



Inter-Firm Cooperation and Firm Performance: An Empirical Study of the Lao Garment Industry Cluster

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Abstract

Inter-firm cooperation is one important instrument for the way of industrial cluster development in developing countries. We utilize the case of Lao garment industry in Vientiane Capital City to examine the relationship between types of cooperation and firm performance. In order to prove our hypotheses, factor analysis and multiple regression analysis methods were used for the information obtained from field survey. The results of the study suggest that cooperation with subcontractors, business associations and distant buyers influence firm performance. On the contrary, cooperation among garment firms and distant suppliers seems to be less effective in this study.

Keywords: Inter-firm cooperation, Firm performance, Industry cluster, Garment industry, Lao PDR

1. Introduction

The concept of industrial clusters has attracted much attention in developing countries during the last decade (Note 1). They have been viewed as important in developing countries because they play an important role in contributing to their economies in terms of employment, output, and exports. Therefore, there are a number of studies dealing with the characteristics and the growth paths of clusters in developing countries. These studies provide a wealth of information about the functioning of clusters, but more fundamentally demonstrate the prevalence of clusters across sectors and countries (Schmitz, 1995 and 1999; Rabellotti, 1995 and 1999; Cawthorne, 1995; Tewari, 1999; McCormick, 1999; Knorringa, 1999; Visser, 1999; Nadvi, 1999a, Weijland, 1999).

Industry clusters are defined as groups of geographically proximate firms in the same industry. They have a striking feature of the geography of economic activity (Krugman, 1991). Many scholars in the field of strategic management and economic development observe how clusters influence firm performance (Harrison, 1992; DeBresson and Amesse, 1991; Harrison et al., 1996; Shaver and Flyer, 2000).

The relevance of clustering as alternative strategy for industrial development in developing countries has dominated many discussions in economic development literature. However, the literature on the topic has mainly consisted of descriptive case studies (Cawthorne, 1995; Tewari, 1999; McCormick, 1999; Visser, 1999; Oyelaran-Oyeyianka, 2001). There are a few papers that have quantitatively investigated the effects of inter-firm cooperation on performance in clusters (Schmitz, 1999; Rabellotti, 1999; Knorringa, 1999; Nadvi, 1999a). These empirical studies illustrate a variety of results. They seem to be depending upon the conditions of industry and country.

Lao garment industry is relatively young and small, but its export accounting for about a third of Laos' total export (Note 2) (Banesaty et al., 2005). The effort to help boost exports come at a time of rapid change in the global economy, garment industry is the one priority sector that Lao government is boosting up on cluster development initiatives (DTIS, 2005). Previous survey of Lao garment industry suggested that the competitive strengths of local Lao garment firms are the ability to coordinate and cooperate with local key players such as Association of Lao Garment Industry (ALGI), exporters and subcontractors. On the other hand, FDI and joint venture firms have competitive advantage through their relationship with foreign counterparts (Bounthavy et al., 2007).

Many existing studies focus only cooperation of firms in the cluster, while neglecting both types of cooperation between cluster members and other (remote firms). Our paper overcomes some of these shortcomings by applying to the case of garment industry cluster in Vientiane Capital City (VCC), Lao PDR. In doing so, we aim at answering these two main questions: what are the Lao garment companies' cooperative behaviors with both cluster members and outside agents and then, do enterprises cooperate with others performed better than those which have not? The results of this study show that Lao garment firms have cooperation with both cluster members and outside agents (Note 3). Specifically, firm performance is influenced by some types of inter-firm cooperation. The paper proceeds as follows. The next section provides literature review. We then develop the relevance hypotheses, present methodology and empirical results. Finally, we present discussions and conclusions.

2. Theoretical background and literature review

An industrial cluster is a group of firms that are specialized by sector, or related industries located in geographically near to each other (Becattini, 1990; Brusco, 1990; Harrison et al., 1996; Storper and Harrison, 1991). Therefore, firms in the clusters have better access to information than other firms (Bianchi and Bellini, 1991; Porter, 1998; Pouder and St. John, 1996). In developing country context, an industrial cluster consists of small and medium-sized enterprises (SMEs). The keys for success of industrial cluster in developing countries are the cooperation among large firms and SMEs, the collective responsibility of local association, the relationship between the parties along the value chain and financial incentives by support industries (Fischer and Reuber, 2003).

