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Close Inter-firm Relationships in the Open Network Systems that maintain Competition and Cooperation

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ABSTRACT

In this survey, we investigated how the characteristics of transactions have changed in the information age. As a result of our survey, we observed that spot transactions produce negative effects on performance in some cases. Further results imply that open information networks based on close inter-firm relationships save transaction cost, decrease feedback time, and increase competitive advantages.

Keywords: open network, electronic market, transaction cost, EDI, contestability

1. INTRODUCTION

Openness of inter-firm relationships has been defined various ways. One major definition refers to EDI standard [1]. The other major definition refers to non-exclusive relationships that cause expansion of suppliers or customers [2]. Because of this difference, there has been a discrepancy in scholars' opinions whether inter-firm relationships should be opened or not. In this paper, we distinct information network openness from social network openness.

First, we construct a framework which enables us to analyze complementarity between information networks and social networks. Second, we formulate several hypotheses based on this complementarity. Finally, we show the results of questionnaire survey of major Japanese corporations.

2. FRAMEWORK

Our framework is shown in fig.1. In this figure transactions are categorized by 3 dimensions. The first dimension is EDI interface. If the transaction rules and protocols in the information networks are standardized, the networks are considered to be open. The second dimension is transaction range. If the transactions are non-exclusive and the numbers of suppliers or customers are increasing, the social network is considered to be open. The third dimension is transaction term. Although some scholars tend to consider that long-term transactions are caused by close network, this is not always be right. The transaction term should be conceptually distinguished from network openness. Because long-term relationships had plenty of benefits such as lower coordination costs [3], firms would not change suppliers or customers, even if there were opportunities to change them. As stated above, EDI interface is related to information networks, but transaction range and transaction term are related to social networks.

In fig. 1a, transactions type of cell "a" are described as "Electrical Market" [4]. Cell "b" and cell "d" are described as "Open but Close Relationships" [1]. The difference of cell "b" and cell "d" is the nature of competition. numbers of suppliers or customers. Cell "b" is represented by perfect competitive market, in which many competitors are participating and the competition is tangible. On the other, cell "d" is represented by perfect contestable market [5], in which a few competitors are participating and the competition is potential.

In fig. 1b, transaction type of cell "e" are described as "Internal Market" [5]. In the same way, cell "f" is described as "Interlocking" and cell "h" is described as "Close Relationships (not contestable)".

One of our concerns is that which types of transactions are rational and cause higher performances. Malone et al (1988) clamed that information technology would reduce coordination costs and more goods and services are obtained through market coordination, which is called "Electronic Market". Although Clemons et al (1993) agreed that more economic activities would be coordinated by markets, the number of buyers and sellers would be smaller and the term of relationships would be longer [6]. Kokuryo (1995) found information technology urge partnership rather than spot transactions in some industries. Taking account of rationality of long term relationships, he clamed that "Open but Close Relationships" would also be an effective transaction type as well as "Electrical Market".

Malone et al. (1988) had not denied the rationality of "Electronic Hierarchies". When asset specificities and product complexities remain high, hierarchy is better than market for coordination. Several Japanese scholars such as Kagono (1993) explained the rationality of "Internal Market" represented cell "e" [7]. Many of competitive researches have recommended "Interlocking" strategy represented cell cell "f". Japanese traditional KEIRETSU whose most important characteristic is long term relationships is represented cell "h". More or less, each cell seems to have rationality.

Another concern of ours is "competition and cooperation". Supposing each cell has economic rationality, each cell must take advantage of competition, cooperation or both. In "Electronic Market", with many buyers and sellers, the buyer can make sellers to compete each other to reduce production costs. In "Electronic Hierarchies", with a few sellers, the buyer can cooperate with them to reduced coordination costs. Then, how about transaction types between "Electronic Market" and "Electronic Hierarchies"? How these transaction types maintain balance of "competition and cooperation"?

Among these types, we should focus on "Open but Close Relationships" because standardized EDI is a trend of the modern business world. Thus, our concern is what kind of transaction policies are needed when information networks become open. In the concrete, we will see whether transaction terms should be long and whether transaction range should be expanded in open information networks.

