

# **How Camera Makers Knit Their Social Networks to Become More Innovative?**

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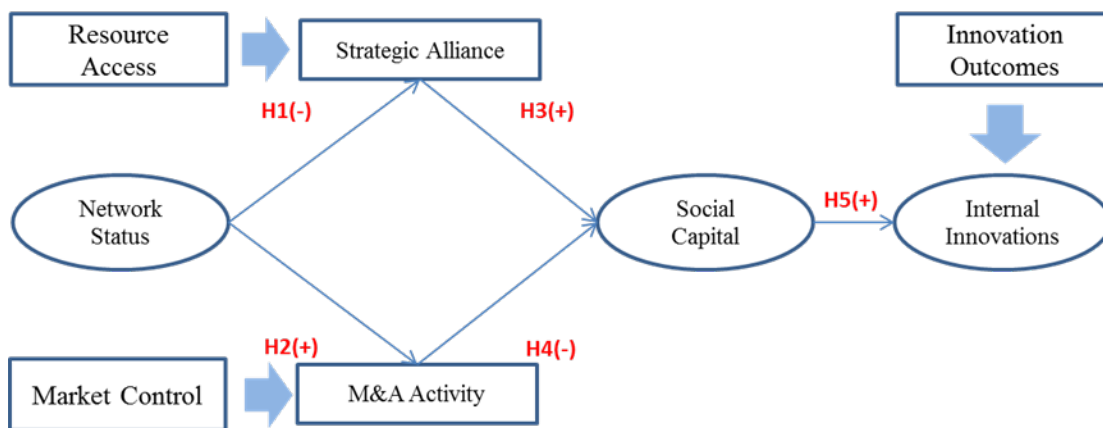
*This paper explores the mechanisms embedded in the relationship between the network status and innovations. Little prior research answered the relationship between M&A, strategic alliances and innovations and how innovations are influenced by strategic alliances and M&A activities. In addition, how network characteristics like networks status influence innovations was not systematically studied. I offered a systematic framework to investigate these issues. I argue that firms use the resource access mechanism and the market control mechanism to knit their social networks and influence the social capital accumulation, which in turn affects the firms' innovations ability.*

## **INTRODUCTION**

The rapid proliferation of strategic alliances has been one of the more enduring features of the business environment over the last two decades. This trend of multiple alliances with multiple partners has embedded firms in a complicated interfirm network world (Balajir and John, 2002). Recognizing the intertwined networks relationships among firms, strategic researchers increasingly use social networks perspective to explain strategic alliances formation. For example, Stuart (1998) and Chun (2000) found that higher network status leads to higher rates of strategic alliance formation, because high-prestige firms enjoy an advantage that stems from their unique capacity to certify in the public eye the initiative of lesser-known firms (Stuart, 1998). On the other hand, Wernerfelt (1984) suggested that corporations formed certain cooperation forms to get the complementary resources which they lack, and Gulati (1998) proposed that strategic alliances may lower the negotiation and other related cost because it entails the creation of a new entity with shared equity between partners. Therefore, strategic alliance formation is an effective way for companies to access strategic assets with lower cost, in other words, strategic alliance formation is a resources access mechanism. Network status, however, is a driver for such mechanism. Traditional economics defines market power in terms of the number and concentration of sellers in the market and argues that fewer major sellers may place greater exclusivity and discretion. Identifying dual conditions for market power, Galbraith and Stiles (1983) proposed that the exclusivity by which companies provides for products, services and market will give rise to "monopoly power". Manne (1965) pointed out that merger can help firms to gain such kind of monopoly power. In his study for the market control phenomenon in aluminum industry from 1903 to 1953, Wallace (1977) also found that acquisitions in the industry empower certain companies with great market power which help them further control the market. Therefore, the M&A activity is regarded as a market control mechanism. In addition, traditional economics argues that the bigger the market power firms gain, the higher market concentration is expected to be. This also indicates that interfirm ties will be reduced with the intensive M&A activities