The majority of the case studies on industrial clusters stress the need for joint action to overcome the new commercial pressures that many of the clusters have faced due to trade liberalization (Mexico; India), quality or environmental standards (Pakistan; palar Valley, India), increased global competition (Brazil), or loss of traditional markets (India) (Schmitz and Nadvi, 1999).

As the business environment changes, industrial clustering seems to encourage information sharing and opportunities for learning new techniques and designs (McCormick, 1999). Within cluster, firms also can gain economies of scale and scope and increased flexibility through specialization and inter-firm cooperation (Humphrey, 1995a).

There are number of case studies of industrial clusters in developing countries. These case studies provide the important information of the firm's behaviors to cope with the environmental change. Cawthorne (1995) studied Tirupper's cotton knitwear cluster in the South India town. Cawthorne posited that successful and dramatic expansion of this cluster has taken place over the last two decades. This cluster created more jobs for Indian people, limited technological improvement, quality improvement in yarn and fabric and increasingly diverse range of garments. Furthermore, the larger firms in the cluster access to export markets have been the driving force to improve their competitiveness.

In the case of woolen knitwear in Ludhiana, India; Tewari (1999) attributed the recovery of the cluster (after the collapse of the Soviet market) to the cluster's strong presence in the domestic market. The large and medium-sized enterprises created brands of their own for the domestic market that were of higher quality than those exported to the Soviet Union. This attention to design and quality for the up-scale domestic market made for an easier transition to exporting to the developed nations. Some evidence of literature shows that industrial clusters are facing new competition. Agra: Indian's knit footwear cluster is a good example. Knorrige (1999) has examined how producers in traditional Indian cluster have responded to major changes in internal and external markets. The study presented that most firms in this cluster increased cooperation with buyers on quality control, though more often in the export sector than in the domestic sector. Moreover, they have also increased cooperation with suppliers, subcontractors and local producers.

In Pakistan, Nadvi (1999a) raised the example of consistent export success as Sialkot stainless steel surgical instrument cluster. In this cluster, the major enterprise is SMEs which their main markets are United States and Western Europe. This author hypothesized that to meet such international quality assurance standards, local firms require to have greater cooperation with both among producers as well as between producers and their suppliers and subcontractors. Moreover, how inter-firm ties, both vertical and horizontal have changed also examined in this study. The results of this paper suggested that joint action has increased, but there remain significant areas of collective failure.

In the case of clustering at early stages of development, Weijland (1999) examined the importance of the case of cottage industrial cluster in rural Indonesia. He suggested that dismally poor but clustered rural micro enterprises may have a seedbed function for industrial development that may useful for clustering policy to bring about some success in Indonesia. Interestingly, Weijland argued that social capital is crucial for the achievement of transaction cost reductions, which attract traders to the clustered enterprises. Moreover, external economies arise from specialization and technical indivisibilities, but vary significantly by subsection.

In the Brazilian footwear cluster of the Sinos Vally, Schmitz (1995) documented the history and growth of the cluster from 1960s to the 1990s. During this period, the cluster grew from a protected infant industry producing for the domestic market into a powerhouse exporter with a substantial share of the world market for shoes. Export agents,

especially from the United States, played a large role in the development of the cluster as a major exporter. Cooperation among the firms has ebbed and flowed over the last thirty years. Prior to the end of 1970s, trust and cooperation founded in a common social identity was strong. During the 1970s and 1980s this cooperation waned as the cluster experienced rapid growth, but then re-emerged in the 1990s.

Moreover, Schmitz (1999) explored the recent initiatives for cooperation in the Sinos Valley in more detail. Greater cooperation between manufacturers and intermediate input producers improved the quality of goods and decreased delivery times and batch sizes of the footwear in response to the demands of foreign buyers in the United States. A joint action initiative intended to take action on marketing abroad and in Brazil failed because the five largest exporting firms (which were vertically integrated and had a close relationship with the largest U.S. buyers) defeated the plan by exerting their influence in the shoes manufacturer's association.

In the case of cluster in Mexico, Rabellotti (1999) focused on the Guadalajara cluster and how inter-firm relationships were affected by trade liberalization. This study found that firm performance was positively correlated with vertical and horizontal cooperation. Rabellotti confirmed that approximately half of firms cooperated with their suppliers in matters such as information exchange, negotiation of payment and delivery conditions, joint product development, quality improvement, and delivery time. On the other hand, there was evidence that vertical cooperation was still lacking in many aspects, despite the pressures of increased competition in international markets. For example, the survey found that manufacturers continued to have delivery problems with suppliers.