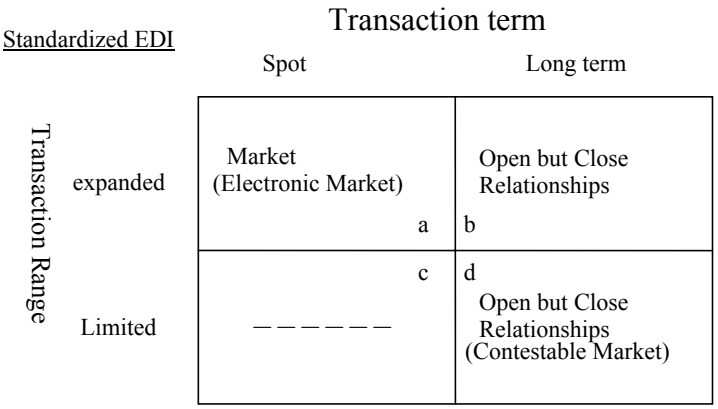


Fig1a Open Information Network

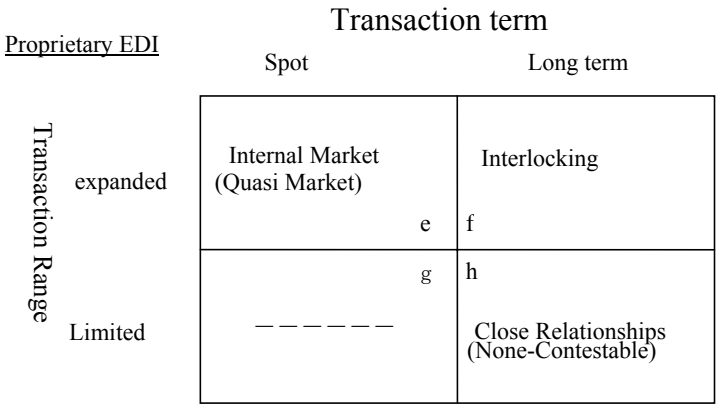


Fig1b Close Information Network

3. HYPOTHESES

Assuming complementarity between information networks and social networks, we can formulate two basic hypotheses.

Although standardized EDI lowers entry and exit barriers and maintains competition high level in itself, it also raises transaction costs especially when goods and services are complex and assets are inter-firm specific. Any complementary policy, such as partnership, is required to reduce such costs.

[H1] In open information networks, firms building close relationships with suppliers (or customers) can enjoy high performance.

On the other, proprietary EDI raises entry and exit barriers and impede competition in itself. Any complementary policy to activate competition is necessary.

[H2] In close information networks, firms expanding their transaction rage of suppliers (or customers) can enjoy high performance.

Focusing on "Open but Close Relationships", we can add more specific hypotheses. If open relationships are compatible with long term relationships, it is possible to pursue merits of both. For example, both of close information networks and long term relationships can reduce transaction costs.

[H1a] In open information networks, firms building longer term relationships with suppliers (or customers) can reduce transaction costs.

Further hypotheses can be fomulated. While long term relationships can shorten feedback time, information network can shorten it technologically. As a result, information accessibility and information sharing will be improved.

[H1b] In open information networks, firms building longer term relationships with suppliers (or customers) can shorten feedback time.

[H1c] In open information networks, firms building longer term relationships with suppliers (or customers) can improve accessibility of information and share more information

A broader point of view, open network enables firms to adapt environmental changes. In open networks, it is easier for firms to change partner especially when radical technological shift occurs. Partnership in open networks help firms to survive agile competition [8]. As a result of open partnership, goods and services are timely launched on the market.

[H1d] In open information networks, firms building longer term relationships with suppliers (or customers) can improve adaptability to market change.

[H1e] In open information networks, firms building longer term relationships with suppliers (or customers) can shorten "time to market" of new products.

Although it is possible to formulate hypotheses for close information networks as well, we cannot go into detail because of limited space.

4. SURVEY

Kansai Productivity Center has been surveyed Japanese enterprise management every 5years since1965. Our data was collected from the 7thSurvey in 2000. Variables and their measurements are shown in table1. The number of respondents was 189 firms (the response rate was about 11.2%).

5. RESULTS

Before testing our hypotheses, it is worth noticing that spot transactions produce negative effects on performance especially when their information networks are open.

According to our analysis, we can conclude that two basic hypotheses（[H1] and [H2]）are mostly supported. First, in open information networks, long-term transaction policy causes higher performance. According to t-test, the difference between long-term transaction policy and spot transaction policy is statistically significant ($p<.001$, fig2a; $p<.005$, fig2b). On the other, in closed information networks, there is much less difference between these policies. These differences are not statistically significant (fig.2a, fig.2b). Thus, [H1] is supported.

