3. DO NETWORK LINKAGES AFFECT FINANCIAL LEVERAGE? A GROUP GOVERNANCE PERSPECTIVE

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Abstract

Using a unique panel of 315 Taiwanese listed business groups over the period of 2006-2008, and adopting the related party purchases and sales transactions as the proxy for network linkages, this study tests whether do the network linkages affect financial leverage. The results find that the shareholdings of family members and the divergence between the board seats control and voting rights are negatively correlated with the related party purchases and sales network linkages. For information technology (IT) family firms, the higher the related party sales, the higher is the debt ratio; the higher the related party purchases, the higher is the long-term debt ratio; and the greater the number of related party suppliers, the higher is the short-term debt ratio. The opposite is true for non-information technology (NIT) family firms.

Keywords: capital structure, network linkages, related party transaction, business groups, family governance

JEL Classifications: C23, G32, G34

I. Introduction

Since the concept of network linkages was first used by Johanson and Mattsson (1987) to explain the basis for corporate cooperation, network linkages have been widely studied and have found applications in strategic organization and in overseas investments (Guler and Guillen, 2010). Firms construct effective value chain linkages, using network structures, in order to develop value-adding partnerships (Phusavat *et al*., 2010). In addition, from the viewpoint of the firm resources, a cooperative relationship between firms can be considered to be a resource of those firms. Kuo

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(2006) indicated that network linkages can help to increase a firm value and subsequently reduce the use of debt financing.

A supply chain that forms economic links between a firm, its suppliers and its clients affects decisions about the firm's capital structure and its competitive behavior in the market (Bae, Kang and Wang, 2011). In this report, the supply chain effects refer to credit financing and long-term trade agreements with the suppliers, the quality guarantee demanded by customers and the ongoing trade relationship with the clients. In recent years, the rise of the Chinese economy and its impact on international economic development, global and inter-industrial competition means that the cooperative relationship between firms is more crucial. Without doubt, the multiple supply chain network linkage has become an important field of development. In deciding on the capital structure, firms can incorporate the idea of a network structure, which can provide a greater understanding of not only a firm's financial leverage but also the optimal leverage level. More importantly, this creates a new opportunity for on the study of capital structure. The influence of network linkages on the capital structure, during the development process of a firm, has seldom been studied. Thus, because of the increasing importance of supply chain management, the effect of network linkages on a firm's capital structure constitutes a valuable new direction for further research.

Because of the trend towards globalization, firms face more intense competition in global markets and transitions in the global economic environment. To cope with these changes, firms seek cooperative opportunities, such as mergers, joint ventures, reinvestments, cross-shareholdings, or the formation of strategic alliances or business groups, in order to share resources, achieve economies of scale and to promote firms' growth and create a competitive edge. Since the subsidiaries of business groups are linked through shares, business groups can be considered to be a network collective. In Taiwan, large business groups are mostly founded and operated by families or relationship networks (Hsieh, Yeh and Chen, 2010) which are subject to overlapping ownership and control (Yeh, 2005; Memili *et al*., 2011). The reasons for formation and the characteristics of Taiwanese business groups are drastically different to those for such groups in other countries. This is because in Taiwan the business groups are typically family firms, while other business groups are established by firstly forming a parent firm and then the subsidiaries. Therefore, the scale of the network linkages within family groups is necessarily substantially different from the scale of network linkages formed by individual firms since the subsidiaries are linked to each other through a "shareholding relationship network" and the family relationships within Taiwanese business groups highlights the importance of network relationships.

This work contributes to the previous literature by four aspects. First, we analyze the effects of supply chain network linkages of business group on their capital structure by using terms of trade amounts as the proxy for the strength of network linkages within the groups. In contrast to the traditional definition of network linkage used in the previous literature, we use related party purchases and sales transaction linkages as a proxy for the network linkage. The two measures were used to assess the strength of the network linkages in the business groups: the number of related party suppliers and buyers and the ratio of related party purchases to sales amounts. Second, we seek to incorporate the mediating effects of family governance on relationship between financial leverage and related party purchases and sales network linkage. Third, in the analysis we use a

unique panel of 315 Taiwanese listed business groups over the period of 2006-2008, and we follow the method proposed by Banerjee, Dasgupta and Kim (2008) to construct the related party purchases and sales transactions list for each business group from the Market Observation Post System (MOPS) of the Taiwan Stock Exchange, and the firm's annual report and website. Fourth, the subsidiaries within Taiwanese business groups are linked to each other through the "shareholding relationship networks" and "family relationship networks", and these highlight the importance of network linkages. Therefore, this study includes two proxy variables to account for the family governance of business groups, that is, the ratio of equity held by family controlling shareholders, and the ratio of deviation between the board seats control and family owner's voting rights.

The remainder of this paper is organized as follows. Section 2 reviews the results of previous empirical researches and develops the empirical hypotheses. Section 3 presents the sample data, variables and empirical models. Section 4 analyzes and discusses the empirical results. Section 5 concludes and presents the implications emerging from the findings.