Apart from the single case studies as have been discussed, some preceding studies also have compared the behaviors of firm in the clusters from countries to countries, from clusters to clusters and performance of firms within clustered and dispersed location. Rabellotti (1995) compared shoe clusters in Guadalajara and Leon in Mexico to clustered shoe producers in Italy. She found backward linkages (or relationships between manufacturers and their suppliers) to be stronger in Italy than in Mexico, but found that forward linkages (into marketing and commercialization) were weak in both Mexico and Italy. Her study also determined that informal relationships took on a greater significance in the Mexico clusters than in the clusters in Italy.

In the case of African clusters, previous studies compared the behaviors of firms from cluster to cluster. Oyelaran-Oyeyianka (2001) investigated the basis for long-term sustainable development of industrial clusters in Lagos, Nigeria by comparing the metropolitan clusters with the Nnewi cluster that located in rural ethnic community. The main characteristics of clustering examined are the forms and intensity of inter-firm linkages, including formation of trade networks, and the role of business associations. The results of this study confirmed that there is a significant level of collaboration among firms in sharing utilities and modest forms of subcontracting non-core activities among Lagos firms, but this is less so at Nnewi. Moreover, networks such business associations are playing vital roles as information providers and as links into the global market although the benefits are yet to fully manifest.

McCormick (1999) compared six African enterprise clusters in Kenya, Kamukunji, Ziواني, Lake Victoria, Ghana and South Africa. She makes argument that geographic and sectoral clustering enables enterprises to overcome constraints to growth and development. More specifically, she underscored the strength of the collective efficiency framework, but found that certain anomalies could only be explained by other contextual variables. The six case studies revealed the important difference among them on playing in the way of industrialization processes. In the case of garment cluster in Peru, Visser (1999) compared the differences between clustered and dispersed firms. He suggested that clustered garment firms show higher performance than dispersed firms. The main reasons behind this are cost reduction and information spillover within cluster.

The literature of industrial clustering not only provide information in terms of case studies, some antecedents also provide the information of industrial cluster in overall of developing countries context. Schmitz and Nadvi (1999) suggested that clustering facilitates the mobilization of financial and human resources, leading to the gains of collective efficiency. Nadvi and Schmitz (1994) offer five lessons learnt in the last decade on the importance of clustering for developing countries. First, it is a significant form of industrial organization for small scale manufacturing. Second, clustering promotes different types of inter-firm linkages. Third, clustering is identified with diverse forms of social networks, which are associated with personal ties, and the notions of trust and reciprocity in competitive behavior. Fourth, clustering is not plans for intervention yet the state has a role in promoting it and finally, cluster experiences are vastly diverse and internally uneven.

In terms of inter-firm cooperation, there are several forms of inter-firm linkages in both developed and developing countries such as subcontracting, market linkages with customers and supplies, informal and formal collaborations (joint ventures, franchise), membership of professional and trade associations and movement of skilled staff from one firms to others (Oyelaran-Oyeyianka, 2001). Joint action within vertical linkages includes backward cooperation with suppliers and subcontractors (Lazerson, 1998) and forward cooperation with traders or buyers (Knorringa, 1996).

More specifically, Nadvi (1999b) pointed out that joint action within bilateral horizontal linkages between two or more

local producers include joint marketing of products, joint purchase of input, sharing of capacity, common use of specialist equipment, joint product development and enhancing know-how and trade information. In the case of joint action at the multilateral horizontal linkages include cooperation with trade associations, trade fairs, and technology and producer service centers (Nadvi, 1999b). As an important horizontal form of networking that has become increasingly important in facilitating joint action is industry or business association (Schmitz, 1998).

The relationship between inter-firm cooperation and firm performance is one interesting discussion point in literature. Therefore, our main concern is inter-firm cooperation matter. Some scholars in the field of economic development have already empirically investigated the relationship between types of cooperative behaviors and firm performance of industrial clusters in developing countries (Knorrige, 1999; Nadvi, 1999a; Rabellotti, 1999; Schmitz, 1999). For instance, Knorrige (1999) examined the relationship between vertical and horizontal cooperation and firm performance of knit footwear industry in India. The results of this study suggested that cooperation with suppliers, subcontractors, buyers and business associations have influenced firm performance.