Second, in closed information networks, increasing the number of the suppliers (or customers) policy causes higher transaction performance. According to t-test, only the transaction performance difference between increasing policy and decreasing policy is statistically significant ($p<.005$, fig3a). On the other, in open information networks, there is no significant difference between these policies (fig.3a, fig.3b). The second basic hypothesis [H2] is partly supported.

Table 1　Variables

Openness	"Does your firm adopt standardized EDI?" （"yes"＝Open Information Network / "No"＝Closed Information Network）
Transaction Policies	"How does your firm's relationship have changed because of EDI?"(4points scale) ・ "The number of suppliers(or customers) is decreased(1) — increased(4)" ・ "Spot transactions are increased (1). — Long-term transactions are increased(4)"
Performance For Transaction Variables	"Estimate the performance of EDI." (4points scale) ・ "Feedback time is increased (1)—decreased (4)" ・ "Transaction cost is increased (1) —decreased (4)" ・ "Bargaining power is decreased (1) —increased(4)" Total performance for transaction variables: The mean of all above variables.
Performance For Competition Variables	"Estimate the performance of your business & information strategy." (5points scale) ・ Adaptability to environmental change is improved. [No(1)-Yes(5)] ・ Accessibility of our customer's information is improved. [No(1)-Yes(5)] ・ "Time to market" of our goods and services is shortened. [No(1)-Yes(5)] ・ Customer satisfactions are raised. [No(1)-Yes(5)] ・ Costs of product development and purchasing are saved. [No(1)-Yes(5)] Total performance for competition variables: The mean of all above variables.
Control Variables	・ The type of industry to which the firm belongs [discrete variables] ・ Firm size [the logarithmic number of employees of the firm] ・ Goods and services are standardized. [No(1)-Yes(5)]

Table 2a Sum of 3 transaction performance variables (mean)

Standardized EDI

	Spot	Long term	
Expanded	Cell a 2.758 (11)	Cell b 3.056 (36)	2.986 (47)
Limited	Cell c 2.576 (22)	Cell d 2.908 (29)	2.765 (51)
(N)	2.636 (33)	2.990 (65)	

Proprietary EDI

	Spot	Long term	
Expanded	Cell e 3.267 (5)	Cell f 3.137 (17)	3.167 (22)
Limited	Cell g 2.741 (9)	Cell h 2.822 (15)	2.792 (24)
(N)	2.929 (14)	2.990 (32)	

Table 2b Sum of 5 competition performance variables (mean)

Standardized EDI

	Spot	Long term	
Expanded	Cell a 3.417 (12)	Cell b 3.697 (35)	3.626 (47)
Limited	Cell c 3.448 (21)	Cell d 3.771 (28)	3.633 (49)
(N)	3.436 (33)	3.730 (63)	

Proprietary EDI

	Spot	Long term	
Expanded	Cell e 3.680 (5)	Cell f 3.733 (15)	3.720 (20)
Limited	Cell g 3.375 (8)	Cell h 3.708 (13)	3.581 (21)
(N)	3.492 (13)	3.721 (28)	