II. Literature Review and Hypotheses Development

II.1 Networks

Johanson and Mattsson (1987) proposed that in the industrial systems as networks, the coordination takes place through interaction among firms in the network. Each firm in the network has relationships with customers, distributors, suppliers, and competitors. In the network model, the interdependencies are among firms, thus, firms' consequences are also interdependent in the network. Gulati (1998) defined strategic alliances as voluntary arrangements between firms involving exchange, sharing, or co-development of products, technologies, or services. They can occur as a result of a wide range of motives and goals, take a variety of forms, and occur across vertical and horizontal boundaries. Research on strategic blocks (Nohria and Garcia-Pont, 1991), strategic supplier networks (Jarillo, 1988; Dyer and Singh, 1998), learning in alliances (Hamel, Doz and Prahalad, 1989), and network resources (Gulati, 1999) have examined inter-firm relationships from a variety of theoretical perspectives.

To discuss the network literature, either the relational view (Dyer and Singh, 1998) or the resource-based view (Wernerfelt, 1984; Barnye, 1991) highlight the importance of external resources available to the firm through its networks (Gnyawali and Madhaven, 2001; McEvily and Marcus, 2005). Also, the embeddedness of firms in networks of external relationships with other organizations provides a firm with access to information, resources, markets, and technologies and then leads to firm's competitive advantage, performance and growth (Gulati, 1999; Gulati, Nohria, and Zaheer, 2000).

Previous researches noticed that firms with dissimilar but complementary strategic capabilities sometimes group together to form blocks, in an effort to improve their abilities to compete on a global basis (Nohria and Garcia-Pont, 1991). In recent years, strategic alliances have become an integral component of a firm's strategy to access and acquire resources from external sources. Alliance networks performance has been

associated with inter-firm strategic organizational compatibility, knowledge-sharing, adaptive governance, and scale or scope economies (Dyer and Singh, 1998; Khanna, Gulati and Nohria, 1998; Dussauge, Garrette and Mitchell, 2000; Dyer and Nobeoka, 2000; Kale Singh and Perlmutter, 2000; Lavie, 2007). Thus, inter-firms' alliance networks can be thought of as an inimitable and non-substitutable by facilitating access to unique resources and capabilities (Gulati, 1999). Zaheer and Bell (2005) stated that firms with superior network structure may be better able to exploit their internal capabilities and, thus, enhance their performance by leveraging these resources.

In sum, networks encompass a firm's set of relationships, both horizontal and vertical, with other organizations (such as suppliers, customers, competitors, or other entities) including relationships across industries and countries. With the network concept, value is co-created by an integration of firms in the network.

II.2 Hypotheses

There were many studies of strategic networks, such as supply chain linkages (Dyer and Singh, 1998) and network resources (Gulati, 1999). From the strategic alliance perspective, studies have used the resource-based view, such as the close cooperative relationship between construction material suppliers (Barney, 1991), the cooperation based on R&D (Powell, Koput and Smith-Doerr, 1996) and the information-trading linkages between managerial teams (Gulati and Westphal, 1999). In addition, from the resource-based perspective, a cooperative relationship between firms can constitute a firm resource, which can increase the firm value (Blankenburg, Eriksson and Johanson, 1999). In particular, network linkages based on financial resources can increase the capacity for spontaneous financing, increase the firm's overall financial flexibility and, thus, reduce the firm's debt level (Vicente-Lorente, 2001; Kuo, 2006). Therefore, during the development of a firm, the network relationship does affect the capital structure. Based on the empirical findings and the arguments presented above, we propose the following hypothesis:

Hypothesis 1. The extent of network linkages is associated with the firm's financial leverage.

There is some evidence about the effect of family on decision-making. James (1999) and Schneider (2000) stated that family shareholders are more concerned about a firm's future growth and longevity, but Hutchinson (2002) found that when a board of directors is dominated by firm insiders, opportunistic behavior is more likely. Yeh, Lee and Woidtke (2001) and Yeh (2005) found that family shareholders in Taiwanese firms are likely to use pyramidal structures or cross-shareholdings within the business groups to occupy the seats on the board of directors or hold the voting rights to strengthen the powers of management and decision-making, and it is likely that there is a divergence between control rights and cash flow rights. Grossman and Hart (1988) and Harris and Raviv (1988) suggested that when voting rights diverge from cash flow rights, there is a negative entrenchment effect on the firm value. Du and Dai (2005) further proposed that the divergence of shareholder control rights and cash flow rights may result in the non-erosion entrenchment effect, the debt signaling effect and the reduce-debt-for-tunneling effect, that is, the divergence is positively correlated with the firm's financial leverage. Banerjee Dasgupta and Kim (2008) found that capital structure decisions of Taiwanese business groups are affected by the buyer-supplier related party transactions. Thus,

family firms have greater incentive to influence related party transaction linkage and capital structure. Accordingly, we hypothesize:

Hypothesis 2. The extent of family governance has the mediating effect on the relationship between network linkages and firm's financial leverage.

