effects can alter the social dilemma characterization of structural holes and closure, providing benefits of openness even for those group members who do not occupy structural holes.

We then focus primarily on the second dimension of cultural variation by modeling the effects that the collective norm of the overall network, which varies across cultures (Galaskiewicz, 2007; Morris et al. 2000), has on the probability of punishment towards those who occupy a structural hole. Although an ideal model should incorporate all three dimensions, we believe that this note deserves attention due to its original attempt to explain cultural differences in network outcomes. Moreover, the potential high correlations among the three dimensions suggest that our formal model is a natural springboard for more comprehensive models. For example, the constraining effect of competing norms on ego (first dimension) is not independent of ego's fear of punishments (second dimension), and the constraint may coerce ego into closing its structural holes (third dimension).

It should also be admitted that the model makes certain simplifying assumptions that limit its ability to address certain important issues regarding closure and structural holes. In particular, the model takes closed groups as exogenously determined entities, and does not attempt to account for variations in their size and density. Furthermore, in focusing on the second mechanism of cultural variation, it directs its analysis of the advantages for occupying structural holes at opportunities for out-of-group exchange rather than access to heterogeneous information.

Our main justification for not addressing these issues is limited space. Given that we are moving into territory where choice-theoretic modeling and indeed individual-level modeling of any kind has been fairly rare, presenting the basics of the formalization consumes a substantial part of the paper. Building a more elaborate model to accommodate additional important network effects would have left no room for our main objective, which is demonstrating that certain empirical phenomena relating to closure and structural holes can be explained using a choice-theoretic formal model. However, we recognize the need to go beyond the scope of this paper, and the model is an ongoing project. In our conclusion, we briefly discuss how such issues as endogeneity and information heterogeneity may be treated in future efforts.

## **A FORMAL MODEL**

We address the relationship between cultural difference and variation in the outcome of structural holes by examining the existing literature on East Asian culture and economic behavior within organizations, but also by adapting it with a choice-theoretical model that can provide microfoundations for macro-level differences in network outcomes. Much of the recent sociological and anthropological literature on institutions of capitalism in East Asia characterize

them as being based a specific cultural form known as “Confucian Capitalism” (Tu, 1984, 1989). More specifically, such institutions as “relational contracting” and “guanxi” are said to be based upon networks of particularistic ties that take on greater importance for economic outcomes than impersonal contracts (Hamilton, 1991; Hamilton and Biggart, 1992; Redding 1988, 1990).

However, despite the emphasis on the importance of networks in East Asian capitalism, no substantial research on the topic has been done using the formal tools of analysis that are available in formal social network theory, including investigation into the operation of structural holes in East Asia. Perhaps the major obstacle to such analysis has been the failure or unwillingness of theorists of East Asian culture to express their analytical assumptions in the kind of formalized fashion that could readily be integrated with formal social network models. Recently, much interest generated by some pioneering literature emerge showing that it is possible not only to formalize cultural attributes, but also to make them compatible with choice-theoretical models (Chai, 1997, 2001). However, this literature has not been applied in a systematic way to addressing the problem of formalizing the culture of East Asian capitalism, nor of investigating the ways in which such formalization can be used to explain the ways in which institutional forms in East Asian vary amongst themselves and with those of the West.

Our work seeks to take a first cut at such analysis by using a formalized cultural approach, integrated with a (rational) choice model of action, which can explain differences in network behavior, specifically addressing variations in the prevalence and closure of structural holes, as well as their effects upon actors occupying them. For this purpose, we present a formal examination using mathematical proofs, which shows how the assumptions about actor preferences and beliefs generated by formalization of propositions found in the East Asian

studies can be used to explain observed broad differences in the nature of structural holes in East Asia and in the West.

### **Network Model of Cooperation, Closure, and Structural Holes**

In this model, we describe a population  $N$ , within which there exists a network  $g(N)$ , which is defined as a set of pairs  $(i, j)$ ,  $i, j \in N$ , such that actor  $i$  and actor  $j$  have a tie. We assume undirected ties, so  $(i, j) \in g \equiv (j, i) \in g$ . We define  $N_i$  as the set of actors with whom actor  $i$  is tied, i.e.  $\{j: (i, j) \in g(N)\}$ , and assume that there is an upper bound  $v$  on the cardinality of  $N_i$  such that  $|N_i| \leq v < |N|$ . For each period, based on previous agreement (see below), actor  $i$  can choose to contribute amounts  $c_{ij} > 0$  to each actor  $j \in N_i$ . A transaction occurs between actor  $i$  and actor  $j$  when  $c_{ij} \neq 0$  or  $c_{ji} \neq 0$ .

