

# Impact of Inter-firm Collaboration on Firm Performance: Comparison from the Perspective of Different Supply Chain Members

*Pairach Piboonrunroj ([me@pairach.com](mailto:me@pairach.com))  
Logistics Systems Dynamics Group, Cardiff Business School,  
Cardiff University, United Kingdom  
and  
Chiang Mai School of Economics, Chiang Mai University, Thailand.*

*Stephen M. Disney  
Logistics Systems Dynamics Group, Cardiff Business School,  
Cardiff University, United Kingdom.*

## Abstract

Many studies have examined the antecedents to and impacts of inter-firm collaboration, however a comparison from the perspective of different supply chain members has seldom been considered. Hence, this study aims to advance the understanding of collaboration by comparing three perspectives on such collaboration. A meta review of the literature reveals that four key constructs, namely trust, transaction cost, collaboration and performance, are to be included in one model. Data from 339 firms were analysed in a Regression and a Structural Equation Model. This paper show that firms with different supply chain roles experience different drivers and benefits of inter-firm collaboration.

**Keywords:** Inter-firm trust, Transaction cost, Tourism supply chains

## Introduction

Key drivers and possible outcomes of inter-firm collaboration have been actively discussed by academics ([Ireland and Webb, 2007](#); [Spekman et al., 1998](#); [Nyaga et al., 2009](#)) and by industrialists ([Engel, 2011](#)). Even though many firms have benefited from collaborative activities with their supply chain partners ([Cooke, 2011](#)), many others have found collaboration difficult or may even have failed to collaborate ([Holweg et al., 2005](#)). This issue could be a result of the lack of sufficient understanding of the mechanism in which inter-firm collaboration makes an impact ([Sheu et al., 2006](#)). Failures can lead to a breach of the collaborative agreement and can damage inter-firm relationships in the long term ([Serapio and Cascio, 1996](#)).

Although there are many studies on inter-firm or supply chain collaboration, the question of whether inter-firm collaboration has an equivalent impact on performance across a supply chain is increasingly a subject of debate. Our meta analysis of literature on collaboration drivers and impacts (see Table 1) reveals that while many studies have

examined the impact of inter-firm collaboration (Christopher, 2011, p. 214; de Leeuw and Fransoo, 2009), few studies have considered the different perspectives of supply chain members (i.e., Nyaga et al., 2009). Instead they have focused on bilateral perspectives between buyers and sellers. We believe a holistic comparison of the perspectives of different member along the supply chain is needed.

To address the gaps discussed above, we have examined the antecedents, *inter-firm trust* and *transaction cost*, and the impact of inter-firm collaboration on performance from a firm's perception at different tiers in the supply chain. Moreover, we simultaneously test the effects of *transaction cost* on *inter-firm collaboration*, which has been rarely done in the previous literature, see Table 1.

Table 1 - Meta review of seminal and recent literature

Authors (year)	CL ~ TC	TR ~ CL	PF ~ CL	PF ~ TR	Theory	Sector
Cao & Zhang (2011)	NA	NA	0.35**	NA	TCE, RBV	Manufact.
Nyaga et al. (2010)	0.48 <sup>a</sup>	0.48 <sup>a</sup>	0.25 <sup>b</sup>	0.51	TCE, RET	Buyer/Seller
Robson et al. (2008)	NA	NA	NA	0.79*	RET	Alliance
Sriram et al. (1992)	0.643***	NA	NA	NA	TCE	NA
De Leeuw and Franco (2009)	positive	NA	NA	NA	NA	NA
Doney and Connon (1997)	NA	NA	NA	0.11	Psycho. & Econ.	NA
Ha et al. (2000)	NA	0.408 <sup>a</sup>	0.655 <sup>b</sup>	0.267 <sup>a</sup>	TCE	Korean firms
Jap and Genevan (2000)	NA	NA	NA	NA	TCE	US retails
Kwon and Shu (2004)	0.92 <sup>a</sup>	0.004 <sup>b</sup>	NA	NA	TCE	Cross-sector
Shue et al. (2006)	NA	positive	positive	NA	TCE	Retails(case)

Key: CL = Inter-firm collaboration, TR = inter-firm trust, PF = firm performance  
<sup>a</sup> average correlation, <sup>b</sup> indirect effect, CL ~ TC = means CL is affected by TC