III. Data and Methodology

III.1. Data

The data for the empirical investigation consists of a balanced panel of 315 Taiwanese listed business groups (financial and insurance firms were excluded) during the period 2006-2008. All firms in the sample are Taiwanese companies listed on the Taiwan Stock Exchange and on the Over-the-Counter (OTC). The empirical data were obtained from the corporate financial statement database and corporate governance database of the Taiwan Economic Journal (TEJ), the MOPS of the Taiwan Stock Exchange, and the firms' annual reports and websites.

This study adopts the definition of business groups that is used in the TEJ database; that is, firms with the same ultimate controller that meet the following requirements: (1) the primary shareholders are members of the same family (the primary shareholders refers to the ten largest shareholders or shareholders with more than 5% shareholdings); (2) at least one third of the directors on the board of directors are in this group; (3) the primary manager, chairperson or CEO is in the same group; (4) there is a controlling or dependency relationship with real controls and (5) there is a mutual investment relationship.

We follow the method proposed by Banerjee Dasgupta and Kim (2008) to construct the related party purchases and sales transactions (i.e., the amount of related party transactions exceeding NT$100 million or firms with paid-in capital of over 20%) list for each business group. At first-level purchases and sales linkage, we select the core firm of the business groups as our object of study. Then, to obtain information about related party purchases and sales for the core firms, each related party transaction as disclosed in the MOPS of the Taiwan Stock Exchange and the firm's annual report and website, was individually analyzed. At second-level purchases and sales linkage, information about firms that have a purchasing or sales relationship with the first-level firms is required. All related party buyers and suppliers are considered to belong to the same business group and to continue doing so, until no further purchase and sales linkages can be constructed, or the linked firm had already appeared once, the process was not repeated. In addition, if a firm linked to a particular firm is also the core firm of another business group, the process was not repeated. Thus, after excluding firms with incomplete sales and purchases data, financial and insurance firms, the final sample included 315 firms.

III.2. Variables

This study uses long-term debt ratios and short-term debt ratios as the proxy variables for capital structure. In terms of how to measure the degree of network linkages between firms, the available literature has not provided a consistent and definitive definition. Since this study focuses on Taiwanese business groups, their unique characteristics,

such as the family networks, organizational networks and human relations networks, must be taken into consideration. In Taiwan, firms affiliated to business groups often engage in related party purchases and sales transactions. In other words, the network linkages in Taiwanese business groups are achieved through supply chain cooperation and the division of labor. Therefore, in contrast to the definition of network linkages used in the available literature (Johanson and Mattsson, 1987; Uzzi, 1997), we use related party purchases and sales linkages as a proxy for the network linkage. The two measures were used to assess the strength of the network linkages in business groups: the number of related party suppliers and buyers, and the ratio of related party purchases and sales amounts. Both measures are defined to include only the purchasing or selling firms with related party transactions exceeding NT$100 million, or with paid-in capital of over 20%.

Controlling shareholders of pyramidal business groups tend to use related party transactions, such as buying assets at high prices and selling them at low prices, to obtain personal benefits (Cheung, Raghavendra and Stouraitis, 2009). In addition, as family shareholders hold large cash flow rights, opportunistic behavior is likely to occur. Family shareholders may sacrifice firm performance for the benefit of family members (Yammeesri and Lodh, 2004). Furthermore, a divergence of voting rights from cash flow rights may cause large shareholders or family shareholders to use pyramidal and cross-shareholdings to misappropriate firm assets (Morck, Wolfenson and Yeung, 2005; Bozec and Laurin, 2008). Therefore, in order to account for the family governance of business groups, this study includes two proxy variables for corporate governance, that is, the share of equity held by family controlling shareholders, and the ratio of deviation between the board seats control and family owner's voting rights.

The capital structure is also influenced by other factors, such as firm size (Smith and Watts, 1992; Kuo, Wang and Wu, 2000), profitability (Moh'd, Perry and Rimbey, 1998; Kuo, Wang and Wu, 2000) and long-term investments (D'Mello and Miranda, 2010). This study also uses the number of affiliated firms in a business group and total assets as proxy variables for group size. In addition, the return on assets and the long-term investment to equity ratio are used as proxy variables for profitability and long-term investments, respectively. Table 1 presents the definition of variables.

Table 1

Definition of Variables

Variables	Abbreviation	Definition
Capital structure		
Long-term debt ratio	*LDebt*	Long-term debt ratio = (Long-term debt/Total assets)*100%.
Short-term debt ratio	*SDebt*	Short-term debt ratio = (Short-term debt/Total assets)*100%.
Network linkage		
Number of related party buyers	*Buyer No*	The number of related party buyers which have trade amounts exceeding NT$100 million or which have paid-in capital of over 20%.
Number of related party suppliers	*Supplier No*	The number of related party suppliers which have trades amounts exceeding NT$100 million or which have paid-in capital of over 20%.