For simplicity, we assume that all actors have equal exchange productivity. An exchange production function  $\phi$ , shared by actors in the population, is characterized as monotonically increasing and concave ( $\phi'(0) > 1$  and  $\phi''(c) < 0$  for all  $c > 0$ , reflecting possible gains and diminishing returns from exchange. The total cost to actor  $i$  for her contribution in a single period is  $\sum_{j \in N_i} c_{ij}$ . We also use the term  $b_{ji} = \phi(c_{ij})$  to refer to the benefit arising from exchange. Thus actor  $i$ 's net benefit over the period will be  $\sum_{j \in N_i} b_{ji} - \sum_{j \in N_i} c_{ij}$ .

Ties can be created, destroyed, and altered endogenously. We describe a stage game as follows. At the beginning of each stage, actors in random rotation may send communications suggesting modification in norms of contribution. Such proposals can extend to the current period only or to future periods as well. The main restriction is that for a proposed contribution to be communicated to actor  $j$ , she must either be in  $N_i$  or must be tied to a member of  $N_i$  with whom a transaction has occurred, i.e.  $\{j: j \in N_i \vee \exists k \in N_i: j \in N_k, c_{ij} \neq 0 \vee c_{ji} \neq 0\}$ . We can refer

to this “second-degree” of  $N_i$  as  $N_i^2$ , i.e.  $\{j: j \notin N_i, \exists k \in N_i: j \in N_k\}$ . Hence, there must be an indirect tie linking actor  $i$  and actor  $j$  in order for an exchange to be proposed. Actor  $j$  may either reject the communication or accept it. If she accepts it, then a tie develops between actor  $i$  and actor  $j$  if one did not exist already, and the proposed profile of contributions is the agreement governing that tie. If she rejects it, and a tie already exists, then the norm-prescribed profile of contributions remains the last agreement made between the two actors.

Another restriction, however, is that  $|\{j: b_{ji} > 0\}| \leq v$ ; ties cannot multiply without limit. If  $N_i = v$ , then actor  $i$  cannot make any proposals to individuals not in  $N_i$  unless an existing tie is first eliminated. If no communication takes place between two tied actors in a particular period, it is assumed that the existing social norm for that tie continues.

Once a round of communication has taken place, each actor generates some total amount of resources for distribution to others. Even if both actor  $i$  and actor  $j$  agree beforehand to a particular bilateral norm of contribution, it is not assumed that they will automatically abide by it. Contributions are made simultaneously, so neither side can observe the other's actual contribution prior to deciding upon their own.

Informational assumptions are as follows: (1) the existence of a tie between two actors is publicly observable to all members of the population; (2) the total amount of resources generated by an actor are not visible to others; (3) only parties directly involved in an exchange are able to directly observe any level of contribution made by themselves and their partners; and (4) actors may communicate such results to other actors which whom they have a tie.

An efficient profile of cooperation for a population  $N$  can be defined as one that generates the highest possible aggregate level of net benefits given available resources. The nature of  $\phi$  implies the existence of a unique optimum  $c^*$  of total contributions for any given partner at which

$b_{ji} - c_{ij}$  is maximized, and that this will be at the point where  $\phi'(c_{ij}) = 1$ . The efficient profile will exist only if all members of the population invest  $\mu c^*$  in exchangeable goods, and distribute  $c$  to each of their  $v$  partners. Of course, what is globally efficient is not necessarily individually rational, and individuals will contribute this amount only if the net benefits from doing so exceed those from shirking, taking into account both the possibility of future retaliation and discount factor  $\delta$ .

With this in mind, we first look at the benefits of a closed group, which have been espoused by Coleman (1990) and his disciples. A closed group can be defined as a subpopulation  $M \subset N$  such that  $\forall i, j \in M: (i, j) \in g(N)$  and  $\forall i \in M, j \notin M: (i, j) \notin g(N)$ .

*Proposition 1:* A profile of cooperation,  $C_M$ , can be sustained as a subgame perfect Nash equilibrium within a closed group  $M$  if and only if  $\forall i \in M: \sum_{j \in M, j \neq i} c_{ij} < \delta \sum_{j \in M, j \neq i} b_{ji}$ .