Fig.2a Transaction term and transaction performance

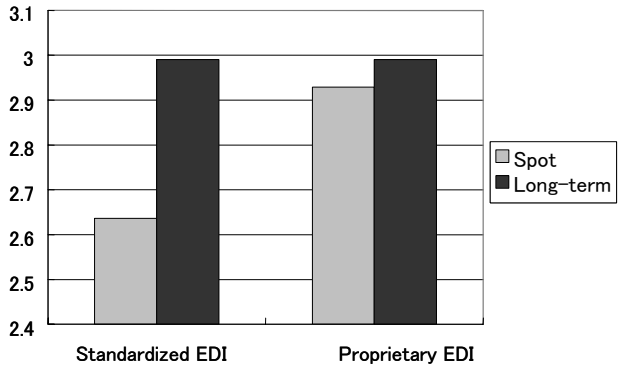


Fig.2b Transaction term and competitive performance

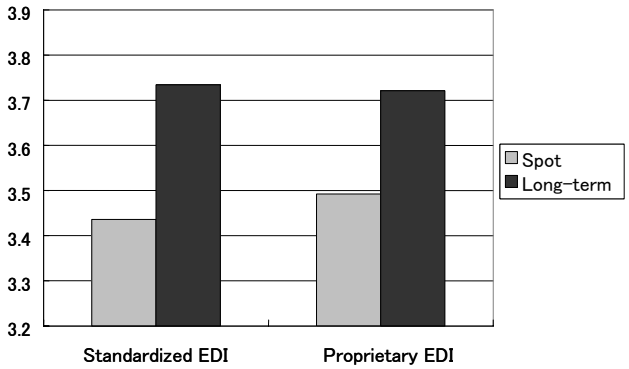


Fig.3a Transaction range and transaction performance

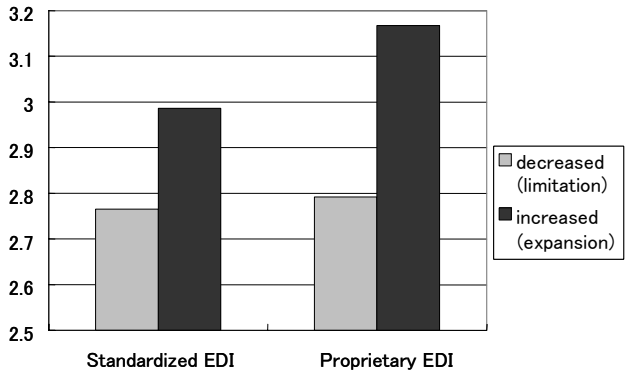
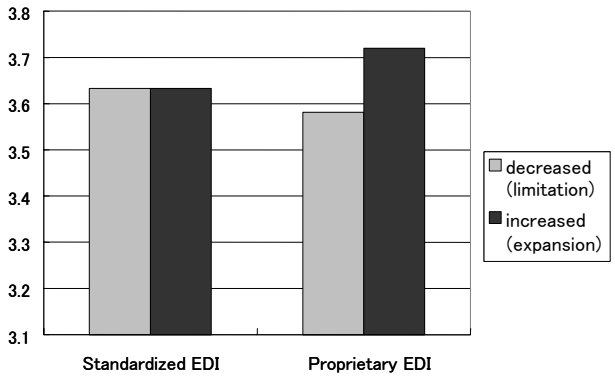


Fig.3b Transaction range and competitive performance



Because the number of respondents was not enough, it is difficult to test which types of transactions cause higher performance. Especially, the respondents belonging to "Internal Market", whose scores were relatively high, were very limited. However, it is insightful to see scores of each transaction type shown table2a and 2b.

Next, let us see five hypotheses focusing on "Open but Close Relationships". In order to test more strictly, we did multi regression analysis. In this analysis, Independent variables are the number of suppliers (or customers) and the length of transaction term. On the other dependent variables are divided into two categories. One is transaction performance including 3 variables which are feedback time, transaction costs and bargaining power. The other is competitive performance including 5 variables which are adaptability to environmental change, accessibility of customer's information, time to market, customer satisfaction and product development/purchasing costs. Their causal relationships are tested not only in cases of standardized EDI, but also in case of proprietary EDI. It is worth noticing that we control the degree of product standardization as well as firms' size and industries to which respondents belong.

As shown table 3 and figure 4a, hypotheses for transaction performance ([H1a], [H1b]) are supported. In open information networks, firms building longer term relationships with suppliers (or customers) can reduce transaction costs and can shorten feedback time. In contrast, such relationships cannot be found in close information networks (table 3 and fig. 4b).

As shown table 4a, table 4b and figure 5, hypotheses for competitive performance are mostly supported. While [H1d] and [H1e] are supported, [H1c] is not. In open information networks, firms building longer term relationships with suppliers (or customers) can improve adaptability to market change and can shorten "time to market" of new products. In contrast, such relationships cannot be found in close information networks (table 4a, table 4b and fig. 5).

Table 3. Multi Regression Analysis for Transaction Performance

Dependent Variables		Feedback Time		Bargaining Power		Transaction Costs	
Contingency variable	EDI	Standard	Proprietary	Standard	Proprietary	Standard	Proprietary
Independent Variables β	The number of suppliers (or customers)	-.022	.252	**.427*****	.243	.108	**.383***
	The length of transaction term	**.458*****	.133	.111	**.493***	**.404*****	-.104
Control Variables β	Goods & Services	.123	.107	-.092	-.058	.221*	-.124
	Firm Size	.154	-.042	.227*	.156	.149	-.006
	Steel, Machinery	-.160	.351	-.019	.114	-.234	.063
	Electronics, precision machinery	-.233	-.079	-.100	-.028	-.174	-.575**
	chemistry	-.078	.056	-.005	-.097	-.195	-.039
	Food, apparel	-.044	.039	-.278	.081	-.271	-.024
	constructors	-.185	-.032	-.045	.085	-.168	-.084
	commerce	-.162	-.051	-.029	.053	-.238	-.256
	Banking, Financing	-.161	-.071	-.120	.088	-.225	-.102
	ITC	-.070	-.176	-.034	.009	-.096	-.071
Adjusted R^2		.244	.005	.207	.174	.263	.386
F value		30388	1.017	2.956	1.718	3.680	3.052
Number of respondents		90	42	91	41	91	42