Variables	Abbreviation	Definition
Related party sales ratio	*Sale Ratio*	Related party sales ratio = (Amount of sales to related parties with transactions exceeding NT$100 million or with paid-in capital of over 20%/Total amount of sales) *100%.
Related party purchases ratio	*Purchase Ratio*	Related party purchases ratio = (Amount of purchases from related parties with transactions exceeding NT$100 million or with paid-in capital of over 20%/Total amount of purchases) *100%.
Corporate governance		
Family ownership ratio	*FMown*	Family ownership ratio = (Equity held by the family controlling shareholders /Total shares)*100%.
Seats control-voting rights divergence ratio	*Diverge*	Seats control-voting rights divergence ratio = Ratio of board seats held by family members/ Family ownership ratio. The ratio of board seats held by family members = (Board seats held by family controlling shareholder/Total board seats)*100%. The family ownership ratio = (Equity held by the family controlling shareholders/Total shares)*100%.
Firm characteristics		
Group size	*GpSize*	Number of affiliated firms in a business group.
Total assets	*LnTA*	Natural log of total assets.
Return on assets	*ROA*	Return on assets = (Net income after tax/Average total assets)*100%.
Long-term investment ratio	*Invest Ratio*	Long-term investment ratio = (Long-term investments/Shareholder equity)*100%.

III.3. Models

In this study, a panel data regression model is used for the empirical analysis, and the *F*-test, the Lagrange multiplier test (LM test) and Hausman test are used to determine the choice of panel data regression model and subsequent empirical analyses.

Firstly, the effect of the family governance of a business group on its related party purchases and sales network linkages is tested. This study uses the related party purchases and sales network linkage (*NL*) as the dependent variable of the model. It is a measurement of the number of related party buyers (*Buyers No*), the number of related party suppliers (*Supplier No*), the ratio of related party sales amount (*Sale ratio*) and the ratio of related party purchases amount (*Purchase ratio*). The independent variables include the family ownership ratio (*FMown*) and the seats control-voting rights divergence ratio (Diverge). The group size (*GpSize*) is the control variable. The empirical model is as follows:

$$NL_{it} = \alpha_i + \beta_1 FMown_{it} + \beta_2 Diverge_{it} + \beta_3 GpSize_{it} + \varepsilon_{it} \quad (1)$$

Then, the relationship between the related party purchases and sales network linkages and the capital structure is analyzed. This study uses the capital structure (*Debt*), a measurement of the short-term debt ratio (*SDebt*) and the long-term debt ratio (*LDebt*),

as the dependent variable. The four related party purchases and sales network linkage (*NL*) (i.e., *Buyers No*, *Suppliers No*, *Sale ratio*, *Purchase ratio*) variables and the seats control-voting rights divergence ratio (*Diverge*) are included as independent variables. Total assets (*LnTA*), the return on assets (*ROA*) and the long-term investment ratio (*Invest Ratio*) are the control variables. The empirical model is as follows:

$$Debt_{it} = \alpha_i + \sum_{k=1}^{p} \beta_k NL_{kit} + \gamma Diverge_{it} + \sum_{k=1}^{p} \theta_k Contol_{kit} + \varepsilon_{it} \quad (2)$$

IV. Empirical Results

IV.1. Data Analysis

The descriptive statistics of each variable are presented in Table 2. One may notice for the sample of 315 firms that the short-term debt ratio, the ratios of the related party sales and purchases, the family ownership ratio and the seats control-voting rights divergence ratio all exhibit large differences in maximum, minimum and standard deviations.

Schneider (2000) suggested that family shareholders are more concerned about the firm's growth and longevity. James (1999) also argued that family firms have broader horizons for the operation of the firms. Anderson, Mansi and Reeb (2003) further suggested that family firms place stronger emphasis on sustained operation and reputation. As the whole, there are more incentives for family shareholders to monitor the firm, thereby increasing firm performance and reducing the operational risks. Hence, this study classifies the 315 business groups according to whether they are run by families. If a firm meets one of the following requirements, then it is classified as a "family firm": (1) the positions of chairman of the board of directors and CEO are held by members of the same family, (2) the family controls more than 50% of the board seats (excluding friendly seats), while the friendly director seats ratio and the external director seats ratio are both lower than 33%, (3) the family controls more than 33% of the board seats, while at least 3 directors or managers are from the ultimate controlling family, and (4) the family ownership ratio is higher than 20%. Out of theses, 177 firms were classified as family firms and 138 firms were classified as non-family firms.

The studies by Grossman and Hart (1988) and Harris and Raviv (1988) both found that the divergence between voting rights and cash flow rights can cause a negative entrenchment effect. Du and Dai (2005) also found that the divergence between voting rights and cash flow rights can increase the firm's tendency to take risks in decisions with regard to capital structure. Therefore, this study uses a seats control-voting rights divergence ratio of 1 as the critical point. That is, if the divergence ratio is larger than 1, it is classified as "high divergence", otherwise, it is classified as "low divergence". Out of theses, 160 firms were classified as high divergence firms and 155 firms were classified as low divergence firms.