because fewer companies survive in the market. In his study for the mechanism between the acquisitions and innovations, Hitt et al. (1996) found that acquisitions negatively influence the internal innovations through the internal corporate control. Though many of research study network status and alliance formation, M&As and innovations, few systematically put strategic alliances and M&A activities under social networks context to study their relationships with innovations, that is, how network status, strategic alliances, M&A activities, social capital and innovations interact with each other and what mechanisms are embedded in their complicated relationships. This paper tries to explore such mechanism and proposes a systematic framework to incorporate all the constructs mentioned above (See Figure 1). The paper is organized as following. First, the conceptual model and the hypotheses examined in this study are presented, and then I will introduce the methods, followed by results. At last, I will discuss the results, conclude the paper and present the limitation and avenues for future research.

**FIGURE 1  
CONCEPTUAL MODEL**



## **THEORETICAL MODELS AND HYPOTHESES**

### **Network Status and Strategic Alliance Formation**

Stuart (1998) and Chung (2000) proposed that higher network status leads to the higher rate of strategic alliance formation, because high-prestige firms enjoy an advantage that stems from their unique capacity to certify in the public eye the initiative of lesser-known firms (Stuart, 1998), thus easier to attract other partners. On the other hand, high prestige means more resources. But high status companies are always reluctant to form alliances because they do not want to share their own resources. For example, by year 2006, Harvard University library did not share EZ borrow with other IVE League universities because Harvard thought it enjoyed the richest resources, thus it was unnecessary to share with others. Here, I adopt the Stuart's definition about network status or prestige-technological prestige. Because highly cited patents are those that have served as important building blocks (Stuart, 1998).

*Hypothesis 1: There is a negative relationship between network status and strategic alliance formation*

### **Network Status and M&A Activity Intensity**

Though few research study the relationship between the network status and M&A activity intensity, we could expect that when a firm enjoys high prestige in the industry, the manager is more willing to strengthen the market power. Because when the high-prestige firm is a start-up, what it pursues in the next step should be growing itself, the fastest way should be acquiring other competitors. Here, popularity

in the business community means easy access to financial capital or other resources to support the intensive M&A activities. Even if a high-prestige firm is already industry leader, the firm will still be intensively involving in M&A activities to keep their positions. On the contrary, if the prestige is low, managers do not have strong motivations to engage in M&A. For example, one CEO in a large format camera maker told me during the phone interview, thus we derive the following hypothesis.

*We just focus on what we are doing now, we do not have much ambition to grow larger and have much power in the market. Currently, we are fine for everything that we did until now. (Interpreted)*

*Hypothesis 2: There is a positive relationship between network status and M&A activity intensity*

### **Strategic Alliance Formation and Social Capital Accumulation**

Coleman (1988) argued that social capital is the foundation of human capital, and human capital could not take any effects without the social capital embedded in it. Burt (1997) stated that social capital will enable managers to explore more opportunities and information. The key to accumulate social capital is to form the social relations. Strategy scholars have argued that interorganizational ties such as strategic alliance or joint ventures are vehicles that provide firms with access to “information, resources, markets and technologies...and allow firms to achieve strategic objectives (Brass et al. 2004)”. Koka and Prescott (2002)’s empirical research also confirmed the positive relationship between the strategic alliance and the social capital, they also argued that firms vary in their levels of social capital not just on their structural position in an alliance network but also in the dynamics that underlie alliance formation and maintenance. In their study, Nahapiet and Ghoshal (1998), though indirectly, postulated that organizations, as institutional settings, are conducive to the development of high levels of social capital. In addition, Coleman (1988) argued that with the network structure, good norms and rules will be enforced, which is one of the factors favoring the social capital formation. Therefore, alliance formation is a type of social tie between the two firms, with such ties, firms may easily get access to or digest the other competitors’ strategic assets. More importantly, the relation between the two firms is built up and strengthened, and social capital is therefore accumulated.