### Theoretical background

Supply chain collaboration could be defined as at least two firms in the same supply chain working together to achieve their mutual goals (Sriram et al., 1992). It is believed that supply chain collaboration could yield large benefits as it is an enabler of the seamless supply chain (Childerhouse et al., 2005). The seamless supply chain is a theoretical goal where there is no boundary between firms and the supply chain thinks and acts as one (Towill, 1997). The performance of the supply chain is also heavily reliant upon accurate and timely information (Mentzer et al., 2001; Holweg et al., 2005). Inter-firm collaboration can masquerade itself in terms of information sharing, incentive alignment and decision synchronisation (Spekman et al., 1998; Holweg and Pil, 2008) through schemes such as Vendor Managed Inventory, Continuous Replenishment Programmes or Collaborative Planning Forecasting and Replenishment (Barrat, 2004; Holweg et al., 2005).

## Hypothesis development

### *Research hypotheses*

Trust is argued to be a critical factor in developing relationships in the supply chain (Ireland and Webb, 2007; Christopher, 2011). Building inter-partner trust can result in better collaborative performance (Robson et al., 2008) and relationship satisfaction (Nyaga et al., 2009). In initial fieldworks, we found that supply chain partners who have higher levels of trust tend to perform better in the business. Hence we propose the following hypotheses;

*H<sub>1</sub>: Inter-firm trust positively affects inter-firm collaboration.*

*H<sub>2</sub>: Inter-firm trust positively affects firm performance.*

According to Transaction Cost Economics (TCE), the boundary of the firm (market or hierarchy) is determined by transaction cost (Williamson, 2005). Activities with low transaction cost tends to be pushed to the market, whilst activities with high transaction costs are kept within firm's boundary. Recently a hybrid form of governance, in the middle of market and hierarchy, has been proposed that increases transactions with other firms but ownership is still reserved. This form of hierarchy are known as *inter-firm collaboration* or *alliance*. It is believed that collaboration is important when the transaction cost is high (Sriram et al., 1992; De Leeuw and Franco, 2009). This leads to the following hypothesis;

*H<sub>3</sub>: Transaction cost positively affects the level of inter-firm collaboration.*

Firms could expect a better level of responsiveness and service level improvements from their inter-firm collaborative programmes (Barrat, 2004). Another benefit could be a reduction of supply chain costs such as the costs of inventory and production. Moreover, there are several types of benefits of collaboration such as eliminating the bullwhip effect (Holweg et al., 2005), inventory reduction, better transport capacity utilisation, and risk mitigation (Spekman et al., 1998). This concurs with Min et al. (2005), Jap and Ganesan (2000) and Nyaga et al. (2009). Thus we propose the following hypotheses;

*H<sub>4</sub>: Inter-firm collaboration positively affects firm performance.*

### *Construct operationalisation*

According to the meta review of the related literature (Table 1) and some initial fieldworks, we included four main constructs in our model. These were *inter-firm trust* (TR), *transaction cost* (TC), *inter-firm collaboration* (CL), and *firm performance* (PF). We adopted existing scales from the literature (Nyaga et al., 2009; Doney and Connon, 1997; Monczka et al., 1998; Kwon and Suh, 2004). The measurement scales were also tested in the initial fieldwork setting to ensure conceptual equivalent to the nature of our research setting (tourism sector). Our conceptual framework is illustrated in the Figure 1 below.

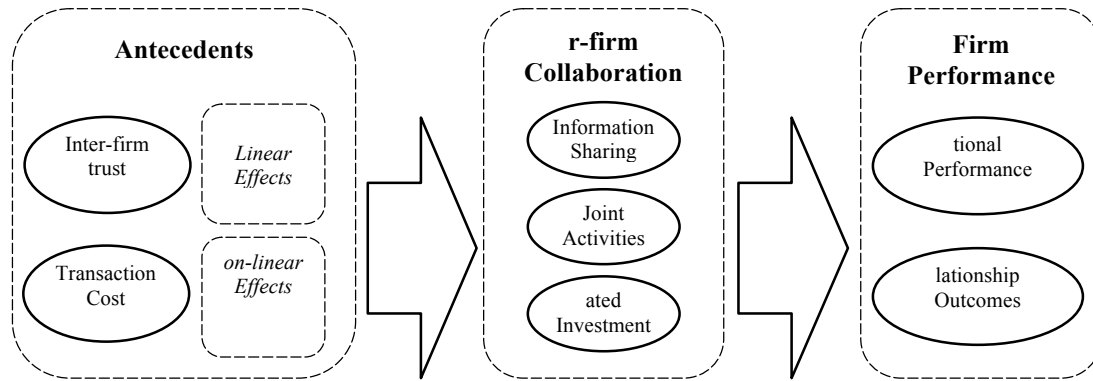


Figure 1 – Our conceptual framework

### Research Methodology

Our research design is shown in Figure 2. We proposed the research hypotheses based on the conceptual framework developed from meta review of the literature and the fieldwork. Data was then collected via a questionnaire survey. Hypotheses were tested by a Multiple Regression Model (MRM) and a Structural Equation Model (SEM). We conducted a follow-up interview to gain more insights from statistics results.