* p<.05, ** p<.01, *** p<.001

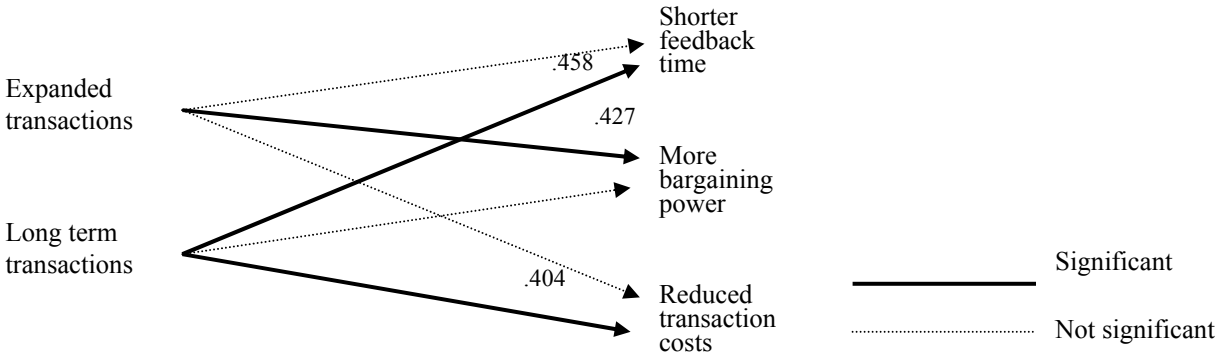


Fig.4a Transaction Policies and Transaction Performances in Open Network

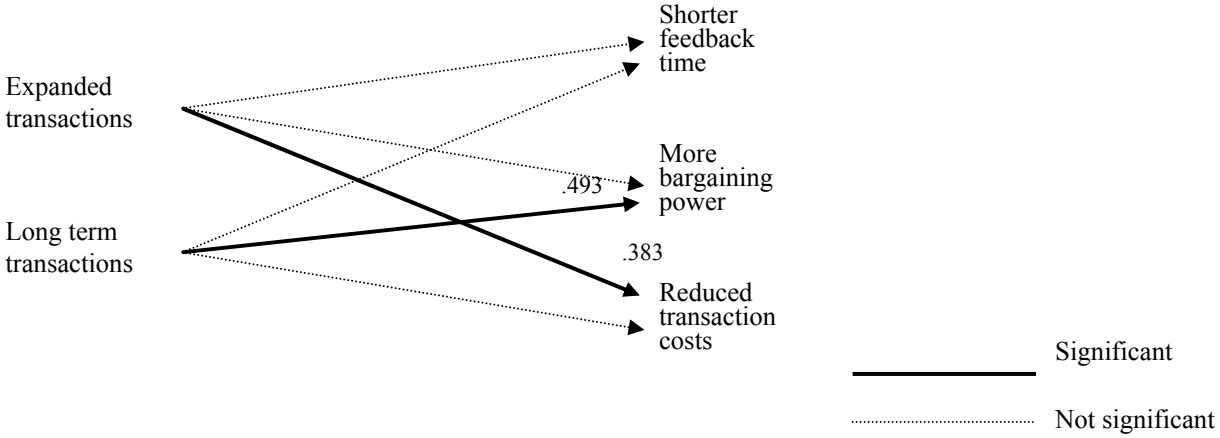


Fig.4b Transaction Policies and Transaction Performances in Closed Network

Table 4a. Multi Regression Analysis for Competitive Performance

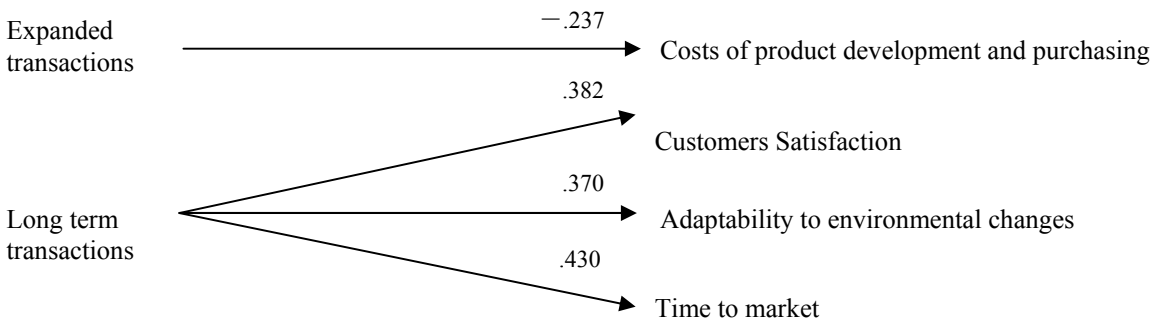
Dependent Variables		Customer Satisfaction		Costs of product development and purchasing		Adaptability to environmental change	
EDI		Standard	Proprietary	Standard	Proprietary	Standard	Proprietary
Independent Variables β	The number of suppliers (or customers)	-.119	.191	**-.237***	-.063	.043	.178
	The length of transaction term	**.382*****	**.446***	-.017	-.212	**.370****	.395
Control Variables β	Goods & Services	.131	.182	.183	-.184	.098	.244
	Firm Size	.084	.114	.178	-.065	.087	.150
	Steel, Machinery	-.250	.142	-1.69	.081	-.224	-.040
	Electronics, precision machinery	-.230	-.074	-0.14	-.241	-.081	-.093
	chemistry	-.320*	-.142	-.025	-.304	-.364**	-.288
	Food, apparel	-.479**	-.115	-.140	.026	-.318*	-.078
	constructors	-.335*	-.184	-.125	-.015	-.215	-.135
	commerce	-.408**	.185	-.141	-.247	-.371*	-.136
	Banking, Financing	-.046	-.194	-.111	-.160	-.067	-.276
	ITC	-.338**	.111	-.163	-.462*	-.243*	-.044
Adjusted R^2		.239	.076	.034	.239	.179	.076
F value		3.358	1.267	1.257	2.019	2.614	1.266
Number of respondents		91	40	89	40	90	40

* p<.05, ** p<.01, *** p<.001

Table 4b. Multi Regression Analysis for Competitive Performance

Dependent Variables		Accessibility of our customer's information		Time to market	
EDI		Standard	Proprietary	Standard	Proprietary
Independent Variables β	The number of suppliers (or customers)	-.152	**.352***	-.063	-.145
	The length of transaction term	.209	.322	**.430*****	.269
Control Variables β	Goods & Services	.020	.227	-.075	.038
	Firm Size	.156	.062	-.087	-.084
	Steel, Machinery	-.219	-.047	-.126	.362