Table 2

Descriptive Statistics

Variables	Min.	Max.	Mean	Std. Dev.
LDebt	0.00	51.71	7.96	9.32
SDebt	2.20	86.79	26.95	14.34
Buyer No	0.00	29	2.68	3.54
Supplier No	0.00	17	1.74	2.08
Sale Ratio	0.00	100	21.98	23.43
Purchase Ratio	0.00	100	29.81	31.92
FMown	0.00	100.00	18.65	21.86
Diverge	0.00	16.37	1.61	2.20
Total Assets (Million NT$)	186	648663	31300	78428
ROA	-47.38	53.10	5.22	9.61
Invest Ratio	0.00	197.23	48.37	32.69

Many studies state that the industry is an important factor in capital structure (Aggarwal and Baliga, 1987; Sekely and Collins, 1988). In Taiwan, the information technology industry has far outstripped traditional industry, since the 1990s, and has become the main player in the development of the Taiwanese economy. In fact, information technology with a comparatively high degree of internationalization has led to a steady growth in Taiwan's GNP. Therefore, 315 firms are classified as information technology (IT) firms or non-information technology (NIT) firms based on the SIC codes. The 186 IT firms contain semiconductors, computer peripherals, optoelectronics, communications networks, components, electronic access, information services and other electronics. The 129 NIT firms contain cement, food, plastics, textiles, electrical goods, chemicals, biotechnology, steel, rubber, automobiles, building materials, construction, shipping, trade, department stores, and others.

A two-sample t-test is then performed, to examine whether there is a significant difference between subgroups. The t-test results, presented in Panel A and Panel B of Table 3, show that family or high divergence firms have higher long-term debt ratio, family ownership ratio, seats control-voting rights divergence ratio and long-term investment ratio than non-family or low divergence firms. Non-family or low divergence firms have higher short-term debt ratio, related party transactions in both the number of related firms and the ratio of trade amount, and return on assets than family or high divergence firms. The t-test results in Panel C show that the IT firm has higher short-term debt ratio and related party sales and purchases ratios than the NIT firm, while the NIT firm has higher long-term debt ratio, family ownership ratio, seats control-voting rights divergence ratio, and long-term investment ratio than the IT firm.

Overall, the t-test results show that the voting rights and seats control of family firms exhibit a higher divergence. Family firms also prefer long-term debt financing and there is a certain relationship with long-term investments. Non-family firms tend to use short-term debt financing and may be influenced by related party purchases and sales. In addition, short-term debt financing in the IT firm may be influenced by the amount of related party sales and purchases, while long-term debt financing in the NIT firm may be influenced by family governance and long-term investments.

Table 3

Differences Test of Cluster Samples

Variables	**Panel A**: Firm type			**Panel B**: Seats control-voting rights divergence			**Panel C**: Industry sector		
	Family	Non-family	t-test	High	Low	t-test	IT	NIT	t-test
LDebt	8.69	7.01	2.767***	8.88	7.00	3.125***	6.66	9.82	-5.131***
SDebt	25.42	28.91	-3.714***	24.93	29.04	-4.441***	28.45	24.79	3.936***
Buyer No	2.39	3.05	-2.763***	2.44	2.92	-2.092**	2.60	2.79	-0.744
Supplier No	1.55	1.98	-2.934***	1.59	1.89	-2.205**	1.73	1.75	-.144
Sale Ratio	19.59	25.06	-3.534***	20.12	23.91	-2.488**	24.25	18.71	3.688***
Purchases Ratio	27.45	32.84	-2.545***	26.39	33.35	-3.361***	34.36	23.25	5.529***
FMown	33.20	0	39.896***	29.98	6.96	19.020***	11.22	29.36	-13.005***
Diverge	2.88	0	29.552***	3.10	0.08	29.251***	1.30	2.06	-5.496***
ROA	4.82	5.73	-1.398	4.65	5.81	-1.846*	5.17	5.30	-0.228
Invest Ratio	53.76	41.45	5.842***	56.21	40.28	7.714***	44.68	53.68	-4.204***

*Notes: ***, **, * Significant at the 1%, 5%, and 10% levels, respectively.*

IV.2. Relationship between the Family Governance and the Related Party Purchases and Sales Network Linkages

The t-test results in Table 3 show that there may be a certain degree of correlation among the related party purchases and sales network linkages, firm type and seats control-voting rights divergence ratio. Therefore, this study further analyzes how the family governance of business groups affects the related party purchases and sales network linkages. The results presented in Table 4 show that the related party sales ratio and the number of related party buyers are mainly influenced by the family ownership ratio. Specifically, the higher the family ownership ratio, the lower are the related party sales ratio and the number of related party buyers. In addition, the related party purchases ratio is negatively correlated to the seats control-voting right divergence ratio. Therefore, the greater the divergence, the lower is the related party purchases ratio. As the whole, the family ownership ratio and the seats control-voting rights divergence ratio are negatively correlated with the related party sales and purchases ratios. Therefore, there is no evidence that family shareholders exhibit opportunistic behavior, when the controlling seats diverge from the controlling shareholdings.

