THE DIFFERENCE IN IMPACTS OF SUPPLY CHAIN CAPITAL STRUCTURES ON CUSTOMER AND SUPPLIER COLLABORATION IN MANUFACTURING FIRMS IN THAILAND

ผลกระทบจากโครงสร้างทางการเงินของห่วงโซ่อุปทานต่อความร่วมมือระหว่างบริษัทกับลูกค้าและซัพพลายเออร์ในประเทศไทย

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Abstract

Effective and efficient firm collaborations with suppliers and customers can lead to improving supply chain performance and stimulate firm growth. This paper investigated customer and supplier collaboration within the different types of supply chain capital structures. We focus on pure Thai, pure MNCs, pure Join Venture, export, and import supply chain capital structures. The data, collected from 2012-2015, consist of 939 responses from manufacturing firms, located in Thailand. One-way ANOVA method is used to analyze the data. The results indicate that at least one type of supply chain capital structure is significantly different from other types of all factors relating to customer collaboration and supplier collaboration. Based on our Post-hoc Analysis, pure MNCs chain and pure JVs chain are significantly different in the supply chain collaboration from the other three chains. However, there is no significant difference in the supply chain collaboration between the group of pure MNCs chain and pure JVs chain.

Keywords: Supply Chain Collaboration, Supply Chain Capital Structure, Supply Chain Management

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บทคัดย่อ

ความร่วมมือระหว่างซัพพลายเออร์และลูกค้าที่ดีสามารถเพิ่มประสิทธิภาพของห่วงโซ่อุปทานและกระตุ้นให้บริษัทเติบโต งานวิจัยนี้ศึกษาเปรียบเทียบความร่วมมือระหว่างบริษัทในห่วงโซ่อุปทานในรูปแบบต่างๆ ที่ประกอบไปด้วย ห่วงโซ่ของบริษัทไทยทั้งหมด (Pure Domestics Chain) ห่วงโซ่ของบริษัทต่างชาติทั้งหมด (Pure MNCs Chain) ห่วงโซ่ของบริษัทร่วมทุนทั้งหมด (Pure Joint Venture Chain) ห่วงโซ่ที่มีลูกค้าเป็นบริษัทต่างชาติ (Export Chain) ห่วงโซ่ที่มีซัพพลายเออร์เป็นบริษัทต่างชาติ (Import Chain) โดยใช้ข้อมูลแบบสอบถามที่จัดเก็บระหว่างปี 2555-2558 ซึ่งมีทั้งหมด 939 บริษัทที่ทำการผลิตและอยู่ในประเทศไทย จากการวิเคราะห์ผ่านค่าความแปรปรวน (One-way ANOVA) พบว่า มีรูปแบบของห่วงโซ่อย่างน้อยหนึ่งรูปแบบที่แตกต่างจากห่วงโซ่อื่นๆ ในทุกปัจจัยของความร่วมมือกับบริษัทลูกค้าและทุกปัจจัยของความร่วมมือกับซัพพลายเออร์ โดยจากการวิเคราะห์เพิ่มเติม (Post-hoc Analysis) พบว่า ห่วงโซ่ที่ประกอบด้วยบริษัทต่างชาติทั้งหมดและห่วงโซ่ที่ประกอบด้วยบริษัทร่วมทุนทั้งหมด มีความแตกต่างอย่างชัดเจนในด้านความร่วมมือกันระหว่างบริษัทในห่วงโซ่ เมื่อเทียบกับห่วงโซ่รูปแบบอื่นๆ แต่ห่วงโซ่ทั้งสองรูปแบบนี้ไม่มีความแตกต่างกันอย่างชัดเจนในด้านความร่วมมือกันระหว่างบริษัทในห่วงโซ่

คำสำคัญ: ความร่วมมือในห่วงโซ่อุปทาน โครงสร้างทางการเงินในห่วงโซ่อุปทาน การบริหารจัดการห่วงโซ่อุปทาน

Introduction

Thailand joined the ranks of the upper-middle-income countries in 2011 (Thailand Industrialization and Ecomomic Catch-up, 2015). Agriculture is one of the main sectors to drive the economy of the country since it employs over 40% of workers. The intensive agriculture has been changed from labor-intensive and traditional methods to more modern production techniques. Basically, it is driven by the increasing of foreign direct investments (FDIs) and resources allocation among economic sectors. The foreign investors mostly come from Japan, the United States, and Europe. They reallocate the labor and capital inputs from the agriculture sector to many other sectors such as manufacturing, automotive, electronic, and service industry (OECD, 2013). From this trend, the government adopts a dual-track policy to enhance the capabilities of Thai firms in these industries. Thailand has derived tech nological capabilities from multinational firms. In other words, the primary technology transfer is embodied in equipment (OECD, 2013).