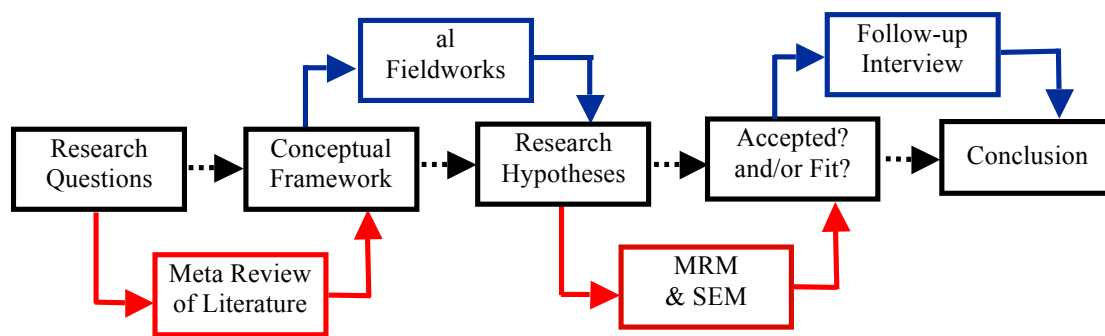


Figure 2 – Our research design

Key: *Blue* = qualitative methods, *Red* = quantitative methods

### Data

We consider a generic tourism supply chain framework that consists of three members (suppliers - hotels - travel agents) to compare the different views of these members. Data was obtained from a national survey of 339 firms in the tourism supply chains in Thailand. Thailand was selected due to the availability of the data and the experience of one of the authors. After we conducted a survey, data was checked and cleaned to ensure its validity (Hair et al., 2010). We also checked if data was *Completely Missing At Random* (CMAR) or whether there was any systematic effect. Normality of the data was also assessed using Shapiro’s test of normality at  $p < 0.05$ . We found no evidence of violation of any of the regression assumptions.

Since the survey data was collected from a single respondent in the same survey, common methods variance can be a problem. We used Harman’s one-factor test to examine the possibility of this problem (Podsakoff and Organ, 1986). There was no issue of common method bias found. We use SEM to test hypotheses of relationships between variables (Flynn et al., 1990) using Mplus 6 (Muthén and Muthén, 1998-2010) R version 15.0 (R Development Core Team, 2012) with the lavaan package (Rosseel,

2012). We developed three multiple-group SEMs of the perceptions of the three main supply chain members (supplier / hotel / travel agency).

## Findings

### Measurement models

We explored the structure of our measurement models of the four constructs. Heat maps with dendrograms (Figure 3) show how items correlated to each other within the same constructs. This supports our measurement structure for all four constructs e.g., for the measurement for inter-firm collaboration clearly consists of three subgroups; Information Sharing (IS1-3), Dedicated Investment (DI1-3), and Joint Activities (JA1-3).