IV.3. Relationship between Related Party Purchases and Sales Network Linkages and Capital Structure

The t-test results for firm type and industry sector in Table 3 indicate that the differences between family and non-family firms and the difference between IT and NIT industries, in relation to related party purchases and sales network linkages, may have a heterogeneous influence on capital structure decisions. In addition, the results from Table 4 show that the family ownership ratio and the seats control-voting rights divergence ratio are significantly negatively correlated with the related party purchases and sales. Therefore, by taking the family governance of business groups into consideration, this study further analyzes the relationship between related party purchases and sales network linkages and corporate capital structure. In particular, the 315 firms are classified into four subsamples, based on firm type (family/non-family) and industry sector (IT/NIT industry), for further analysis. The number of firms in each subsample is as follows: 75 IT family firms, 111 IT non-family firms, 102 NIT family firms and 27 NIT non-family firms. The empirical results are presented in Table 5 and Table 6.

Table 4

Results for Related Party Purchases/Sales and Family Governance

Variables	Related party sales		Related party purchases	
	Sales Ratio	Buyer No	Purchases Ratio	Supplier No
FMown	-0.091* (-1.863)	-0.015*** (-3.234)	-0.050 (-0.785)	-0.006 (-0.865)
Diverge	-0.452 (-1.112)	-0.003 (-0.072)	-1.175** (-2.370)	-0.046 (-0.976)
GpSize	0.358** (2.318)	0.180*** (13.645)	0.463** (2.163)	-1.700*** (-10.537)
Intercept	21.974*** (11.099)	1.747*** (9.942)	29.474*** (10.912)	
F-test	18.18***	38.19***	29.74***	27.90***
LM-test	680.21***	1.46	771.92***	702.74***
Hausman-test	0.78	0.01	0.40	123.29***
Adj. R^2	0.8522	0.164	0.9061	0.900

*Notes: ***, **, * Significant at the 1%, 5%, and 10% levels, respectively. ( ) is the t-value.*

Table 5 shows that for the IT family firms the long-term debt ratio and short-term debt ratio are significantly positively correlated with the related party sales ratio. The long-term debt ratio is also significantly negatively correlated with the number of related party buyers and the seats control-voting rights divergence ratio. For the IT non-family firms, the short-term debt ratio is significantly positively correlated with the number of related party buyers and significantly negatively correlated with the related party sales ratio. Furthermore, the long-term debt ratio is significantly negatively correlated with the number of related party suppliers.

Table 5

Results for the IT Industry

Variables	IT family firms		IT non-family firms	
	SDebt	LDebt	SDebt	LDebt
Buyer No	0.058 (0.094)	-0.719* (-1.712)	1.045*** (2.809)	0.041 (0.194)
Supplier No	0.680 (1.019)	0.359 (0.629)	0.777 (1.547)	-0.0663**(-2.319)
Sales Ratio	0.109* (1.782)	0.065* (1.803)	-0.113*** (-3.219)	-0.010 (-0.501)
Purchases Ratio	-0.079 (-1.614)	0.015 (0.607)	0.001 (0.026)	-0.001 (-0.041)
Diverge	0.591 (0.993)	-0.578** (-1.978)		
LnTA	8.802***(3.869)	4.197***(5.725)	-1.091 (-1.244)	1.976***(4.069)
ROA	-0.071 (-1.353)	-0.169***(-3.509)	-0.008 (-0.148)	-0.098***(-2.909)
Invest Ratio		0.029 (1.184)		0.022 (1.349)
Intercept		-59.245***(-5.271)	45.497***(3.380)	-24.184***(-3.258)
F-test	23.82***	7.68***	9.40***	7.86***
LM-test	136.94***	76.43***	161.37***	141.73***
Hausman-test	41.35***	6.03	9.38	5.78
Adj. R^2	0.8919	0.7098	0.8936	0.7126

*Notes: ***, **, * Significant at the 1%, 5%, and 10% levels, respectively. ( ) is the t-value.*

Table 6 shows that for the NIT family firms the short-term debt ratio is significantly positively correlated with the number of related party suppliers and significantly negatively correlated with the related party sales ratio. The long-term debt ratio is significantly negatively correlated with the seats control-voting rights divergence ratio. In addition, the long-term investment ratio is significantly positively correlated with the long-term debt ratio of NIT family firms, but the opposite is true for NIT non-family firms.

This study also finds that the influence of related party purchases and sales network linkages on capital structure is more evident in the IT firms (for both family and non-family firms) and NIT family firms. For the IT family firms, when the number of related party buyers is more diverse, the firm's long-term debt financing is significantly lower. For the NIT family firms, when the number of related party suppliers is more diverse, the firm's short-term debt financing is significantly higher. For the IT firms, the related party sales ratio increases with long-term and short-term debt financing, but decreases with short-term debt financing for the NIT family firms. This shows that the IT family firms tend to use debt to finance working capital requirements that arise from related party sales.