Thailand can boost performance in the long run by improving labor force skill, investing in infrastructure, and coordinating and implementing on science and technology policies. Upgrading the country's innovation capabilities depends partly on enhancing teaching and research quality, investing in public research facilities, and providing research and development (R&D) incentives to local firms, joint ventures (JVs) firms, and multinational companies (MNCs) firms. Thai manufacturing firms also need to strengthen collaborative innovation linkages with suppliers and customers (OECD, 2013).

The increase of local firms, JVs, and MNCs firms make business environment become more competitive in both formal R&D firms

(Dzhumashev, Mishra & Smyth, 2016) and non-formal R&D firms (Sterlacchini, 1999). In order to become more resilient and adapt to the globalization, each firm must focus on improving their performances and product innovation (Cucculelli, Le Breton-Miller & Miller, 2016; Mantovani, 2006; Petsas & Giannikos, 2005), process innovation (Reichstein & Salter, 2006), and collaboration with suppliers and customers (Alarcón & Sánchez, 2013).

In this paper, only customer and supplier collaboration within each type of supply chain capital structure are taken into consideration. From our interview with the manufacturing firm in Thailand, we would like to categorize five types of the supply chain capital structure. They are pure domestic chain, pure JVs chain, pure MNCs chain, export chain, and import chain. Thus, the objective of this paper is to investigate the difference in impacts of supply chain capital structures on customer collaboration and supplier collaboration.

Literature Review

There are many factors that the manufacturing firms need to improve such that the firms can stay competitive with their competitors in this tough business environment. Those factors are product innovation (Cucculelli et al., 2016; Manders, de Vries & Blind, 2016; Mantovani, 2006; Petsas & Giannikos, 2005), process innovation (Reichstein & Salter, 2006), position and paradigm innovation (Baregheh, Hemsworth, Rowley & Davies, 2012), absorptive capacity utilization (Huang et al., 2015), technological competency (Vega-Jurado et al., 2008), supply chain integration innovation (Wong, Wong & Boon-itt, 2013), human resource development (Zhang & Yin, 2012), market expansion (Martinez-Ros, 1999), collaboration with internal and external resources (Alarcón & Sánchez, 2013). Past studies showed that the firms that improve these factors can improve their performances.

Scholars defined the definitions of collaboration differently. Simatupang, Wright & Sridharan (2004) and Cao & Zhang (2011) stated that collaboration is a partnership process, where two or more firms work closely to plan and execute supply chain operation toward a common goal and mutual benefit. Samaddar & Kadiyala (2006) defined collaboration as an imitation and implementation of knowledge creation endeavor. The members of the chain share the expenses and benefits of newly created knowledge through joint ownership of patents and/or licenses. The ability to work across organizational boundaries to create and manage unique value-added processes to meet customer needs was also part of collaboration (Fawcett et al., 2011). Simatupang & Sridharan (2008) defined collaboration as sharing resources and capabilities with the related firms to meet customer demands. Therefore, collaboration is the process of cooperation with the downstream (customers) and upstream (suppliers) members of the supply chain. Simatupang & Sridharan (2005) presented five activities of collaboration. They are collaborative performance, information sharing, decision synchronizing, incentive-aligning, and supply chain integration processing. In this

paper, we are interested in the following activities of collaborations. They are joint capital investment, personnel exchange between the firms and its partners, training to/from the customers and/or suppliers, and joint product/service design with the downstream and/or upstream members. The objective of the collaboration is mostly to yield mutual benefits for firms in the supply chain. We consider these factors because from our interview the firms basically talk about these kinds of customer and supplier collaboration.

In warehouse operations, the goal of the collaboration is to increase throughput and reduce inventory and operation expenses (Simatupang, Wright & Sridharan, 2004). Maietta (2015) studied the determinants of R&D collaboration between the university and firm, and how this collaboration influences product and process innovation in the low-tech industries. The results indicated that the university-firm R&D collaboration affects the process and product innovation. Hudnurkar, Jakhar & Rathod (2014) summarized the factors affecting supply chain collaboration. They stated that information sharing is very significant and effective in supply chain collaboration. The collaboration with internal and/or external resources are essential for the firm's development (Alarcón & Sánchez, 2013). It is the main sources of knowledge transfer and knowledge development within the firms. The firms with supplier/customer collaborations are more likely to create innovation and achieve high performance (Karabulut, 2015).