Proof. Because all members of a closed group can communicate with one another, it is possible for the members of  $M$  to sustain a “second-order” norm of community enforcement against actor  $i$  if she fails to deliver on the contributions specified in  $C$ . As per previous work on community enforcement (Bendor and Mookherjee, 1987; Calvert, 1994; Kandori, 1992), the maximum disincentive for shirking can be provided by a “grim” punishment norm of collectively setting members contributions to actor  $i$  to 0 for all future periods if they hear that any member did not receive the prescribed contribution from actor  $i$ . Knowing that this is the norm implies two things for actor  $i$ : (1) if she shirks she will shirk her contributions to all members of the group, since all members will punish her regardless; and (2) in future periods, she will continue to shirk towards all member, since resuming contributions will not affect her punishment.

By shirking contributions to all members, actor  $i$  saves costs  $\sum_{j \in M_i} c_{ij}$ . The loss will be in future periods, where she will receive 0 rather than her customary net benefit  $\sum_{j \in N_i} b_{ji} - \sum_{j \in N_i} c_{ij}$ . Played out indefinitely, this will be valued at  $\delta(\sum_{j \in M_i} b_{ji} - \sum_{j \in M_i} c_{ij}) / (1 - \delta)$  for a net gain of  $\sum_{j \in M_i} c_{ij} - \delta(\sum_{j \in N_i} b_{ji} - \sum_{j \in M_i} c_{ij}) / (1 - \delta)$ . Simplifying this term leads us to the incentive condition for the equilibrium.

One thing that is striking about the finding is that it seems to indicate that the size of the closed group has no effect on the level of cooperation that can be sustained, all other things being equal. This is easier to see if we examine on egalitarian profiles of cooperation, i.e. where each member of the group is supposed to contribute the same amount to each other member.

*Corollary 1:* For egalitarian profiles of cooperation, the highest amount of contributions that can be sustained as a subgame perfect Nash equilibrium is independent of the size of the group. Furthermore, if a uniform profile of contributions at level  $c$  can be sustained, then those at all lower levels can be sustained as well.

*Proof.* An egalitarian profile implies  $\forall i, j \in M c_{ij} = c$ . Given this, the incentive criterion for failing to carry out the profile is simply  $|M|c > \delta|M|b$ , which reduces to  $c > \delta b$  or  $c/b > \delta$ . Because  $\phi$  is convex,  $d(b/c)/dc < 0$ , hence for any  $c^- < c$  and  $b^- = \phi(c^-)$ ,  $c^-/b^- > \delta$  as well.

The implication that group size is not relevant to enforcement power is counterintuitive in light of the conventional view of social capital, as well as Coleman's (1990) own analysis, both of which suggest that closure helps sustain cooperation because it multiplies the number of partners from which punishment can be expected if only one of them is cheated. Admittedly, the key assumption in this reasoning is that actors can only cheat single members of a group at a time, rather than choosing to simultaneously cheat the entire group. Indeed, given the setup of

our model, in which actors may communicate with other actors to whom they have a link, an actor will either choose to cheat the entire group or cheat none, thus offsetting the advantage of numbers.

On the other hand, only closed groups of sufficient size allow their members to attain optimal levels of aggregate net benefits:

*Corollary 1b:* For closed group,  $M$ , an optimally efficient profile of contributions can be obtained only if  $|M| \geq v$ .

Proof. Given a closed group, all contributions that an actor within the group makes will be given to other members of the group. Thus, even if optimal contribution  $c^* \leq \delta b^*$ , at most  $c^*|M|$  can be expended by each member.

A related point about small groups is that they are not conducive to closure: a group of size less than  $v$  will leave all members some “slack” for developing or maintaining ties outside the group. If closure has not occurred, then the dynamics of cooperation are going to be much different, as members who violate group norms are in a position to form new cooperative ties to replace those destroyed by their violation.

Consider a quite different group that has less constraint in the sense that all members of a subgroup  $M^o \subset N$  have links to other actors who are not members of  $M^o$ , and these actors have ties to additional actors who are also not members of  $M^o$ . For actor  $i$  of  $M^o$ , it is the members of  $N^2_i$  who are crucial, particularly those who have fewer than  $v$  social ties. These are actors for whom it would be possible to form new ties outside  $M^o$  if  $M^o$  is no longer viable for them. Let us refer to this set as  $N^+_i = \{j \in N^2_i: |N_j| < v\}$ .

*Proposition 2:* If, for all actors  $i$  of  $M^o$ ,  $|N^+_i| > |M^o|$ , then stable cooperation cannot be sustained in  $M^o$ .