These results are similar to the study of Schmitz (1999). In the case of the study of the shoe industry, Sino Valley, Brazil, Schmitz (1999) posited that firms within cluster that have cooperation with supplier, subcontractors, other shoemakers and business associations show higher performance more than those firms that have not cooperation. Another study (Nadvi, 1999a) concluded that cooperation with subcontractors and buyers have positively significant association with firm performance. Moreover, the results of this study showed cooperation with suppliers and business associations do not influence firm performance. In the case of footwear industry in Mexico, Rabellotti (1999) found that cooperation with suppliers, other footwear firms and business associations are positively associated to firm performance, but cooperation with buyers to not matter.

According to aforementioned, we need to conclude that cooperation between clustered firms and local suppliers are positively associated to firm performance (Knorrige, 1999; Rabellotti, 1999; Schmitz, 1999), while firms that have cooperation with suppliers cross country are not (Nadvi, 1999a). In contrast, firms that have cooperation with buyers in distant markets influence firm performance (Knorrige, 1999; Nadvi, 1999a), while firms that have cooperation with local buyers have no impact on the performance. This is due to international buyers have higher technology, know-how, assets and etc. more than buyers in domestic market have. Therefore, firms that cooperate with those agents seem to be effective.

Even though the relationship between types of cooperation among firms in clusters and firm performance has been investigated in some levels, all of the studies failed to investigate all types of cooperation in a single study, for instance, cooperation with local buyers (Schmitz, 1999), subcontractors (Rabellotti, 1999), other firms (Knorrige, 1999); Nadvi, 1999a). More specifically, Visser (1999) stressed that garment industrial cluster in Peru has limitation in terms of inter-firm cooperation beyond local borders and absent linkages with foreign agents. Therefore, as our aim at overcoming these shortcomings, we further develop the main hypotheses in next section.

3. Hypothesis development

As mentioned in the previous section, most scholars in the field of economic development focus on industrial cluster, specifically in terms of inter-firm cooperation among firms in the cluster as case studies. Only a few researchers have investigated the issue systematically. Table 1 provides the summary of empirical results from literature on the relationship of inter-firm cooperation and performance. As has been pointed out from prior researchers that cooperative behavior among firms influence performance. However, they depend on many factors such as types of cooperation, size of firm, industry and also the country's conditions. According to literature results, we observed that most types of cooperation have improved performance, although some few cases have not. In the case of Lao garment industry; we believe the cooperative behavior is an important factor of the way on industrial cluster development in the Lao PDR. As the results, inter-firm cooperation should have positive impact to performance. Based on aforementioned, we develop five hypotheses as below:

Hypothesis 1: *Backward cooperation with suppliers is positively significant associated to performance.*

Hypothesis 2: *Backward cooperation with subcontractors is positively significant related to performance.*

Hypothesis 3: *Forward cooperation in the export market is positively significant associated to performance.*

Hypothesis 4: *Horizontal cooperation with other garment manufacturing firms is positively significant related to performance.*

Hypothesis 5: *Horizontal cooperation with business associations is positively significant associated to performance.*

4. Methodology

4.1 Data source and sample

We collected information on inter-firm cooperation and performance by using a field survey of garment firms in VCC,

Lao PDR during August-September 2007. Field survey has been conducted by researchers and two lecturers of Faculty of Economics and Business Management, National University of Laos.

Our questionnaire has adopted the works of Schmitz (1999) and Rabelotti (1999) as the basis. The pilot survey has been conducted through e-mail to five garment companies in VCC one month before the field survey has been done. Three questionnaires have returned to us within two weeks. The modification of questionnaires has been conducted by researchers based on the results of pilot survey.

According to the official report of ALGI to Vientiane Capital City Tax Office (VCCTO) in 2007, there are 52 garment manufacturing firms located in VCC and registered as member of ALGI. These number of garment firms are located in 7 districts of VCC. We utilize face to face interview method on the collecting information from 44 garment firms from all districts.

4.2 Variables

4.2.1 Dependent variable

In our questionnaire, performance was originally measured by several indicators including output (quantity), percent of exported, annual sales, net profit, lead time, productivity and quality of product. Principal Component Analysis (PCA) of factor analysis method was utilized for extracting factors. FAC1 is dependent variable for our analysis. FAC1 consists of all performance indicators except lead time (Note 4) and it has explained variability 60.8%.

4.2.2 Independent variables

The independent variables included in our regression model are indicators of the forms of cooperation. They are FAC2 (backward cooperation with suppliers), FAC3 (backward cooperation with subcontractors), FAC4 (forward cooperation with customers in abroad), FAC5-1 and FAC5-2 (horizontal cooperation with other garment firms) (Note 5) and FAC6 (horizontal cooperation with institutions). All these components also obtain from PCA method and factor score.