From collaboration, Dyer & Nobeoka (2000) presented a case study related to how Toyota create and manage a high performance of knowledge sharing network. This case study examines the black box of knowledge sharing within Toyota's network. It also demonstrates Toyota's ability to create and manage network-level of knowledge sharing effectively. It partially explains the relative productivity advantages enjoyed by Toyota and its suppliers. The result suggests that creating competitive advantages the firms need to extend beyond its boundaries. Knowledge sharing within Toyota's network can improve the performance of the firms, so Toyota motivates members to participate and openly share knowledge by preventing members from free riding. Toyota can effectively and efficiently transfer both explicit and tacit knowledge (Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995).

From the literature, two hypotheses are proposed.

Hypothesis 1: Types of supply chain capital structure do not differently impact on the customer collaboration.

Hypothesis 2: Types of supply chain capital structure do not differently impact on supplier collaboration.

Methodology

We observed three members in the supply chain: the firms, the customers, and the suppliers. Each member of the supply chain has the following capital structure: 100% local owned (Domestic), joint ventures (JVs), and multi-

national companies (MNCs). Only five types of the supply chain capital structure are observed in this paper. Those supply chain types are: pure domestic chain (domestic, domestic, domestic), pure JVs chain (JVs, JVs, JVs), pure MNCs chain (MNCs, MNCs, MNCs), export chain (all, all, JVs/MNCs), and import chain (all, all, domestic). To specify, the word all in the export chain and import chain refer to any types: domestic, JVs, or MNCs of supply chain capital structure. Pure MNCs chain and Pure JVs chain in the export chain are excluded since it is classified as two different types already. Pure domestic chain in Import chain is also excluded since it is classified as another type of supply chain capital structure.

We collect data via questionnaire surveys. The constructed questionnaire contain three main parts the demographic profile of the establishment, the achievement for upgrading product and process innovation, and business linkages with main customers and supplier.

1. Sample and Data Collection

The questionnaires are constructed. Then it is distributed to the manufacturing firms located in Thailand via email, post office, and in person. In this paper, the data are collected from 2012 to 2015. There are 939 responses, included in the empirical statistical analysis.

2. Measurement Scale

In this paper, the dependent variable consists of customer collaboration and supplier collaboration. In each main group, there are also sub-factors. The dichotomous questions are used to measure customer collaboration and supplier collaboration, where 0 = No and 1 = Yes. The independent variable is the s upply chain capital structure type. There are 5 categories in the supply chain capital structure, where 1 = pure domestic chain, 2 = pure JVs chain, 3 = pure MNCs chain, 4 = export chain, and 5 = import chain. In this paper, one-way ANOVA method is used to observe which type of supply chain capital structure are better and significantly different for each sub-factor of customer (H1) and supplier collaboration (H2).

Results and Discussions

1. Data Descriptive

The demographic of the respondents consists of four parts. Each part contains frequency and percentage as illustrated in table 1. This table gives the basic information of the manufacturing firms, who responds to our survey.

Table 1 Demographic of the respondents

Sections	Description of each section	Freq	%
Capital structure of establishment (Firms)	100% local owned	773	82.3
	100% foreign owned (MNC)	79	8.4
	Joint Venture (JV, locally and foreign owned)	87	9.3
Total		939	100.0
Capital structure of Customers	100% locally private owned	667	71.0
	100% foreign owned	125	13.3
	Joint Venture	102	10.9
	Total	894	95.2
	missing	45	4.8
Total		939	100.0
Capital structure of Suppliers	100% locally private owned	610	65.0
	100% foreign owned	121	12.9
	Joint Venture	137	14.6
	Total	868	92.4
	missing	71	7.6
Total		939	100.0
Number of full-time employees	1-19	230	24.5
	20-49	164	17.5
	50-99	137	14.6
	100-199	110	11.7
	200-299	64	6.8
	300-399	28	3.0
	400-499	21	2.2
	500-999	58	6.2
	1000-1499	25	2.7
	1,500-1,999	17	1.8
	2,000 and above	66	7.0
	Total	920	98.0
	missing	19	2.0
Total		939	100.0

Table 1 Demographic of the respondents (cont.)