*Hypothesis 3: There is a positive relationship between strategic alliance formation and social capital accumulation*

### **M&A Activity Intensity and Social Capital Accumulation**

M&A activity intensity is regarded as a tool of market control as mentioned at the beginning. When managers are busy acquiring other firms, their focus will not be on forming ties with other players. The emphasize on the financial control distracts managers to ignore the importance of the relations building internally and externally. In his research, Jeffrey (1972) argued that merger will be a way for firms to reduce symbiotic interdependence and avoid the previous interdependencies. Such dependence, to some extent, means breaking the connection with other players, which isolated the firms from the networks. In that case, the social capital will be lost.

*Hypothesis 4: There is a negative relationship between M&A activity intensity and social capital accumulation*

### **Social Capital and Innovations**

Burt (1992) proposed that the innovations spread via the social contagion of structural equivalence. Tsai (1998) found that social capital positively increases the firms’ value creation. The similar arguments appear in the Nahapiet and Ghoshal (1998)’s work, they pointed out that social capital facilitates the creation of new intellectual capital and it is because of organization’s more dense social capital that firms,

within certain limits, outperform markets in creating and sharing intellectual capital. In addition, in his research, Obstfeld (2005) indirectly supports the above finding, and found that there exists a negative relationship between the social constraint and the innovation involvement. Burt (1997) has proved that there exists a negative relationship between social constrain and social capital. As a result, we could expect that the more social capital accumulated, the higher innovation ability will be gained. Thus, we get the following hypothesis.

*Hypothesis 5: There is a positive relationship between social capital and innovations*

## **METHODS**

### **Sample**

The time span of my research is from year 1976 to 2008. The initial firm list was based on camerapedia because it contains the most comprehensive firm list to the best of my knowledge, I then compared this list with Wolfman Report on the Photographic and Imaging Industry in the U.S., Popular Photography (Kadiyali, 1996) and made a more comprehensive firm list. Subsequently, I excluded the companies from the list which have not been active since year 1976, and then kept the companies which produced cameras in our study time frame. Finally, I filtered out the firms whose company specific information could not be found from any public sources. At last, I got a final focal firm list containing 115 firms.

### **Data Collection**

Company basic information was obtained from multiple internet resources, company websites and databases like Factiva. Company basic information is firm-level data, such as firm age, firm history, product information and business operation information and so on. Financial data were retrieved from multiple databases such as COMPUSTAT, Bureau van Dijk, Worldscope, Hoover, Corp-Tech, InvesText, Orbis, Zephyr and VentureXpert. Strategic alliances and M&As data were collected from the SDC Platinum database and verified using Lexis-Nexis, Factiva, company websites and SEC filings, the alliance and M&As information were included unless at least the three of the above resources have the same information as SDC. Following the earlier research (Rowley, Behrens, and Krackhardt, 2000 and Lin et al., 2009) and the focus of this study is in photographic industry, I constructed the alliance network by three criteria: (1) membership in the photographic industry; (2) At least one strategic alliance with another member of this industry; (3) The deal contents of alliances should be directly related to the photographic businesses. A total of 594 strategic alliances were identified. For M&As, I identify 296 M&A deals. Since the termination date which SDC reports is very few and there are large exits and entries phenomenon for focal and non-focal firms which violates the balance theory, I therefore only calculated the social constraint annually rather than a certain time window using a ego-centered approach. Finally, patent data were collected from Derwent Innovations Index. I only collected photographic and lens patents because photographic industry and camera makers are my main focus.