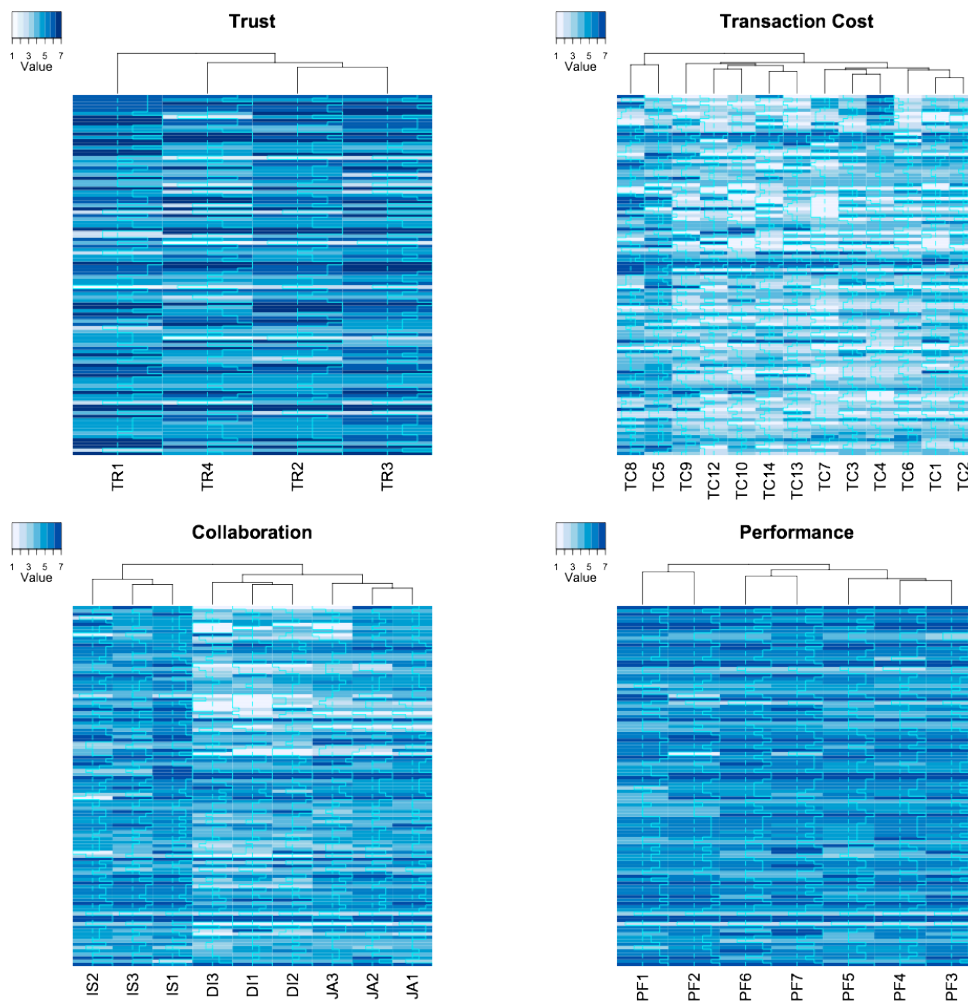


Figure 3 - Heat maps and histograms of collaboration, trust, transaction cost and performance

### Confirmatory Factor Analysis (CFA)

To ensure reliability, we assessed when the internal consistency of the measurement using Cronbach's alpha was greater than 0.70 (Hair et al., 2010). To assess data validity we conducted a CFA. The result shows that the loading scores (Jöreskog and Lawley, 1968) were larger than a cut-off point of 0.60 (Hair et al., 2010; Nunally, 1978) and offers acceptable fit indices e.g.,  $\chi^2/DF$ , CFI, TLI and RMSEA (Table 3).

Table 3 - CFA results of measurement models

Survey items	Std. Estimate
<b>Inter-firm Collaboration (CL)</b> (Cronbach's alpha = 0.91)	
$(\chi^2/df=1.388$ (p value = 0.110), CFI=0.988, TLI=0.979, RMSEA=0.061)	
Information sharing	<b>0.643</b>
<i>We inform this supplier / buyer in advance of changing needs.</i>	0.664
<i>It is expected that any information, which might help the other party, will be provided.</i>	0.679
<i>The parties are expected to keep each other informed of changes that may affect the other party.</i>	0.858
Joint activities	
<i>My firm and this supplier...</i>	<b>1.045</b>
<i>... have a joint team.</i>	0.881
<i>... conduct joint planning to anticipate and resolve operational problems.</i>	0.878
<i>... make joint decisions about ways to improve overall cost efficiency.</i>	0.842
Dedicated investments	
<i>In building the relationship with my firm, this supplier...</i>	<b>0.839</b>
<i>... has invested substantially in personnel.</i>	0.972
<i>... has provided proprietary expertise and/or technology.</i>	0.933
<i>... has dedicated significant investment.</i>	0.783
<b>Inter-firm trust (TR)</b> (Cronbach's alpha =0.90)	
$(\chi^2/df=0.365$ (p value = 0.695), CFI=1.0, TLI=1.0, RMSEA<0.001, SRMR= 0.009)	
<i>My firm can understand this supplier well.</i>	0.689
<i>This supplier is genuinely concerned that we succeed.</i>	0.863
<i>We trust this supplier keeps our best interests in mind.</i>	0.896
<i>This supplier / buyer considers our welfare as well as its own.</i>	0.876
<b>Transaction Cost (TC)</b> (Cronbach's alpha =0.90)	
$(\chi^2/df=0.983$ (p value = 0.478), CFI=1.00, TLI=1.00, RMSEA<0.001, SRMR=0.038)	
<b>Problem solving cost</b>	<b>0.801</b>
<i>It is very complicated and difficult to write a contract.</i>	0.793
<i>It took a significant effort to gather the critical information.</i>	0.974
<i>It takes a lot of effort to solve problems in our relationship.</i>	0.652
<b>Opportunism cost</b>	<b>1.020</b>
<i>It is very difficult to monitor the performance of this supplier.</i>	0.938
<i>It is costly, in time and effort, to monitor the performance of this supplier.</i>	0.668
<i>This supplier tends to take advantage from my hotel with guile.</i>	0.896
<b>Opportunity cost</b>	<b>0.705</b>
<i>Our investment in resources is not productive.</i>	0.615
<i>We should better select other suppliers.</i>	0.867
<i>There is an alternative supplier that we did not identify.</i>	0.672
<b>Firm Performance (PF)</b> (Cronbach's alpha =0.971)	
$(\chi^2/df=1.202$ (p value = 0.288), CFI=0.997, TLI=0.993, RMSEA=0.044, SRMR = 0.020)	
<i>This relationship has ...</i>	
<i>... reduced our order cycle times.</i>	0.721
<i>... reduced our ordering cost.</i>	0.728
<i>... improved our order processing accuracy.</i>	0.921
<i>... improved our on-time delivery.</i>	0.899
<i>... increased our forecast accuracy.</i>	0.866
<i>... improved our order accuracy in term of product types.</i>	0.820
<i>... improved our order accuracy in term of product quantity.</i>	0.750