Sections	Description of each section	Freq	%
Main business activity	food, beverages, tobacco	96	10.2
	Textiles	39	4.2
	Apparel, leather	33	3.5
	Footwear	2	0.2
	Wood, wood products	57	6.1
	Paper, paper products, printing	48	5.1
	Chemical, chemical products	27	2.9
	Plastic, rubber products	44	4.7
	Other non-metallic mineral products	13	1.4
	Iron, Steel	42	4.5
	Non-ferrous metals	13	1.4
	Metal products	42	4.5
	Machinery, equipment, tools	56	6.0
	Computers & computer parts	20	2.1
	Other electronics & components	66	7.0
	Precision instruments	2	0.2
	Automobile, auto parts	99	10.5
	Other transportation equipment and parts	12	1.3
	Handicraft	2	0.2
	Other	212	22.6
	Total	925	98.5
	missing	14	1.5
Total		939	100.0

2. Hypotheses Testing

There are two main groups of the dependent variables. They are customer collaboration factors (H1) and supplier collaboration factors (H2). The factors in each group are analyzed by using one-way ANOVA method, where the independent variable is the different types of supply chain capital structures. The detail of dependent and independent variables are shown in table 2 and table 3, respectively. The significant level p-Value of this empirical analysis is 95% confidence level.

Table 2 Customer and supplier collaboration factors

Dependent Variables			Freq	Mean	STD
Customer Collaboration	Factor 1a	Firms having a capital tie-up with the main customer	904	.16	.370
	Factor 1b	Firms dispatch personnel to the main customer	904	.32	.466
	Factor 1c	Main customer dispatches personnel to the firms	887	.22	.414
	Factor 1d	Firms provide any training to the main customer	906	.40	.491
	Factor 1e	Firms receive some training from the main customer	905	.47	.499
	Factor 1f	Firms design a new product or service with the main customer	908	.44	.497
Supplier Collaboration	Factor 2a	Firms having a capital tie-up with the main supplier	883	.20	.418
	Factor 2b	Firms dispatch personnel to the main supplier	833	.29	.453
	Factor 2c	The main supplier dispatches personnel to the firms	843	.21	.410
	Factor 2d	Firms provide any training to the main supplier	875	.37	.484
	Factor 2e	Firms receive some training from the main supplier	877	.49	.500
	Factor 2f	Firms design a new product or service with the main supplier	881	.41	.493

Table 3 Types of supply chain capital structure

Independent Variables			Freq	%
5 Types of Supply Chain Capital Structure	Type 1	Pure_Domestic_Chain	508	54.1
	Type 2	Pure_JVs_Chain	24	2.6
	Type 3	Pure_MNCs_Chain	23	2.4
	Type 4	Export_Chain	225	24.0
	Type 5	Import_Chain	159	16.9
Total			939	100.0

3. Customer Collaboration (H1)

There are six factors included in customer collaboration that we used to observe firm and customer collaboration. Those factors are given in table 4. From table 4, the p-Value is less than 0.05 for all factors. Therefore, the null hypothesis (H1) is rejected since these data provide substantial evidence that at least there is one significant different impact of supply chain capital structure on the collaboration between the customer and the firm with 95% confidential interval.

Table 4 The impact of supply chain capital structure on customer collaboration

Customer Collaboration			Sum of Squares	df	Mean Square	F	Sig.
Factor 1a	Firms having a capital tie-up with the main customer	Between Groups Within Groups Total	3.208 120.562 123.77	4 899 903	0.802 0.134	5.981	0.000
Factor 1b	Firms dispatch personnel to the main customer	Between Groups Within Groups Total	4.687 191.197 195.884	4 899 903	1.172 0.213	5.509	0.000
Factor 1c	The main customer dispatches personnel to the firms	Between Groups Within Groups Total	10.565 141.005 151.569	4 882 886	2.641 0.16	16.521	0.000
Factor 1d	Firms provide some training to the main customer	Between Groups Within Groups Total	6.959 211.186 218.146	4 901 905	1.74 0.234	7.423	0.000
Factor 1e	Firms receive some training from the main customer	Between Groups Within Groups Total	9.24 215.982 225.222	4 900 904	2.31 0.24	9.625	0.000
Factor 1f	Firms design a new product or service with the main customer	Between Groups Within Groups Total	10.677 213.111 223.789	4 903 907	2.669 0.236	11.311	0.000

In post-hoc Multiple Comparisons, LSD is used for the equal variances assumed. From post-hoc Analysis, we can identify which pair of a chain of the capital structure is significantly different. There are four pairs, significantly different within factor 1a and factor 1c. The export chain is significantly better than import chain and pure domestic chain, where pure MNCs chain is significantly better than pure domestic chain and import chain. Factor 1b, the export chain is significantly better than a pure domestic chain, where pure JVs chain is significantly better than pure domestic chain and import chain. Factor 1d, export chain, import chain, and pure MNCs chain are significantly better than a pure domestic chain. Factor 1e, the export chain is significantly better than import chain and pure domestic chain. Pure JVs chain is significantly better than a pure domestic chain. Factor 1f, export chain, pure JVs chain, and Pure MNCs chain are significantly better than a pure domestic chain.