### **Measures**

To test hypothesis 1 and 2, following the previous research (Stuart, 1998; Z. Lin et al., 2009), I operationalize the dependent variables in the firm-level models as the count of strategic alliances and of M&A deals by each organization from year 1976 to 2008. Hence, the data are panel observations. I use maximum likelihood Poisson Regression, which can be expressed as:

$$\Pr(Y_{it} = y_{it}) = \frac{\exp(-\lambda_{it})\lambda_{it}^{y_{it}}}{y_{it}!}$$

where the parameter  $\lambda_{it}$  represents the mean and the variance of the event count. Though the assumption of Poisson Regression states that the mean and variance should be equivalent (Hausman, Hall and Griliches, 1984) and such assumption is often violated in practice, Stuart (1998) proved that the results of regression are not sensitive to the assumption. Following the previous research (Pfeffer, 1972), I develop models to test hypothesis 3, 4 and 5 using random-effect GLS regression. Random-effect regression assumes that some omitted variables may be constant over time but vary between cases, and others may be fixed between cases but vary over time. In addition, the Hausman test indicates that random-effect regression will better fit the model. To avoid the potential interdependence issues, I also run the one year lag for all the independent variables and control variables, the signs of coefficients do not change and the results are not reported here.

### Dependent Variables

To test Hypothesis 1 and 2, I use the yearly count of strategic alliances and of M&A deals of a focal firm to represent the strategic alliance formation and the M&A activity intensity, these measurements are often used by other studies (Pfeffer,1972; Stuart,1998;Chung,2000; Rowley et al.,2000; Z. Lin et al., 2009). To test Hypothesis 5, I measure the internal innovations as the R&D expenditure per \$1000 sales following the studies of Hitt et al. (1996), this variable is commonly used to assess input into the innovation process (Hitt et al., 1996).

### Independent Variables

To capture the popularity of a firm in the networks, I adopt Stuart's (1998) technological prestige measurement as the indicator of network status. Because patent citations reflect technological building relationships and highly cited patents are those that have served as important building block (Stuart, 1998). On the other hand, Knoke and Burt (1983) stated that an actor is prestigious when it is the object of relationship from other actors in a network of directed ties. Stuart defined the technological status as follows,

$$D_{it} = \frac{\sum_j C_{jit}}{L_t}$$

where  $D_{it}$  denotes the prestige of firm  $i$  at time  $t$ ,  $C_{jit}$  was coded as 1 when a patent of firm  $j$  cited a patent of firm  $i$  during the interval  $t$ , and  $L_t$  was the total number of citations accruing to all photographic firms during the interval  $t$ . The restriction  $i \neq j$  was imposed so that patent self-citations did not contribute to a firm's prestige level. Here, I just simply use the prestige of each year to capture the network status of firms, because the photographic industry is the one that the focuses of firms do not change continuously. In addition, I also run the five year window analysis to test the impact of network status on the strategic alliance formation (Stuart, 1998), the signs of coefficients do not change. To test hypothesis 3 and 4, I use the count of strategic alliances and M&A deals of each year to capture the resources access mechanism and market control mechanism. To examine hypothesis 5, I adopt an ego-centered approach to calculate social constraint. In his research, Burt (1992,1997) argued that there is a negative relationship between social constraint and social capital. Because I am interested in exploring the relationship between the strategic alliance formation and the M&A activity and social capital accumulation, I therefore use the social constraint to represent the social capital. The formal formula of the social constraint can be expressed as:

$$c_{ij} = \left( p_{ij} + \sum_{q, q \neq i, q \neq j}^Q p_{iq} p_{qj} \right)^2$$

where  $c_{ij}$  is the constraint of absent,  $p_{ij}$  is the proportion of the value of  $i$ 's relation(s) with  $j$  compared to the total value of all relations of  $i$  ( Burt, 1992), the social constraint was calculated using Pajek 1.23.