Proof. Let us consider the “best” case for  $M^o$ , one in which all members have ties to each other member (this can only be the case if  $|M^o| < v$ . This enables community enforcement, generating an expected return from shirking of  $\sum_{j \in M_i} c_{ij} - \delta(\sum_{j \in N_i} b_{ji} - \sum_{j \in M_i} c_{ij}) / (1 - \delta)$  absent any outside opportunities. However, once shirking takes place, actor  $i$  can, for each member  $j$  of  $M^o$  who is now no longer cooperating, propose a similar arrangement with a member of  $N^+_i$ , who will accept it because it provides positive net benefits and she does not have to sacrifice any existing ties. This reduces punishment down to zero.

Hence, the model provides a logical mechanism underlying why closure is of benefit to groups: if existing groups did not have closure, then cooperation could not take place, or only do so at a greatly diminished level.

### **Structural Holes and Laissez-Faire Norms**

However, the interesting case from the point of view of structural hole theory is a “semi-closed” group,  $M^p$ , with only a single actor  $i$  who has an additional links outside the group, and (to take an extreme case)  $|N^+_i| > |M^p|$ , with  $|N^+_j| = 0$  for all other members. Such actor can use her outside opportunities to demand and receive preferential treatment from other members of the group:

*Proposition 3:* If a group,  $M^p$ , has a single member such that  $|N^+_i| > |M^p|$ , with  $|N^+_j| = 0$  for all  $i \neq j$ , there is a cooperative equilibrium in which all members besides  $i$  contribute  $c^*$  to each of their partners within the group, including actor  $i$ , and actor  $i$  contributes only  $\delta c^*$ .

Proof. Let  $c_i$  be the average contribution that actor  $i$  makes to other members of the group. If she defects, then she gains a one-time benefit of  $|M^p|c_i$ , then can create new ties sufficient to gain a per-period subsequent net benefit of  $|M^p|(b^* - c^*)$ . Thus the criterion for not shirking is

$|M^p|(b^* - c_i) / (1 - \delta) \geq |M^p|c_i + \delta|M^p|(b^* - c^*) / (1 - \delta)$ , or simply  $c_i \leq \delta c^*$ . This is beneficial for the other members if  $\phi(\delta c) \geq c$ , since they have no alternative partners. But since the condition for cooperation for other members of the group is  $\delta\phi(c) \geq c$ , and the strict concavity of  $\phi$  implies  $\phi(\delta c) > \delta\phi(c)$ , the conditions for cooperation are fulfilled.

At this point, we have demonstrated the benefits to a group of closure, and the benefits to the actors within such groups who are exceptions to the rule, i.e. whose own networks are not closed. However, we have not yet introduced a factor that is central to Burt's own causal explanation for why structural holes are beneficial to actors. This is the issue of information diversity, i.e. the assertion that actors within a group whom have outside ties will provide higher-quality information to than those who do not, and that this can be leveraged by them to gain relatively higher levels of compensation than their counterparts with closed ties.

There are various ways of formalizing Burt's insights into a choice-theoretical model, drawing in part on his concept of "constraint" and its role in social capital (Burt, 2005). Burt defines constraint for actor  $i$  as  $\sum_j (p_{ij} + \sum_{k \neq i,j} p_{ik} p_{kj})^2$ , where  $p_{ij}$  is the percentage of  $i$ 's resources devoted to interaction with  $j$ . For our formal model, it must be definable not simply as an attribute of  $i$ , but in terms of the value of  $i$ 's information to  $j$ , where the shared network of  $i$  and  $j$  may vary depending on the identity of  $j$ . The most straightforward way of doing this is simply  $\zeta_{ij} = (b_{ij}/B_i + \sum_{k \neq i,j} b_{kj} b_{ik} / B_k B_i)^2$ , where  $B_i = \sum_{j \in N_i} b_{ij}$  and  $\zeta_{ij}$  is a measure of the *degradation* in the relative value of  $i$ 's information to  $j$  caused by information redundancy, so that  $b_{ji} = (1 - \zeta_{ij})\phi(c_{ij})$ . Given this, it is clear that while an actor's benefits provided to her partners in a group will be higher per unit of investment if she has outside ties.

There a few difficulties, however, with such a formalization. First of all, it implicitly asserts a certain value for information diversity, without examining variations in what such value

might be across cultures. Hence, we might instead posit a "redundancy factor"  $\gamma \in [0,1]$  that reflects the extent to which, within a particular culture, sharing ties with one's partner renders information one provides to that partner redundant and thus less useful. This leads to  $\zeta_{ij} = \gamma((b_{ij} / B_i + \sum_{k \neq i,j} b_{kj} b_{ik} / B_k B_i))^{-2}$ . However, even this formalization has a few characteristics that appear counterintuitive.