Hence, all significant pairs within each factor of customer collaboration, only firms in the pure domestic chain have less collaboration with the customer. Then import chain has the customer collaboration higher than a pure domestic chain. The export chain is even better than pure domestic chain and import chain. The pure MNCs chain and pure JVs chain has the highest customer collaboration, and there are not any significantly different between pure MNCs chain and Pure JVs chain.

4. Supplier collaboration (H2)

We investigated six factors of supplier collaboration. They are used to observe firm and supplier collaboration. From table 5, the p-Value is less than 0.05 for all factors. Therefore, the null hypothesis (H2) is rejected since these data provide substantial evidence that at least there is one significant different impact of supply chain capital structure on the collaboration between the supplier and the firm.

In post-hoc Multiple Comparisons, LSD is used for the equal variances assumed. Post-hoc can show which pair of the chain of the capital structure is significantly different. Factor 2a, pure MNCs chain is significantly better than a pure domestic chain, export chain, and import chain. Factor 2b, the export chain is significantly better than a pure domestic chain. Factor 2c, pure MNCs chain and export chain is significantly better than a pure domestic chain. Factor 2d, the export chain is significantly better than pure domestic chain and import chain. Factor 2e, export chain and import chain are significantly better than a pure domestic chain. Factor 2f, pure JVs chain, pure MNCs chain, and export chain are significantly better than a pure domestic chain. Moreover, pure MNCs chain and export chain are significantly better than import chain.

Table 5 The impact of supply chain capital structure on supplier collaboration

Supplier collaboration			Sum of Squares	df	Mean Square	F	Sig.
Factor 2a	Firms having a capital tie-up with the main supplier	Between Groups Within Groups Total	5.303 148.815 154.118	4 878 882	1.326 0.169	7.822	0.000
Factor 2b	Firms dispatch personnel to the main supplier	Between Groups Within Groups Total	3.237 167.19 170.427	4 828 832	0.809 0.202	4.008	0.003
Factor 2c	The main supplier dispatches personnel to the firms	Between Groups Within Groups Total	5.926 135.639 141.566	4 838 842	1.482 0.162	9.154	0.000
Factor 2d	Firms provide any training to the main supplier	Between Groups Within Groups Total	8.415 196.381 204.795	4 870 874	2.104 0.226	9.32	0.000
Factor 2e	Firms receive some training from the main supplier	Between Groups Within Groups Total	4.754 214.393 219.147	4 872 876	1.189 0.246	4.834	0.001
Factor 2f	Firms design a new product or service with the main supplier	Between Groups Within Groups Total	12.854 200.925 213.78	4 876 880	3.214 0.229	14.011	0.000

Hence, all significant pairs within each factor of supplier collaboration, only firms in the pure domestic chain have less collaboration with the supplier. Then import chain has the supplier collaboration higher than a pure domestic chain. The export chain is even better than pure domestic chain and import chain. The pure MNCs chain and pure JVs chain has the highest supplier collaboration, and there are not any significantly different between pure MNCs chain and Pure JVs chain.

Conclusion and Further Study

Based on our empirical results, each factor of customer collaboration and supplier collaboration are significantly impacted by the type of supply chain capital structure. From post-hoc, the pairs, which is significantly different in each factor of customer and supplier collaboration, are defined. From those significantly different pairs; basically, we can see that there are no collaboration factors that are significantly different between pure MNCs and pure JVs chain. Pure MNCs and pure JVs chain seem

to have the highest customer and supplier collaboration. After these two chains, the levels of collaboration activities are followed by an export chain, import chain and pure domestic chain in sequentially.

This paper contributes to the existing literature by identifying some key factors of customer collaboration and supplier collaboration, that impacted differently among the upply chain capital structures. There are 3 limitations in our study. First, the relationship period of the firm with their customer and supplier are not considered. Second, we do not classify the firms into the small, medium, and large firm. In case that we classify, the sample size for some types of supply chain capital structure is very small, and we cannot use it to analyze. Third, the data are collected from the manufacturing firm; however, we cannot focus on a specific type of business since the sample size is not enough to analyze.

Acknowledgment

This research is funded by Economic Research Institute for ASEAN and East Asia (ERIA), and it is partially supported by Sirindhorn International Institute of Technology (SIIT), Thammasat University (TU). Authors would like to express our thankfulness to Dr. Masatsugu Tsuji and Mr. Yasushi Ueki for providing invaluable guidelines on the questionnaires and analysis.

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