### Multiple Regression Analysis

Six regression models were developed to preliminary assess relationships between dependent and independent variables. The results support significant causal relationship between *trust*, *transaction cost*, *collaboration* and *performance*. The regression models are presented in Figure 4 as a scatter plot with predicted regression line (solid lines) are illustrated with 95% confident interval (light blue shade). Even though there was little evidence for a significant effect of trust on transaction cost on collaboration, it is interesting that transaction cost has a curvilinear impact on collaboration and performance. The results were used to revise the final SEM model.

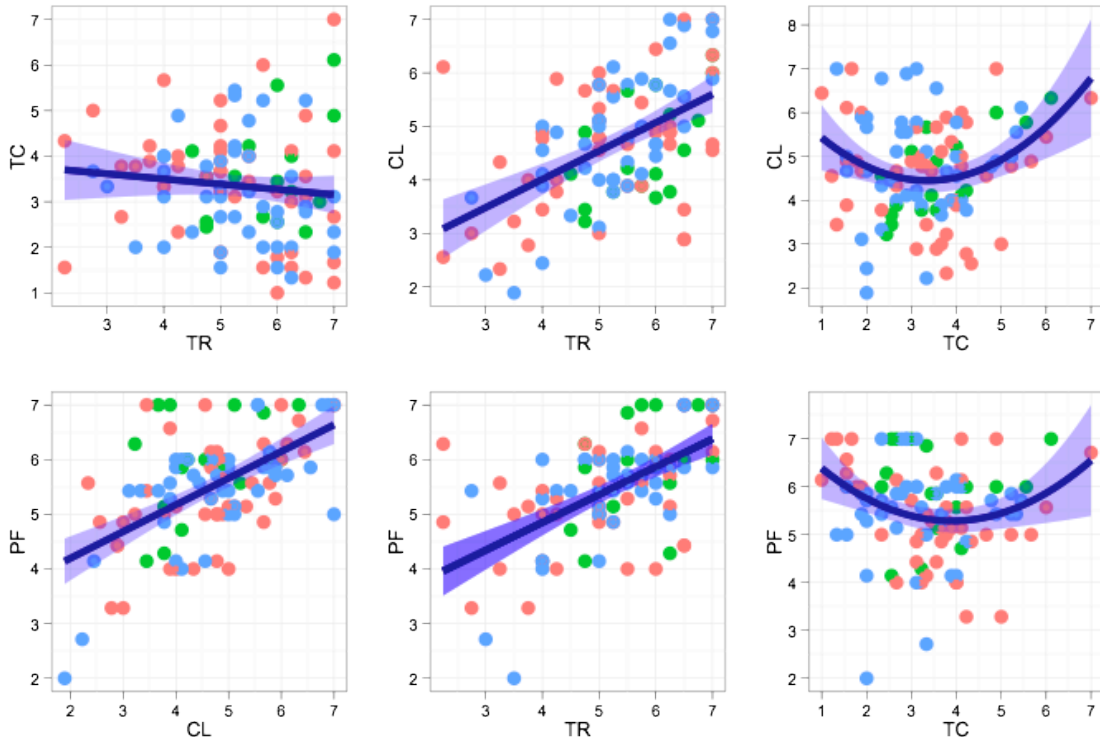


Figure 4 - Scatter plot and predicted curve of binomial regression models  
 Note: Red = Hotels, Green = Suppliers, Blue = Travel Agents