Let us define a total community  $M^T$  as one with complete closure, i.e. as a set of actors such that all actors are tied to one another, and there have no ties outside the community. In such a case it would make sense that if  $\gamma = 1$ , we would have  $\zeta = 1$  for all actors in the total community regardless of the size of the community, since all information that the actors possess would be derived from the same set of ties. This would seem to be even more likely if all actors devote the same amount of resources to each of their partners. In such a case, it would be we would have  $\zeta = \gamma(1 / (|M^T| - 1) + (|M^T| - 2) / (|M^T| - 1)^2)^{-2}$ , which would be 1 for group of size 2 with  $\gamma = 1$  but take values of 9/16, 25/81, 49/256 for groups of size 3, 4, and 5. This is in part a reflection of the fact that constraint itself takes values of 1, 9/8, 75/81, 49/64 over groups of size 1–4, both due in part of the fact that the effect of shared indirect ties of more than length 2 does not play a role in the calculation. Given that, a somewhat different calculation in which  $\zeta_{ij}$  is defined recursively as  $\gamma(b_{ij} / B_i + \sum_{k \neq i,j} \zeta_{jk} b_{ik} / B_i)$  would lead to the more intuitive result of  $\zeta_{ij} = \gamma$  for all total communities, and that in case of total communities, information exchange will not be productive unless  $\gamma < 1$ .

That being said, it is clear in either case that possession of outside ties increases the value of an individual's information to a group. At the same time, depending on the nature of the outside ties and the level of preexisting exchange engaged in by the members with such ties, it can create a situation in which cooperation is not possible if  $|N_i^+| > |M^o|$ .

## **Structural Holes and Confucian Capitalism**

Based on our formal model, let us return to our main question of why results about the advantages of occupying structural holes do not seem to translate into the East Asian context. Anecdotal evidence even suggests that merely having outside ties leads to punishment from within the group. Indeed, one can see the “Confucian Capitalist” system as one in which the presence of such ties is itself seen as a kind of shirking and violation of work norms.

Hence, we can posit second-order “closed community” norm that prescribes a grim punishment norm for acquiring any new ties outside the group, or for agreeing to profile of contributions that includes a non-zero amount to someone outside the group. Any violation of such a rule triggers a grim punishment strategy by all members of the group.

*Proposition 4:* Given a closed community norm within a group, then ties outside the group will not confer any advantage to members in determining profiles of cooperation within the group.

This follows from the fact that, in order to credibly threaten to defect from cooperation within the group, an actor must “activate” at least one of her outside ties by having a transaction with that tied other actor. However, this will immediately trigger a grim strategy by all players, making any agreement to alter contribution profiles impossible. Since mutual grim strategy norms are subgame perfect equilibria for N-person prisoner’s dilemma-type games regardless of the criteria that trigger them, it is clear that they are enforceable.

Provided a closed community norm exists, it is clear that interactions will tend to coalesce around mutually disjoint communities with full closure, between which no bridges exist. From previous discussion, we can see how such a closed community norm can promote higher levels of cooperation than would exist than a system in which individuals tend to have numerous

outside ties. Another by-product of such a system, however, will be greater egalitarianism, since uniformity of closure will eliminate the ability of some individuals to leverage their outside ties for relatively higher compensation from outside.

This paper does not attempt to account for the origination of a closed community norm, though elsewhere it has been argued that this norm can be seen as part of a “weak Confucian norms,” a repertoire of strategies generated by popular understandings of Confucian morality. It is furthermore argued that in order to generate institutions, such norms do not need to be internalized in the sense that actors have an intrinsic preference to follow them. Rather, weak Confucian norms provide a kind of “focal point” which determines which among a set of sustainable equilibria within large populations will actually be realized as institutions.

What the model presented here does provide is a partial explanation for how a system that discouraged the filling of structural holes, and thus the sharing of information across organizational boundaries, could nonetheless promote high rates of economic growth. By promoting closure, it provides the conditions of high group solidarity with maximum incentives for cooperation, hence generating conditions under which it is most likely that efficient levels of trade will be achieved. It also shows how the advantages of such a system are weakened when information heterogeneity allows for more productive trade, and when such heterogeneity is only available from actors with outside ties.