## Control Variables

For hypothesis 1, 2 and 5, I control for the similar set of variables, any differences will be pointed out. For the models testing hypothesis 3 and 4, I only control the firm size because larger firms are always expected to have more social connections. The previous research stated the positive and negative impacts of diversifications on innovations (Cohen and Levin, 1989; Ahuja, 2000). Therefore, dummy multidivision is set to 1 if a camera firm has more than 3 business divisions. Past performance may affect the formation of M&As (Haunschild, 1993). I include past performance using the averaged return on assets during the previous two years (Z. Lin et al., 2009). For strategic alliance formation, Stuart (1998) argued that a number of studies had found no effects of accounting measures of performance on alliance formations. Therefore, I do not include firm performance as a control in models testing the impacts of the network status on strategic alliance formation. To investigate hypothesis 5, I follow the study of Ahuja (2000) and simply control the yearly ROA as firm performance. Previous studies have issued calls for the rigorous research on the role of institutional environments (Meyer et al., 2009; Peng, 2003; Peng et al., 2008). Lin et al. (2009) found that institutional differences may affect the formation of M&As, Hitt et al. (2000, 2004) also argued that country of origin will affect the partner selection. Therefore, I code developed area and underdeveloped area as two dummy variables to reflect the institutional settings. Here, developed areas and underdeveloped areas do not only point to the economic and political context, they mainly reflect the maturity level of the photographic industry, this is a little different from Lin et al. (2009). The developed area set to 1 if the firm's headquarter is located in USA, Japan and Germany. The underdeveloped areas is set to 1 if the firm's headquarter is located in none of the countries mentioned above. To examine hypothesis 5, because different institutional settings may cause different industry policies and business environments which influence innovations, I also include institutional development as a control variable modeling hypothesis 5. Tan and Peng (2003) stated that organization slack may influence managers pursuing acquisitions. Following the previous research (Stuart, 1998; Cheng and Kesner, 1997; Z. Lin et al., 2009), I use debt to assets ratio and recoverable slack (general and administrative expenses/sales) to measure the organization slack. In addition, it is said that digital camera became a watershed for the photographic industry. The digital cameras also shaped the industry thereafter. I code digital camera controlling the possible effect in the models of hypothesis 1, 2 and 5. The variable is equal to 1 if a firm produced digital cameras in its product portfolio in the research time frame. Other control variables contain firm size (measured by logarithm of total sales), firm age (the difference between the firm's founding year and year 2008), and firm's number of prior M&As and alliances deals (one year lag for the number in a given year). Because Ahuja (2000) found that direct ties have positive impact on innovations, thus I include strategic alliance counts to control possible effects for hypothesis 5.

## RESULTS

Table 1 reports the descriptive statistics of means, standard deviation and correlation matrix for all independent and control variables. Table 2 presents Poisson maximum-likelihood regression results of models testing hypothesis 1. Table 3 reports Poisson maximum-likelihood regression results of models testing hypothesis 2. Table 4 presents the random-effect GLS regression results of models testing hypothesis 3 and 4 and table 5 reports the random-effects GLS regression results of models testing hypothesis 5. Hypothesis 1 argues that the network status may negatively influence the strategic alliance formation. The coefficients between network status and the strategic alliance formation in model 3 and 4 are negatively significant at  $p < 0.05$ , supporting hypothesis 1. Hypothesis 2 suggests that the network status may positively influence M&A activity intensity. The coefficients between network status and M&A activities intensity in model 7 and 8 are positively significant at  $p < 0.1$ , supporting hypothesis 2. Hypothesis 3 examines the positive relationship between the strategic alliance formation and social capital accumulation. The coefficient between the strategic alliance formation and the social constraint in model 10 is negatively significant at  $p < 0.1$  in support of hypothesis 3. But the coefficient between the M&A Activity Intensity and the social constraint in model 10 is positively insignificant which is not supportive for hypothesis 4. Hypothesis 5 explores the positive relationship between the social capital and

innovations. The coefficient between the social constraint and the internal innovations in model 13 is negatively significant at  $p < 0.05$  in support of hypothesis 5.