To ensure the validity of the regression model, post-hoc analysis was conducted to check for problems such as Heteroscedasticity or non-normality of regression residuals, by inspecting four plots produced by the *plot()* command in **R** (see Figure 5), which shows that there is no evidence that regression assumptions were not supported.

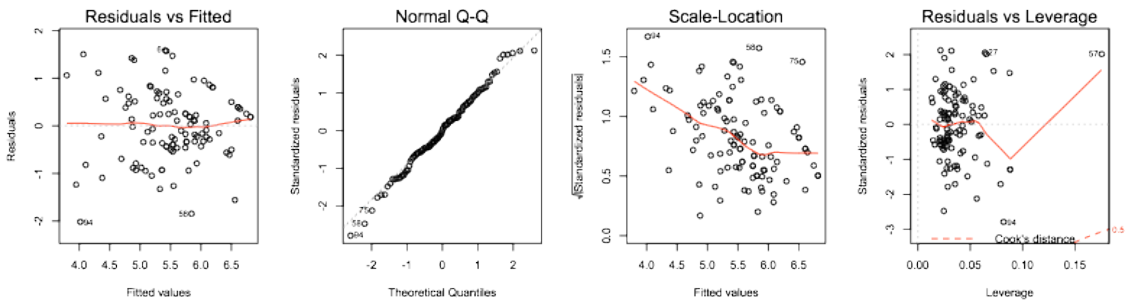


Figure 5 - Post-hoc analysis for assumption checking of regression models

#### Latent variable model

To simultaneously test all the research hypotheses ( $H_1 - H_4$ ), we tested the data with a full SEM model. In the final SEM model, all hypotheses were significant ( $p < 0.05$ ). All goodness of fit indices are acceptable ( $\chi^2/df = 1.598$ , CFI = 0.956, TLI = 0.941, RMSEA = 0.075,  $p$ -value (RMSEA  $\leq 0.05$ ) = 0.044). Standardised coefficients are presented in the *Overall* column in the Table 4.

Table 4 - SEM full model results

		Overall	Hotel Model	Supplier Model	Agency Model
Causal Links	H <sub>1</sub> : CL ~ TR	0.477****	0.27**	0.410***	0.961****
	H <sub>3a</sub> : CL ~ TC	-0.766****	-1.118**	1.229**	1.176**
	H <sub>3b</sub> : CL ~ TC <sup>2</sup>	0.934****	1.171**	-0.543**	-1.092**
	H <sub>2</sub> : PF ~ TR	0.463****	0.278**	0.414**	-0.465 <sup>NS</sup>
	H <sub>4</sub> : PF ~ CL	0.405****	0.477***	0.186***	1.354***
Fit Indices (accepted value)	$\chi^2/DF$ (< 2.0)	1.598	1.266	1.097	1.045
	CFI (> 0.95)	0.956	0.972	0.960	0.996
	TLI (> 0.90)	0.941	0.956	0.936	0.993
	RMSEA (< 0.080)	0.075	0.077	0.076	0.032

Note: \*\*\*\*  $p < 0.001$ , \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ ,  $A \sim B = A$  is affected by  $B$

Multiple Group Analysis

Next, we conducted a multiple group for SEM. The invariance test (Table 5) show that all three models have acceptable fit indices (Chi-square / df < 3, CFI > 0.95, TLI > 0.95, RMSEA < 0.07, RMSR < 0.06). All coefficients in the models are significantly greater than zero ( $p < 0.05$ ). The results from each perspective are presented in Table 4.