In light of transformations in the East Asian political economies in recent years, particularly following the 1997 fiscal crises, it is interesting to question why closed community norms seemed to have weakened in the wake of these events. There are two major plausible explanations for this. The first is that the information heterogeneity provides few advantages in economies that are in the “catch up” stage of late development (Gerschenkron, 1952). During

such a stage, there is little need for innovation, but rather for the systematic application of labor to existing technology. In such a situation, it can be argued the information heterogeneity hampers rather than helps in generating the type of institutions that are optimal for the catch-up phase. Likewise, it can be argued that once a country passes reaches “second-stage” industrialization, in which innovation in products and production methods is a prerequisite for continued growth, the balance in favor of information heterogeneity vs. group solidarity.

A second explanation, somewhat complementary explanation, can also be proffered. As countries move into later stages of development, the pressures to open up economies to foreign investment increase. This in turn creates an environment in which domestic companies may attempt to enforce a closed community norm, but foreign companies and joint ventures in the same environment will not be doing so. For certain actors whose networks span across both domestic and foreign companies, there may be a wide range of conditions under which the close community norm cannot be enforced, and exist therefore occurs from any organization that tries to enforce it. At any rate, both these possible explanations are issues that require a separate paper to be explored in a more systematic fashion.

## **DISCUSSION AND FUTURE RESEARCH**

We have shown through our formal model that the efficacy of structural holes can be contingent on some elements of national culture. Compared to the Western society, the collectivity-oriented culture of East Asian society provides individuals with more gains when they are loyal to in-group norms of inter-actor contributions, yet less gains when they attempt to tie with out-group members creating structural holes. This might have served as a cause that resulted in uneven amount of empirical research on structural holes between US and East Asia. Our model is limited in that because we focus only upon the benefits and costs imposed on the

individuals depending on her decision whether to stay in a group or to expand her ties beyond the boundary of the group, we did not examine the whole features of structural holes. For example, the model takes into little account the potential difference in benefits, whether information benefit or control benefit, stemming from a structural hole itself across different cultures. However, anecdotal evidence certainly suggests that our key parameter in the model plays a significant role in differentiating the value of structural holes.

More generally, our model also hints a resolution to the long-pending contention between Coleman's (1990) notion of closure and Burt's hypothesis about structural holes (1992). Indeed, Burt (2005) himself, as well as other network scholars (e.g., Gargiulo and Benassi, 2000; Podolny and Baron, 1997), have addressed the tension between the two seemingly opposite views, and their solutions are presented with a discussion of the trade-off between those two views, is shown to be contingent upon the content or goals of networks. However, our model provides a more structural approach to the conflicts between closure and structural holes. According to our model, groups in general benefit from closure while members of such groups whose own networks are not closed will tend to do better than other members. This in turn links to a possible reason why Coleman's emphasis on the benefit of closure and Burt's support of structural holes may be seen as complementary, not competing. It is clear from his discussion that Coleman was concerned primarily about the aggregate welfare of a group (i.e. "community social capital") when discussing closure, while Burt's main concern was about an individual's relative standing vis-a-vis his peers (i.e. "individual social capital"). Hence Burt's (2005) test of the Coleman hypothesis, in which he demonstrated that within his dataset that individuals inhabiting closed networks did worse overall than those occupying structural holes, may have

attempted to use the notion of closure to explain something that it was not designed for— individual position.

Since our formal model assumes somewhat simplified versions of cultural variations in individual behavior, however, we urge the extensions of our model by including some other culture dimensions as key parameters. Although our focus on culture variation in actor's behavior has been at the individualism-collectivism dimension, other cultural dimensions that distinguish Confucian capitalism from the Western capitalism may also produce different pictures of the structural-hole thesis. There are many areas in our model that can benefit from a consideration of other cultural dimensions. For example, a Confucian, “yin-yang” image of women as second-class citizens (Brook and Luong, 1997; Gelb and Palley, 1994) may call our attention to the role of gender in our model. Given the substantial gender effects in interpersonal networks (Ibarra, 1992, 1993, 1997), cultural variation in the perception of women may produce variation in women's benefits and costs in their network activities, particularly in the penalty for the violation of collective agreement. Similarly, because the “patrimonial social principle” (Clegg 1990) in the Confucian society emphasizes a hierarchy of ordered relationships between the old and the young, our model can also be adapted by examining different implications of age distribution for network performance across national cultures. In a sense, considering the age-based contrast between the Western horizontal relationship and the Confucian vertical relationship highlights “power distance,” an important cultural dimension in Hofstede's (1991) framework: “the extent to which the less powerful members of institutions and organizations within a country expect that power is distributed unequally” (p. 28).