4.2.3 Control variables

Prior studies on the field of management and industrial organization identified a significant positive relationship between firm size, firm age and performance (Evans, 1987; Xayphone, 2006; Xayphone and Kimbara, 2007, 2008). We control for these factors by taking natural log of number of employees (LOGFS) and age of firm (LOGFA) to balance the variance of these two variables.

4.3 Analysis

4.3.1 Factor analysis

In order to aggregate data from the questionnaires, we performed a factor analysis on the variables representing firm performance (FAC1) and inter-firm cooperation (FAC2; FAC3; FAC4; FAC5-1, FAC5-2 and FAC6) by using principal component analysis (PCA).

Kaiser-Meyer-Olkin (KMO) was conducted to check whether or not the value is bigger than 0.5. All of KMO values of our analysis more than 0.7, which is sufficient for performing factor analysis (Sharma, 1996). Using the cutoff criterion eigenvalues >1, there are 7 factors were obtained (from 27 variables).

We obtained factor score of 7 factors from equation below:

$$F_{ik} = W_{i1} Z_{k1} + W_{i2} Z_{k2} + \dots + W_{in} Z_{km} \quad (1)$$

Where

Z_{ij} = Variable j of case k (standardized)

n = Sample size

m = Number of factor

W_{ij} = coefficient loading factor of variable j of factor i

F_{ik} = Factor score of factor i in the case k

4.3.2 Analysis model

$$FAC1 = b_0 + b_1 FAC2 + b_2 FAC3 + b_3 FAC4 + b_4 FAC5-1 + b_5 FAC5-2 + b_6 FAC6 + \text{Control variables} + \text{Dummy variable} + \text{Interaction terms} + \varepsilon \quad (2)$$

Where

$FAC1$ = Firm performance; $FAC2$ = Cooperation with suppliers; $FAC3$ = Cooperation with subcontractors; $FAC4$ = Cooperation with buyers; $FAC5-1$ & $FAC5-2$ = Cooperation with other garment firms and $FAC6$ = Cooperation with business associations. *Control variables* = The natural log of firm age and firm size; *Dummy variables* = Dummy for

firm size (number of worker less than 100, 300 and 500 respectively) and *Interaction terms*= The interaction between independent variables (statistically significant variables) and dummy variables.

5. Results

5.1 Survey of inter-firm cooperation

As can be seen in type (1) cooperation of table 2, for the majority of firms there has been backward cooperation between Lao garment firms and their suppliers. This is the clearest in all types of cooperation. The highest percentages of firms reporting cooperation in terms of quality improvement and respect of delivering time, respectively. In contrast, at least 15 percent of informants report there has not been cooperation with suppliers. Here, the highest percentages of firms reporting cooperation did not exist among manufacturing firms and suppliers are negotiating of payment and delivery conditions and exchange information and experience, respectively.

Type (2) cooperation of table 2 reports the survey results of the cooperation among garment manufacturers and their subcontractors. In the relationships between Lao garment manufacturers and their subcontractors there has been clear trend towards greater cooperation. Specifically, the cooperation in terms of quality control, exchange information and experience and joint labor training are the greatest percentages of firms reporting, respectively. Based on our survey results, more than 80 percent of firms in the sample report they have at least 3 subcontractors. However, the cooperation among them in terms of technological upgrading is the lowest level in Lao garment cluster.

Type (3) cooperation of table 2 illustrates the cooperation between garment manufacturers and their customers in international markets. As the survey results report, there also exists the forward linkage (cooperation) between garments firms and their buyers in abroad in Lao garment industry. As can be seen in table 2 (type 3), the highest percentages of firms reporting cooperation between garment firms and buyers are setting of product specification and quality control, respectively. However, the cooperation among them in terms of technological upgrading is also the lowest level in Lao garment cluster.

The horizontal cooperation among Lao garment manufacturers has been summarized in type (4) cooperation in table 2. Our survey results suggest that horizontal cooperation among garment firms in the cluster was particular low. Most firms report that they were too involved with day to day survival, and were not able to have interaction with others. The forms of cooperation which high percentages of firms reported are machinery lending, exchange information and experience and joint labour training, respectively. A few informants indicate they cooperate with other garment firms in terms of sharing order and joint purchase materials.