Table 5 - Invariance test for multiple group analysis

Model	$\chi^2/df$ .	$p$ .	CFI	RMSEA	BIC
M1: Configural invariance	2.548	0.054	0.961	0.209	1300.324
M2: Weak invariance (equal loadings)	2.548	0.054	0.961	0.209	1300.324
M3: Strong invariance (M2 + intercepts)	2.187	0.020	0.911	0.183	1284.382
M4: M3 + means	2.187	0.020	0.911	0.183	1284.382

The results show that trust gives rise to a level of collaboration. However, trust has a more influence for intermediaries (*travel agency*) rather than for suppliers and even lower for the focal firms (*hotel*). Findings from our follow-up interview support that hotels normally possess more bargaining power than their suppliers and travel agents. For the hotels, high transaction cost tends to push them away from collaboration but the opposite effect holds for suppliers and agents. A comparison of the three perspectives on the impact of transaction cost on inter-firm collaboration is illustrated in the Figure 6.



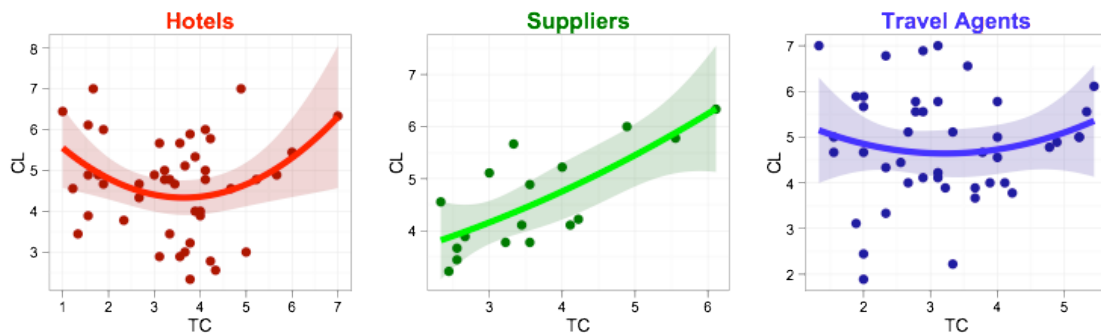


Figure 6 - Multiple group comparison of the impact of transaction cost on collaboration

## Contribution and Limitations

### *Theoretical implications*

This research advances the literature on inter-firm relationship management by proposing and empirically testing the model of causal relationship between the main constructs e.g., collaboration, trust, transaction cost and performance. This study is the first to include the transaction cost construct as a mediating variable between trust and collaboration. This study also compares the effect size of the relationship from the perspectives of different supply chain members. Moreover, product-based and service-based transactions were also compared through a multiple group SEM analysis.

### *Managerial implications*

This study also offers a clearer insight for managers on inter-firm collaboration with different supply chain partners (upstream and downstream). Whilst many types of collaboration can potentially be undertaken by both upstream and downstream partners, the type of collaboration that should be implemented depends on its ability to increase firm performance.

### *Limitations and future research*

Collecting data from a single sector (tourism) in one country offers rich internal validity, but the generalisability of our result may be limited. However, this is the first research that assesses the model from different supply chain perspectives based upon different types of transactions. Future research could test this model with data from other countries and / or other sectors.

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## References

- Barratt, M. (2004), "Understanding the meaning of collaboration in the supply chain", *Supply Chain Management: An international Journal*, Vol. 9, No. 1, pp. 30-42.
- Christopher, M. (2011), *Logistics and Supply Chain Management*, 4th ed., Prentice Hall, London.
- Churchill, G.A. (1979), "A paradigm for developing better measures of marketing constructs", *Journal of Marketing Research*, Vol. 16, No. 1, pp. 64-73.
- Cooke, J.A. (2011), "Sharing supply chains for mutual gain", *CSCMP's Supply Chain Quarterly*, Quarter 2, available at: <http://www.supplychainquarterly.com/print/scq201102kimberly/> (assessed on 11 November 2011).