While our model focuses on a static illustration of action-reaction in networking, we can also incorporate the evolution of interpersonal relationships characterized by various

mechanisms such as the Bayesian updating of the relationships. For example, given that networking with others is repeated events, it is possible to postulate that each network actor learns locally from her networking experiences, thereby adjusting subsequent networking behavior, and the actor's local learning depends on his or her judgment about the 'success' or 'failure' of experiences with particular local ties. Networking also involves 'mutual learning': not only does the actor initiating a tie learn from the experience, but so does the counterpart receiving or rejecting the initiation (Lave and March, 1975). Thus, the primary engine of this learning-based development of interpersonal relationship is what March (1999) calls the "basic mutual learning multiplier," defined as "a strong positive feedback loop by which jointly favorable experiences lead to further jointly favorable experiences, and jointly unfavorable experiences lead to further jointly unfavorable experiences" (p. 141). Adding such evolutionary mechanism to our framework will spotlight the advantage of our model because the mutual learning process is certainly influenced by collectivism versus individualism. More interestingly, the future consideration of age- and gender-based asymmetric interpersonal relationship may show uneven learning from network experience between men and women and between the young and the old.

The implications of our model for management can be easily identified. There has been fruitful empirical research that provides managers with information on the advantages of structural holes and the contingencies of the advantages on some demographic or contextual variables. However, our discussion suggests that managers must consider the cultural aspects when they attempt to exploit the advantage of structural holes in their networks. Given the globalization of modern business, it is particularly important to recognize that a network abundant in structural holes can be a liability, not an asset, in some countries.

## REFERENCES

- Bendor, J., & Mookherjee, D. 1987. Institutional structure and the logic of ongoing collective action. *American Political Science Review*, 81:129-154.
- Bian, Y. 1997. Bringing strong ties back in: Indirect ties, network bridges, and job searches in China. *American Sociological Review*, 62: 266-285.
- Brook, T., & Luong, H. V. (Eds.). 1997. *Culture and Economy: The Shaping of Capitalism in Eastern Asia*. University of Michigan Press, Ann Arbor, MI.
- Burt, R. S. 1982. *Toward a Structural Theory of Action: Network Models of Social Structure, Perception, and Action*. Academic Press, New York.
- Burt, R. S. 1992. *Structural Holes: The Social Structure of Competition*. Harvard University Press, Cambridge, MA.
- Burt, R. S. 1997. The contingent value of social capital. *Administrative Science Quarterly*, 42: 339-365.
- Burt, R. S. 2000. The network structure of social capital. *Research in Organizational Behavior*, 22: 345-423.
- Burt, R. S. 2002. Bridge decay. *Social Networks*, 24: 333-363.
- Burt, R. S. 2005. *Brokerage and Closure: An Introduction to Social Capital*. Oxford University Press, New York.
- Burt, R. S. 2007. Secondhand brokerage: Evidence on the importance of local structure for managers, bankers, and analysts. *Academy of Management Journal*, 50: 119-148.
- Burt, R. S., Hogarth, R.M., & Michaud, C. 2000. The social capital of French and American managers. *Organization Science*, 11: 123-147.

- Calvert, R., 1994. Rational actors, equilibrium and social institutions. In J. Knight & I Sened (Eds.), *Explaining Social Institutions*: 57-95. University of Michigan Press, Ann Arbor, MI.
- Chai, S. 1997. Rational choice and culture: clashing perspectives or complementary modes of analysis? In R. Ellis & M. Thompson (Eds.), *Culture Matters*: 45-56. Westview Press, Boulder, CO.
- Chai, S. 2001. *Choosing an Identity: A General Model of Preference and Belief Formation*. University of Michigan Press, Ann Arbor, MI.
- Clegg, S. R. 1990. *Modern Organizations: Organization Studies in the Postmodern World*. Sage, London.
- Coleman, J. S. 1990. *Foundations of Social Theory*. Harvard University Press, Cambridge, MA.
- Galaskiewicz, J. 2007. Has a network theory of organizational behaviour lived up to its promises? *Management and Organization Review*, 3: 1-18.
- Galaskiewicz, J., Bielefeld, W., & Dowell, M. 2006. Networks and organizational growth: A study of community based nonprofit. *Administrative Science Quarterly*, 337-380.
- Gargiulo, M., & Benassi, M. 2000. Trapped in your own net? Network cohesion, structural holes, and the adaptation of social capital. *Organization Science*, 11: 183-196.
- Gelb, J., & Palley, M. L. 1994. *Women of Japan and Korea: Continuity and Change*. Temple University Press, Philadelphia, PA.
- Gerschenkron, A. 1952. Economic backwardness in historical perspective. In B. F. Hoselitz (Ed.), *The Progress of Underdeveloped Areas*: 3-29. University of Chicago Press, Chicago, IL.
- Granovetter, M. 1973. The strength of weak ties. *American Journal of Sociology*, 78: 1360-1380.