Table 6

Results for the NIT Industry

Variables	NIT family firms		NIT non-family firms	
	SDebt	LDebt	SDebt	LDebt
Buyer No	0.360 (1.327)	-0.095 (-0.491)	-1.351 (-1.231)	1.169 (1.360)
Supplier No	1.181** (1.973)	-0.249 (-0.595)	-1.032 (-1.337)	0.551 (0.912)
Sales Ratio	-0.102** (-2.541)	-0.002 (0.936)	0.035 (0.246)	-0.129 (-1.083)
Purchase Ratio	0.003 (0.070)	-0.022 (-0.826)	-0.058 (-0.501)	0.113 (1.169)
Diverge	0.450 (1.265)	-0.478* (-1.735)		
LnTA	-4.747*** (-4.816)	2.162*** (3.352)	33.984*** (3.745)	5.033 (0.682)
ROA	-0.097 (-1.139)	-0.115 (-1.636)	-0.566*** (-3.988)	-0.283* (-1.774)
Invest Ratio		0.094*** (4.883)		-0.346** (-2.268)
Intercept	99.018*** (6.418)	-27.230*** (-2.766)		
F-test	16.76***	8.29***	15.29***	17.09***
LM-test	195.59***	106.13***	43.09***	30.60***
Hausman-test	10.33	11.83	18.51***	17.94**
Adj R^2	0.8480	0.7226	0.8510	0.8690

*Notes: ***, **, * Significant at the 1%, 5%, and 10% levels, respectively. ( ) is the t-value.*

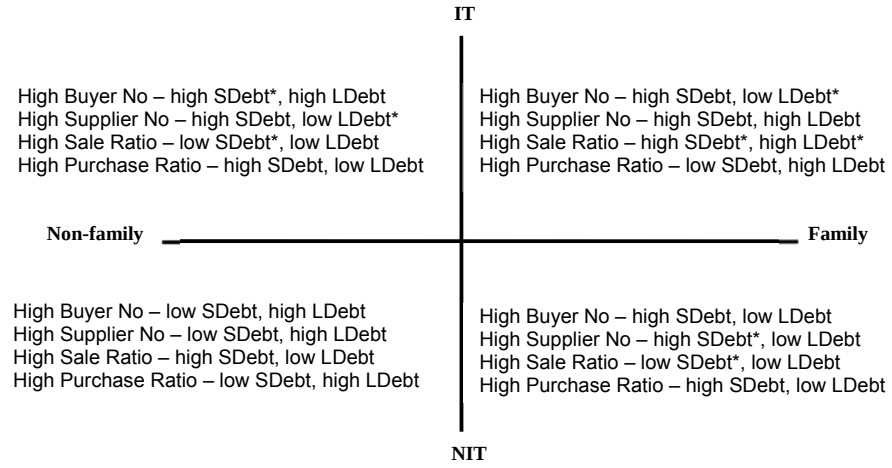
For the IT and NIT family firms, the seats control-voting rights divergence ratio is positively correlated with the short-term debt ratio, but is negatively correlated with long-term debt financing. These results suggest that when the seats control-voting rights divergence ratio is high, the IT and NIT family firms prefer to use short-term debt financing, which is similar to the findings of Du and Dai (2005). That is, high divergence increases a firm's tendency to take risks with its capital structure. Finally, this study finds that the NIT family firms prefer to use long-term debt financing for long-term investments. Whether this results in agency problems, wherein the family shareholders use debt financing as a way to engage in opportunistic behavior, requires further study.

Based on the results in Table 5 and Table 6, the findings concerning the relationship between network linkages, industries, family governance and capital structure (short-term debt ratio or long-term debt ratio) are summarized in a relationship diagram, as shown in Figure 1. The horizontal and vertical axes represent family governance and the industry sector, respectively. On the whole, the related party purchases and sales network linkages have an opposite effect, in terms of their influence on the capital structure of family and non-family firms from different industries. For the IT and NIT family firms, the related party sales ratio and long-term debt of the IT family firms are positively correlated, while the related party sales ratio and long-term debt of the NIT family firms are negatively correlated. In addition, the related party purchases ratio has a negative effect on the short-term debt of the IT family firms and a positive influence on long-term debt, while the opposite is true for the NIT family firms. These results show that the IT family firms tend to use debt financing to provide financial support to related parties through the sales network linkage. Consequently, it is important to consider

whether this behavior creates agency problems in the IT family shareholders. In terms of IT/NIT non-family firms, both the number of related party suppliers and the related party purchases ratio have a positive effect on the short-term debt of the IT non-family firms and a negative effect on their long-term debt, while the opposite is true for the NIT non-family firms. Thus, the results show that the related party purchases network linkage increases the maturity risk in capital structure, for the IT non-family firms.

Figure 1

Relationship Diagram for Network Linkages, Industries, Family Governance and Capital Structure



Notes: * indicates a statistically significant relationship.

IV.4 Discussion

Most previous researches had focused on nonfinancial strategic networks of inter-firms, such as supply chain networks (Dyer and Singh, 1998; Barney, 1991), R&D networks (Powell, Koput and Smith-Doerr, 1996; Helble and Chong, 2004), knowledge-sharing networks (Dyer and Nobeoka, 2000), technological networks (Sun and Du, 2011), social networks (Gulati, Nohria and Zaheer, 2000). From now on, fewer empirical studies have been reported in the financial networks. Vicente-Lorente (2001) and Kuo (2006) demonstrated that financial network linkages can increase a firm's financial capacity and flexibility. Thus, given the rapid proliferation of alliances, neglecting the financial networks in which firms embedded can lead to an incomplete understanding of firm's capital structure.