	Electronics, precision machinery	-.165	-.056	-.060	.047
	chemistry	-.284*	.052	-.145	.084
	Food, apparel	-.255	.212	-.195	.397
	constructors	-.160	-.168	-.261	-.053
	commerce	-.141	.010	-.345	.035
	Banking, Financing	-.019	-.191	-.069	-.051
	ITC	-.179	-.120	-.035	-.100
Adjusted R^2		.021	.285	.142	-.038
F value		1.156	2.294	2.209	.884
Number of respondents		90	40	89	39

* p<.05, ** p<.01, *** p<.001



Besides most of our hypotheses are supported, we can find interesting contrasts. Comparing figure 4a to figure4b, we can see appropriate transaction policies are contingent on the openness of information network. Most of these contrasts can be explained complementarity between information networks and social networks. Basically, when information network is open, competition is taken for granted, so any complementary transaction policy for cooperation is required. When information network is closed, cooperation is taken for granted, so any complementary transaction policy for competition is required.

6. CONCLUSION

In conclusion, we can draw several findings. First, spot transactions produce negative effects on performance when EDI is standardized. Rather, Standardized EDI should be complemented with close inter-firm relationships to save transaction costs and shorten feedback time. Second, as mentioned above, appropriate transaction policies are contingent on the openness of information networks. Third, being compared "Open but Close Relationships" to other transaction types, it seems to be as good as "Interlocking" and "Internal Market". Forth, in other words, there is no best transaction type, but there must be several appropriate transaction types as Picot et al (1996) insisted [9]. However, if information network is getting open and open, we had better built closer relationships to balance between competition and cooperation [10].

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