- Hamilton, G. S. (Ed.) 1991. *Business Networks and Economic Development in East and Southeast Asia*. Hong Kong. Centre for East Asian Studies, University of Hong Kong.
- Hamilton, G. S., & Biggart, N. W. 1992. Market, culture and authority: A comparative analysis of management and organization in the Far East. In R. Swedberg & M. Granovetter (Eds.), *The Sociology of Economic Life*: 181-224. Westview Press, Boulder, CO.
- Hofstede, G. 1991. *Culture and Organizations*. Sage, Beverly Hills, CA.
- Ibarra, H. 1992. Homophily and differential returns: sex differences in network structure and access in an advertising firm. *Administrative Science Quarterly*, 37: 422-447.
- Ibarra, H. 1993. Personal networks of women and minorities in management: A conceptual framework. *Academy of Management Review*, 18: 56-87.
- Ibarra, H. 1997. Paving an alternative route: Gender differences in managerial networks. *Social Psychology Quarterly*, 60: 91-102.
- Johnson, J. D. 2004. The emergence, maintenance, and dissolution of structural hole brokerage within consortia. *Communication Theory*, 14: 212-236.
- Kandori, M. 1992. Social norms and community enforcement. *Review of Economic Studies*, 59: 63-80.
- Kilduff, M., & Tsai, W. 2003. *Social Networks and Organizations*. Sage, Thousand Oaks, CA.
- Krackhardt, D. 1999. The ties that torture: Simmelian tie analysis in organizations. *Research in the Sociology of Organizations*, 16: 183-210.
- Lave, C. A., & March, J. G. 1975. *An Introduction to Models in the Social Sciences*. Harper and Row, New York.
- Lin, N. 2001. *Social Capital: A Theory of Social Structure and Action*. Cambridge University Press, New York.

- March, J. G., 1999. A learning perspective on the network dynamics of institutional integration. In E. Egeberg & P. Læg Reid (Eds.), *Organizing Political Institutions*: 129-155. Scandinavian University Press, Oslo.
- Morris, M. W., Podolny, J. M., & Ariel, S. 2000. Missing relations: Incorporating relational constructs into models of culture. In P. C. Earley & H. Singh (Eds.), *Innovations in International and Cross Cultural Management*: 52-90. Sage, Thousand Oaks, CA.
- Podolny, J. M. 2005. *Status Signals: A Sociological Study of Market Competition*. Princeton University Press, Princeton, NJ.
- Podolny, J. M., & Baron, J. N. 1997. Relationships and resources: Social networks and mobility in the workplace. *American Sociological Review*, 62: 673-693.
- Reagans, R. E., & Zuckerman, E. W. 2006. *Why Knowledge Does not Equal Power: The Network Redundancy Trade-off*. Working paper, Carnegie Mellon University. Pittsburgh, PA.
- Redding, S. G. 1988. The role of the entrepreneur in the new Asian capitalism. In P. L. Berger & H.-H. M. Hsiao (Eds.), *In Search of an East Asian Development Model*: 99-114. Transaction, New Brunswick, NJ.
- Redding, S. G. 1990. *The Spirit of Chinese Capitalism*. Walter de Gruyter, Berlin.
- Rhee, M. 2004. Network updating and exploratory learning environment. *Journal of Management Studies*, 41: 933-949.
- Tu, W. 1984. *Confucian Ethics Today: The Singapore Challenge*. Federal Publications, Singapore.

Tu, W. 1989. The rise of industrial East Asia: The role of Confucian values. Modernization process in East Asia: economic, political and cultural perspectives. *Copenhagen Papers on East and Southeast Asian Studies*, 4.

Xiao, Z., & Tsui, A. S. 2007. When brokers may not work: The cultural contingency of social capital in Chinese high-tech firms. *Administrative Science Quarterly*, 52: 1–31.