- De Leeuw, S. and Fransoo, J. (2009), "Drivers of close supply chain collaboration: one size fit all?", *International Journal of Operations and Production Management*, Vol. 29, No. 7, pp. 720-739.
- Doney, P.M. and Cannon, J.P. (1997), "An examination of the nature of trust in buyer-seller relationships" *Journey of Marketing*, Vol. 61, No. 2, pp. 35-51.
- Engel, B. (2011), "10 best practices you should be doing now", CSCMP's Supply Chain Quarterly, Quarter 1, available at: <http://www.supplychainquarterly.com/topics/Procurement/scq201101bestpractices/> (assessed on 11 November 2011).
- Ha, B.C. Park, Y.K. and Cho, S. 2010. Suppliers' affective trust and trust in competency in buyers Its effect on collaboration and logistics efficiency. *International Journal of Operations and Production Management*. Vol. 31 No. 1, pp. 56-77.
- Hair, J. et al. (2010), *Multivariate Data Analysis: A Global Perspectives*. 7Eds, Pearson, London.
- Holweg, M., Disney, S.M., Holström, J. and Småros, J. (2005), "Supply chain collaboration: making sense of the strategy continuum", *European Management Journal*, Vol. 23, No. 2, pp. 170-181.
- Holweg, M. and Pil, F.K. (2008), "Theoretical perspective on the coordination of supply chains", *Journal of Operations Management*, Vol. 26, No. 3, pp. 389-406.
- Ireland, R.D. and Webb, J.W. (2007), "A multi-theoretic perspective on trust and power in strategic supply chains", *Journal of Operations Management*, Vol. 25, No. 2, pp. 482-497.
- Jap, S.D. and Ganesan, S. (2000), "Control mechanisms and the relationship life cycle: implication for safeguard specific investments and developing commitment", *Journal of Marketing Research*, Vol. 37, No. 2, pp. 227-245.
- Jöreskog, K. G. (1969). "A general approach to confirmatory maximum likelihood factor analysis", *Psychometrika*, Vol. 34, No. 2, pp. 183-202.
- Kwon, I-W.G. and Suh, T. (2004), "Trust, commitment and relationship in supply chain management: a path analysis", *Supply Chain Management: An International Journal*, Vol. 10, No. 1, pp. 26-33.
- Mentzer, J.T., De Witt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. and Zacharia, Z.G. (2001), "Defining supply chain management" *Journal of Business Logistics*, Vol. 22. No. 2, pp. 1-25.
- Monczka, R.M., Petersen, K.J., Handfield, R.B. and Ragatz, G.L. (1998), "Success factors in strategic supplier alliances: the buying company perspective", *Decision Sciences*, Vol. 29, No. 3, pp.553-577.
- Min, S., Roath, A.S., Daugherty, P.J., Genchev, S.E., Chen, H., Arndt, A.D., Richey, G.R. (2005), "Supply chain collaboration: what is happening?", *International Journal of Logistics Management*, Vol. 16, No. 2, pp.237-256.
- Muthén, L.K. and Muthén, B.O. (1998-2010), "Mplus User's Guide". Sixth Edition. Los Angeles, CA: Muthén & Muthén.
- Nunnally, J.C. (1978), *Psychometric Theory*, McGraw-Hill, New York, NY.
- Nyaga. G.N., Whipple, J.M., Lynch, D.F. (2009), "Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ?", *Journal of Operations Management*, Vol. 28, No. 2, pp. 101-114.
- R Development Core Team. 2012. 'R: A Language and Environment for Statistical Computing'. R Foundation for Statistical Computing, available at: <http://www.R-project.org> (assessed on 30 March 2012).
- Robson. M.J., Katsikeas, C.S., Bello, D.C. (2008), "Drivers and performance outcomes of trust in international strategic alliances: the role of organizational complexity" *Organization Science*, Vol. 19, No. 4, pp. 647-665.
- Rosseel, Yves. (2012), "lavaan: Latent Variable Analysis, R package version 0.4-13, Online<URL=<http://CRAN.R-project.org/package=lavaan>> (Accessed on 10<sup>th</sup> April 2012).
- Sheu, C., Yen, H.R. and Chae, B. (2006) "Determinants of supplier-retailer collaboration: evidence from an international study", *International Journal of Operations and Production Management*, Vol. 26, No. 1, pp. 24 – 49.
- Spekman, R.E., Kamauff Jr, J.W. and Myhr, N. (1998). "An empirical investigation into supply chain management: a perspective on partnerships", *Supply Chain Management*, Vol. 3, No. 2, pp. 55-67.
- Stank, T.P., Keller, S.B. and Daugherty, P.J. (2001), "Supply chain collaboration and logistical service performance", *Journal of Business Logistics*, Vol. 22 No. 1, pp. 29-48.
- Sriram. V., Krapfel, R. and Spekman, R. (1992), "Antecedents to buyer-seller collaboration: an analysis from the buyer's perspective", *Journal of Business Research*, Vol. 25, No. 4, pp. 303-320.
- Voss, C., Tsikriktsis, N., Frohlich, M. (2002), "Case research in operations management", *International Journal of Operations & Production Management*, Vol. 22, No. 2, pp.195-219.
- Williamson, O.E. (2005), "Transaction cost economics and business administration", *Scandinavian Journal of Management*, Vol. 21, No. 1, pp. 19-40.