Type (5) cooperation of table 2 shows the cooperation among garment manufacturers and institutions (Lao National Chamber of Commerce and Industry (LNCCI) and ALGI). Our survey results confirmed that the cooperation between garment firms and institutions (business associations) has been increasing over time. Particularly, in terms of sharing information, training participation and accessing to new market are the highest percentages of firms reporting. Based on our interview, institutions play an important role in collaboration within cluster. Specifically, ALGI plays the role in linking between international customers and garment manufacturers in the Lao PDR.

The performance of the surveyed firms is illustrated in figure 1. It shows that the percentage of firms increasing output (in quantity), exported, annual sales, net profit, productivity and quality is higher than that decreasing all of indicators. The survey results report that all firms of the sample have improved their performance by more than 60 percent. Moreover, there are around 50 percent of all informants stated that their lead time has been decreasing over time, while 43 percent of them reports it has not changed and the rest of informants answer it has been increasing (see figure 1). Noteworthy, the clearest results are the high percentages of firms indicating increases in quality improvement and annual sales, respectively.

From what has been said so far we need to conclude that cooperation exist within Lao garment cluster in VCC. Most surveyed firms report that they cooperate with others in both vertical and horizontal cooperation. Even though some types of cooperation are particular low, the trends seem to be increasing over time. Therefore, we further empirically investigate the relationship between cooperation and performance of firm in Lao garment cluster in next section.

5.2 Inter-firm cooperation and performance

In order to test the relationship between types of cooperation and performance, we construct the analysis in two stages. First, we investigate the relationship between two by classifying firms as strong performers (those firms reporting increase performance) and poor performers (those firms reporting decrease performance) and using Kendall coefficient to test the significant level of those relationship in detail. Later, we construct the multiple regression analysis to investigate relationship between types of cooperation (five factor loading variables) and performance in five models.

Table 3 provides disaggregate between different types of inter-firm cooperation and their relationship with performance. The results of the survey show that garment firms in Lao cooperate both vertically and horizontally. The clearest results are backward cooperation with subcontractors and horizontal cooperation with institutions (ALGI and LNCCI). All

indicators of these two types of cooperation have positively significant association with performance at 1% level, except in terms of negotiation of payment and delivery of cooperation with subcontractor ($p < 0.05$). The cooperation with customers shows the moderate level. Most indicators of the type of cooperation are positively significant associated with performance ($p < 0.001$), except in terms of negotiation of payment and delivery and technological upgrading (coefficients are positive but insignificant). The results show a few indicators of cooperation with other garment are positively and significantly: they are lending machinery and joint labor training. In terms of cooperation with suppliers, the results indicate positive coefficients in all indicators, except negotiation of payment and delivery (negative coefficient), but all of them are insignificantly related to performance.

In order to test our five hypotheses systematically, we utilize multiple regression analysis method to prove these hypotheses. But at first, we provide the basic statistics of correlations between main variables (dependent and independent variables). As has illustrated in table 4, the correlations among independent variables are particular low and insignificant, therefore the bias of multicollinearity would not exist in our models. However, we would further check this bias with other methods by observing Durbin-Watson and Variance of Inflation Factor (VIF) in running models process.

Table 5 provides empirical results of regression analysis of independent variables, additive variables (Note 6) and dependent variables (performance). In model 1, we incorporate the different types of cooperation including six factors loading (five types of cooperation) and one factor loading of performance.

The results of model 1 indicate three independent variables are statistically significant and positively associated to performance. Those significant variables are FAC3 (cooperation with subcontractors), FAC4 (cooperation with buyers in distant markets) and FAC6 (cooperation with institutions), which significant at 1%, 10% and 5% level respectively. Based on the results, hypothesis 2, 3 and 5 were strongly accepted. On the contrary, as has been seen in model 1 results there are three variables that are not significantly related with performance including FAC2 (cooperation with suppliers), FAC5-1 and FAC5-2 (cooperation with other garment firms). Therefore, by following this results we need to state that hypothesis 1 and 4 were not supported. From what has been said so far, we want to interpret that firms which have stepped up cooperation with subcontractors, buyers and institutions (business associations) have improved their performance more than those which have not. These findings suggest not only cooperation among clustering firms but cooperation with external agent such as distant buyers also matters. This is the one unique result found in the Lao garment industry.

In model 2, we insert control variables (the natural log of the number of employees: LOGFS and the number of firm age: LOGFA). The aim of including these variables to the model is to avoid the effect of firm size and firm age on the relationship between the types of cooperation and performance. As the results show in model 2 of table 4, the coefficients and significant levels do not change compared to the results of model 1. However, LOGFS has statistically significant and positively related with performance. This implies that larger firms enjoy higher performance than smaller ones.