Kuo (2006) explored financial network for the Taiwanese listed firms and found that financial network linkage along with debt ratio resented a U-shape effect. Kuo and Wang (2013) analyzed the relation between network linkage and performance through the intra-business group related-party transactions in Taiwan and found a U-shaped relation between ROA and related-party purchases network linkage, but an inverted-U-shaped association between related-party receivable-payable network linkages and debt ratio.

Both works did not yet treat the impact of internal corporate governance on financial network.

Several studies have shown that strong ties to family and close friends led to trust as well as sharing of contacts and information (Chell and Baines, 2000; George, Wood and Khan 2001), the emerging firms tend to leverage ties with entrepreneurs' family members and friends to gain the key resources needed to establish firm viability (Larson and Starr, 1993), the family and friends more often provided initial financial support than banks and venture capitalists combined (Bhide, 1999). The characteristic of Taiwanese family groups highlights the traits of a network relationship. In addition, Taiwanese business groups generally have supply chain cooperation between group members through related party transactions to access the resources, and through exchange of payables and receivables in the groups to get the spontaneous funds. Unlike previous researches, this paper specifically focuses on the effect of family governance on financial networks, which directly influences the flow of fund across the intra-firm within the business groups. Thus, our study sheds further light on the means by which a financial linkage among intra-firms can influence groups' capital structure. We suggest that capital structure of business groups can be more fully understood by examining the financial network linkages through the effect of family governance of a business group on its related party purchases and sales network linkages.

V. Conclusion

In recent years, the trend toward globalization and liberalization means that corporations face increasingly fierce competition in the global market and a rapidly changing global economic environment. This has forced firms to develop closer working relationships with each other, through network linkages, in order to share resources, to stimulate business growth and to improve competitiveness. A network relationship is an important resource for the construction of an effective value chain, during a firm's development process, as it can enhance the firm's competitive advantage and value, by reducing the level of debt financing. Therefore, capital structure issues can be examined from the perspective of network linkages. This not only enables further analysis of the firm's financing leverage and its optimal financing level, but also gives a new significance to studies of capital structure. Therefore, this study contributes to the literature by examining the changes in capital structure from the perspective of commercial transaction network linkages. This issue has hitherto not been the subject of much study, but it provides an area for innovative research.

This study uses a unique panel of 315 Taiwanese business groups listed on the Taiwan Stock Exchange (TSE) and Over-the-Counter (OTC) over the period 2006-2008. We analyze the effects of supply chain network linkages of business group on their capital structure by using the related party purchases and sales transactions as the proxy for the strength of network linkages within the groups. And, we also investigate the mediating effects of family governance on relationship between financial leverage and related party purchases and sales network linkage.

Overall, this study finds that the family ownership ratio and the seats control-voting rights divergence ratio are negatively correlated with the related party sales ratio and number of related party suppliers. This indicates that when the board seats controlled

by the family diverge from the voting rights, there is no clear evidence that family shareholders or large shareholders use related party transactions to obtain personal benefits. Secondly, the effects of related party purchases and sales network linkages on capital structure are opposite for both family and non-family firms and for different industries. The related party sales ratio is positively correlated with the debt of the IT family firms, while it is negatively correlated with the debt of the NIT firms. In addition, the related party purchases ratio is negatively correlated with the short-term and positively correlated with the long-term debt of the IT family firms. However, the opposite is true for the NIT family firms. Moreover, both the number of related party suppliers and the related party purchases ratio have a positive effect on the short-term debt and a negative effect on the long-term debt of the IT non-family firms. The effects are again opposite for the NIT non-family firms. Thus, the results indicate that the IT family firms tend to use debt financing to fund the capital needs of related party sales network linkages. However, it must be noted whether this behavior creates agency problems for the IT family shareholders and whether the related party purchases network linkages increase the maturity risk in the capital structure of the IT non-family firms. That is, for the IT non-family firms, it must be noted whether there is an increase in short-term debt financing, when the number of related party suppliers or the amounts of related party purchases is high. Finally, this study finds that the seats control-voting rights divergence ratios of the IT and NIT family firms are positively correlated with short-term debt ratio and negatively correlated with the long-term debt ratio, which indicates that the seats control-voting rights divergence ratios influence a firm's tendency to take risks in decisions about capital structure. In summary, this study finds that network linkages do indeed influence a firm's capital structure. However, in analyzing the relationship between the related party purchases and sales network linkages and the capital structure, the industrial sector and the influence of family governance must be considered.

Future studies could examine how a firm's capital structure is affected by integration of the dynamic adjustment of network linkages and director linkages. The simultaneous equations model could be used to test the endogenous problem of the dynamic adjustment of network linkages and director linkages.

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