Overall, all hypotheses except for hypothesis 4 are supported. The findings suggest that a joint consideration of the strategic alliances formation and M&A activity intensity helps to understand how camera makers knit their social networks to influence the innovations. The positive role of social capital in innovations is confirmed (Results are shown in Table 1-5).

**TABLE 1  
DESCRIPTIVE STATISTICS AND CORRELATIONS**

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
1 Firm age	61.52	43.62	1.00																	
2 Multidivision	0.16	0.37	0.17	1.00																
3 Digital camera	0.18	0.39	-0.06	0.15	1.00															
4 Debt to assets ratio	0.15	0.70	0.00	-0.01	-0.05	1.00														
5 Firm size	7.56	3.47	-0.08	0.12	0.15	0.04	1.00													
6 Network status	0.01	0.05	0.15	0.17	0.13	-0.03	0.22	1.00												
7 Prior alliance	1.83	1.73	0.43	-0.01	0.06	0.16	0.07	0.32	1.00											
8 Prior M&A	0.08	0.48	0.10	0.09	0.14	-0.01	0.09	0.28	0.21	1.00										
9 Developed areas	0.65	0.48	0.08	0.12	0.12	0.02	0.30	0.17	0.07	0.10	1.00									
10 Underdeveloped areas	0.35	0.48	-0.08	-0.12	-0.12	-0.02	-0.30	-0.17	-0.07	-0.10	-1.00	1.00								
11 Recoverable slack	0.26	0.13	0.02	0.18	0.02	-0.04	0.03	0.13	0.00	0.06	0.29	-0.29	1.00							
12 Past Firm performance	-0.32	6.29	0.00	0.03	0.04	-0.12	0.21	0.03	0.07	0.02	0.18	-0.18	0.04	1.00						
13 Firm performance	-0.16	4.85	0.00	0.02	0.03	-0.10	0.09	0.02	0.06	0.01	0.10	-0.10	-0.03	0.16	1.00					
14 Social capital	0.54	0.38	-0.02	0.05	0.03	0.11	-0.44	-0.02	-0.12	-0.06	0.00	0.00	-0.03	-0.25	-0.25	1.00				
15 Strategic alliance formation	1.83	1.73	0.43	-0.01	0.08	-0.19	0.01	0.18	0.12	0.34	0.07	-0.07	-0.13	0.27	0.15	-0.24	1.00			
16 M&A activity intensity	0.08	0.48	0.10	0.09	0.13	-0.01	0.12	0.33	0.21	0.22	0.10	-0.10	0.04	0.02	0.01	-0.11	-0.21	1.00		

**TABLE 2**  
**EFFECTS OF NETWORKS STATUS ON STRATEGIC ALLIANCE FORMATION**

Variables	Model 1	Model 2	Model 3	Model 4
<b>Control Variables</b>				
Firm Size	-0.12(0.305)	-0.12(0.305)	-0.12(0.304)	-0.12(0.304)
Developed Areas	-2.46(0.01)**	-	-2.46(0.008)***	-
Underdeveloped Areas	-	2.46(0.01)**	-	-2.46(0.008)***
Firm Age	0.02(0.001)***	0.02(0.001)***	0.03(0.000)***	0.03(0.000)***
Multidivision	0.68(0.263)	0.68(0.263)	0.78(0.196)	0.78(0.196)
Digital Camera	-0.77(0.012)**	-0.77(0.012)**	-0.62(0.051)*	-0.62(0.051)*
Prior Alliances	-0.03(0.504)	-0.03(0.504)	-0.005(0.934)	-0.005(0.934)
Recoverable Slack	-3.30(0.287)	-3.30(0.287)	-3.57(0.254)	-3.57(0.254)
Debt to Assets Ratio	0.83(0.574)	0.83(0.574)	0.42(0.78)	0.42(0.78)
<b>Independent Variables</b>				
Network Status			-4.17(0.025)**	-4.17(0.025)**
N	27	27	27	27
Log likelihood	-46.8453	-46.8453	-43.8421	-43.8421
$\chi^2$	34.77	34.77	40.77	40.77
Pseudo R <sup>2</sup>	0.2706	0.2706	0.3174	0.3174