In later three models (model 3, 4 and 5), we insert dummy variables and interaction terms between dummy variables and statistically significant independent variables (FAC3, FAC4 and FAC6). In order to test size of internal heterogeneity, we classify firm size of the sample into three levels: small and medium-sized enterprises (SMEs) which have number of employees less than 100 and large firms have number of employees less than 300 and 500, respectively. To avoid the bias of introducing many variables in the case of small sample size in the one model; we analyze these size classifications separately. The main objective of dividing firm size into three categories is to test whether or not the degree of the relationship between inter-firm cooperation and performance depends on size of firm.

The results of model 3 suggest that firm size has negatively significant association with performance. This confirmed that larger firms are strong performers. Interestingly, the interaction terms between firm size and cooperation with business associations is positively significant associated to performance. The interpretation of this result is that SMEs cooperate with business associations improved performance more than those large firms cooperate with business associations. On the other hand, among SMEs, this result implies that those firms have cooperation with business associations have higher performance than those firms have not. However, other variables remained the same as previous models' results (model 1 and 2).

As has been seen in table 5, the results of model 4 indicate firm size in this category (number of workers less than 300) also has negatively significant association with performance. This means that larger firms enjoy higher performance. Other significant variables are interaction terms of cooperation with subcontractors, distant buyers and firm size (FAC3xDI1 and FAC4xDI1, respectively). These two variables are positively significant ($p < 0.05$) related with performance. These imply Lao garment firms in this category have cooperation with subcontractors and buyers in distant markets improved performance. However, other variables remained the same as previous models' results (model 1, 2 and 3).

The results of the last model suggest consistent evidence with previous models (model 3 and 4) in terms of the relationship between firm size and performance. The clearest results from this model is that interaction term between cooperation with subcontractors and firm size has positively significant ($p < 0.001$) association with performance. More interesting, the coefficient of this interaction term is the highest one in our all results ($b = 0.86$). It is reasonable to note that large firms those have cooperation with subcontractors improved performance more than those large firms have not. On the other hand, larger firms cooperate with their subcontractors outperform those small firms cooperate with their subcontractors. Another interpretation of this result is firm size matter. Without control for firm size, large firms have more positive impact on the relationship between types of cooperation and performance. As has been seen in model 5, all types of cooperation have not statistically significant related with performance since we insert dummy large firm (number of employees less than 500) to the model. Regarding this evidence, it is our challenge for giving implication to policy makers and donors which will be placed in the last section of this paper.

6. Discussion and Conclusion

Our main aim is to identify the relationship between inter-firm cooperation (Note 7) and firm performance. Many existing previous studies concluded both vertical and horizontal cooperation matter for industrial clusters. The results seem to vary from country to country and case studies. Our empirical results confirm that firms have cooperation with subcontractors and business associations enjoy higher performance than firms those have not. More specifically, large firms which have number of employees between 100 and 500 workers show the highest performance in terms of cooperating with subcontractors. On the other words, SMEs which have number of employees less than 100 workers cooperate with business associations have higher performance than other sizes of firm and firms those have not cooperation with business associations. From what have been said so far, we need to interpret that inter-firm cooperation (linkage) with subcontractors and business associations are the bases for long-term sustainable development of industrial cluster of garment industry in Lao PDR.

As mentioned in the previous section, our analysis is to not only investigate the cooperation among firms within cluster, but also the cooperation among cluster member firms with outside agents such as distant suppliers and buyers. Our results suggest that firms have cooperation with distant buyers also outperform those firms have not. This result is similar to some previous studies that concluded the cooperation among cluster firms and buyers abroad is more effective than cooperation with local buyers. The main reason is foreign buyers have high capacity such as assets, technologies, know-how more than local buyers. Therefore, when cluster firms cooperate with those buyers, these capacities should be transferred to the firms in some levels.

According to our empirical results, we did not find any evidence to support the relationship between the cooperation with suppliers, other firms and performance. In terms of cooperation with suppliers, some previous evidences from other countries have already posited that cooperation with outside cluster suppliers does matter. Our results also support this argument. The reasons are that all suppliers of Lao garment firms are in different countries such as China (Note 8), India, Thailand etc. Almost Lao garment firms order input materials through the agents in Thailand (Note 9), which means Lao garment firms have indirect relationship with their suppliers. This might be one reason that cooperation between cluster firms and their suppliers have not influenced firm performance.