Note: \*P<0.1; \*\*P<0.05; \*\*\*P<0.01

**TABLE 3**  
**EFFECTS OF NETWORK STATUS ON M&A ACTIVITY INTENSITY**

Variables	Model 5	Model 6	Model 7	Model 8
<b>Control Variables</b>				
Firm Size	0.29(0.003)**	0.2892(0.003)**	0.26(0.011)**	0.26(0.011)**
Developed Areas	-1.75(0.088)*	-	-1.59(0.129)	-
Underdeveloped Areas	-	1.75(0.088)*	-	1.59(0.129)
Firm Age	0.05(0.000)***	0.05(0.000)***	0.05(0.000)***	0.05(0.000)***
Multidivision	1.07(0.01)**	1.07(0.01)**	1.08(0.01)**	1.08(0.01)**
Digital Camera	0.65(0.006)***	0.65(0.006)***	0.57(0.02)**	0.57(0.02)**
Prior M&A Deals	-0.01(0.811)	-0.01(0.811)	-0.02(0.65)	-0.02(0.65)
Past Firm Performance	-4.48(0.02)**	-4.48(0.02)**	-4.79(0.014)**	-4.79(0.014)**
Recoverable Slack	-4.84(0.013)**	-4.84(0.013)**	-4.75(0.016)**	-4.75(0.016)**
Debt to Assets Ratio	0.39(0.726)	0.39(0.726)	0.10(0.927)	0.10(0.927)
<b>Independent Variables</b>				
Network Status			1.48(0.082)*	1.48(0.082)*
N	208	208	208	208
Log likelihood	-161.7711	-161.7711	-160.3174	-160.3174
$\chi^2$	180.85	180.85	183.76	183.76
Pseudo R <sup>2</sup>	0.3585	0.3585	0.3643	0.3643

Note: \*P<0.1; \*\*P<0.05; \*\*\*P<0.01



**TABLE 4**  
**EFFECTS OF M&A ACTIVITY INTENSITY AND STRATEGIC ALLIANCE FORMATION ON SOCIAL CAPITAL ACCUMULATION**

Variables	Model 9	Model 10
<b>Control Variables</b>		
Firm Size	-0.04(0.000)***	-0.04(0.191)
<b>Independent Variables</b>		
M&A Activity Intensity		0.02(0.357)
Strategic Alliance Formation		-0.02(0.093)*
N	241	59
Wald $\chi^2$	13.47	5.31
R <sup>2</sup>	0.1912	0.1542

Note: \*P<0.1; \*\*P<0.05; \*\*\*P<0.01

**TABLE 5**  
**EFFECTS OF SOCIAL CAPITAL ACCUMULATION ON INNOVATIONS**

Variables	Model 11	Model 12	Model 13
<b>Control Variables</b>			
Firm Size	7.04(0.014)**	7.04(0.014)**	-1.57(0.663)
Developed Areas	-1269.03(0.129)	-	-
Underdeveloped Areas	-	-	-
Firm Age	22.52(0.028)**	22.52(0.028)**	-0.48(0.000)***
Multidivision	-360.39(0.587)	-360.39(0.587)	-26.10(0.015)**
Digital Camera	2.48(0.643)	2.48(0.643)	5.26(0.436)
Debt to Assets Ratio	2.40(0.94)	2.40(0.94)	-91.88(0.043)**
Firm Performance	5.24(0.933)	5.24(0.933)	30.68(0.708)
Strategic Alliance Formation	1.54(0.159)	1.54(0.159)	0.82(0.521)
<b>Independent Variables</b>			
Social Capital			-30.79(0.027)**
N	67	68	38
Wald $\chi^2$	14.4	12.71	47.89
R <sup>2</sup>	0.0289	0.0289	0.6228

Note: \*P<0.1; \*\*P<0.05; \*\*\*P<0.01

## DISCUSSIONS

The purpose of this paper is to explore the mechanism embedded in the relationship between the network status and innovations. I found that companies which enjoy high prestige in the networks use strategic alliances--resources access mechanism--to accumulate their social capital and to increase innovation ability. On the other hand, high-prestige companies unweave their networks via M&A activities--market control mechanism, which may reduce their innovation ability because the social capital held is lost. The relationship between M&As and innovations in this study was also consistent with the earlier research (Hitt et al., 1996). There are three points I want to emphasize in the conclusion.

First of all, the previous research found that the position of a firm in a broader technological context is one factor that positively influences the strategic alliances formation (Stuart, 1998). This paper, however, found the opposite conclusion that technology prestige or network status negatively influences the strategic alliance formation. The difference may be due to various industries studied. This paper focused on the photographic industry while the previous research focused on semiconductor industry.

Second, many scholars studied the drivers of M&As and strategic alliances (Capron et al., 1998; Stuart, 1998; Gulati, 1998; Chung, 2000; Koka and Prescott, 2002; Park et al., 2002; Haleblan et al., 2006; Hayward, 2002; Hitt et al., 2004; McEvily and Marcus, 2005; Peng and Luo, 2000; Z. Lin et al., 2009), the drivers of innovations (Hitt et al., 1996; Tsai and Ghoshal, 1998; Nahapiet and Ghoshal, 1998; Obstfeld, 2005; Ahuja, 2000), the relationship between M&As and social capital (Pfeffer, 1972), and the relationship between alliances and social capital (Koka and Prescott, 2002). But few systematically incorporated the above relationships together to consider how network status influences innovations. This paper argues that network status influences innovations through the resources access mechanism and the market control mechanism, which extends the earlier research.

Third, the negative relationship between the network status and innovations has been consistent with the earlier findings about the disconnectedness and innovations (Phillips, 2010), which indicates that disconnectedness may be the source of innovations. Contrary to the common sense, the higher status is not translated into the richer social capital, because the high-prestige firms more likely adopt the market control mechanism to unweave their social networks, lose their social capital accumulated by the efforts of their pursue of the resource access mechanism, while the disconnectedness, due to its own popularity and resources restriction, cannot impose market control mechanism but is better at resources access mechanism, this situation makes the disconnectedness learn new knowledge and find new opportunities faster, the disconnectedness therefore becomes more innovative.

Fourth, the innovation ability could be weakened due to positions in technology community. Therefore, the high status firms should be cautious about their position in the networks, because the networks give the actors the trade-off between the flexibility and limitations (Gargiulo and Benassi, 2000).

### Limitations and Avenues for Future Research

The limitations of the research offer opportunities for future improvements. First, I only study one industry, though the sampling is based on international context, as I mentioned before, caution should still be exercised in generalizing the findings to other industries. Second, the fact that I do not use yearly moving windows to calculate the social constraints might post a potential risk in the interpretation of the results. Third, though the generalization of the findings should be safely considered, the negative relationship between the network status and strategic alliance indicates that the disconnectedness may be related to the innovation initiation. Future research might want to further explore the mechanisms for how disconnectedness influences innovations. Moreover, the significant effects of the variable multidivision on social capital and the relationship between social capital and innovations indicate that firms' social networks content may also be an insightful influential and worthy factor for innovations.

## CONCLUSION

We anchor our theory on one of the most fruitful areas of social sciences, the role social capital (Narayan and Cassidy, 2001), suggesting that social capital and network structures positively influence innovations. We highlight strategic alliance, M&A and innovations in light of social capital theory, showing that firms address their needs in innovations by using resources access and market control mechanisms. We believe that social capital theory offers important insights for innovations literatures, and we hope that future researchers could join us to navigate and advance the understanding in this line of inquiry.

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