Surprisingly, the cooperation among Lao garment firms have no relationship with firm performance. This result seems to be unique compared with industrial clusters in other developing countries. Why is that, as we have discussed in previous section that the cooperation among Lao garment firms themselves is particular lower than other types of cooperation. As has been shown in table 2, there are two forms of cooperation (leading machinery and joint labor training) that have positive correlation with firm performance. Many informants pointed out that they are very busy with day-to-day survival and they have no time to cooperate with other firms in both informal and formal relationship. This information is likely to be one main reason reflected to our results.

In sum, several interesting results have been obtained regarding inter-firm cooperation and performance both among cluster members and outside agents. Inter-firm cooperation would be the predominant factors of the industrial cluster development in Lao PDR, specifically, in terms of cooperation with subcontractors and business associations' forms. Both types of cooperation were significant in the regressions of firm performance as well as cooperation with distant buyers. Firms that have cooperation with external economies (Note 10) have higher performance than firms that have not. However, we have lack of evidence to support the relationship between suppliers, other firms and firm performance in our sample.

As an industrial cluster provide employment for large numbers of people in developing countries, and have become significant exporters. Case studies highlighting the successes of developing country clusters in these respects have led to enthusiasm on the part of development practitioners about the prospects of clustering as a strategy to promote private sector development and reduce poverty. Regarding this, there are some policy implications to practitioners and policy makers as well as donors. Firstly, the development of SMEs is one important strategy that would lead to industrial cluster development due to the fact that subcontracting firm is SMEs. To promote SMEs (Note 11), business association

is a key actor in providing many kinds of support such as information, trade fairs as well as financial support. Secondly, linkage or cooperation among cluster members and outside agents are critical factor of industrial cluster development and these factors improve firm performance. Therefore, owners/managers should take the issue into account whether they do every things or every process by themselves or collaboration with others. Lastly, one problem of industrial development in Lao PDR, especially garment industry lacks of skilled human resources. Based on the information from many owners/managers of garment firms, the vocational schools in Lao PDR are somehow takes long time (Note 12). To provide a specific skilled labor to labor market (garment industry), policy makers should take this information into account and how to solve this problem for garment industry is one challenge for both policy makers and donors.

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Notes

- Note 1. Authors observed from two issues of journal *World Development* (Vol. 23, No. 1 (1995) and Vol. 27, No. 9 (1999)).
- Note 2. Lao garment industry started in 1990. There are 58 manufacturing firms and 55 branches and subcontractors which employ 27,000 workers in 2005. Lao garments export is the third industry after hydropower and mining industry.
- Note 3. Suppliers and customers in abroad.
- Note 4. Lead time has low correlation with other indicators
- Note 5. FAC5-1 includes exchange information and experience, machinery lending, joint training and joint import materials. While FAC5-2 includes joint order, joint product development and market cooperation.
- Note 6. Additive variables include control variables, dummy variable and interaction terms.
- Note 7. Not only cooperation with cluster members but also cooperation with outside agent such suppliers and buyers
- Note 8. China includes Hong Kong and Taiwan.
- Note 9. Many Lao garment firms have headquarter in Thailand [10] Subcontractors, Business associations and buyers
- Note 11. The situation of SMEs in Lao PDR, see Xayphone and Kimbara, 2007, 2008.
- Note 12. At least three years (Owners/managers interview).

Table 1. Empirical results of literature

Authors	The relationship between cooperation and performance				
	C&P1	C&P2	C&P3	C&P4	C&P5
Knorrige (1999)	√	√	√	-	√
Nadvi (1999a)	X	√	√	-	X
Rabellotti (1999)	√	-	X	√	√
Schmitz (1999)	√	√	-	√	√

Note: C&P1= Cooperation with Suppliers; C&P2= Cooperation with Subcontractors; C&P3= Cooperation with Buyers; C&P4= Cooperation with Other Firms; and C&P5= Cooperation with Business Associations.

√, X and - = Positively significant, not significant and not available, respectively.

Table 2. Inter-firm cooperation's behaviors

Typology of inter-firm cooperation	A lot (%)	A little (%)	Never (%)
<u>(1) Cooperation with suppliers</u>			
Exchange of information and experience	55.40	18.18	27.27
Negotiation of payment and delivery	45.50	20.45	34.09
Joint product development	50.00	27.27	22.73
Quality improvement	65.91	18.18	15.91
Speeding up delivery	59.09	22.73	18.18
<u>(2) Cooperation with subcontractors</u>			
Exchange of information and experience	56.82	18.18	27.27
Negotiation of payment and delivery	47.73	36.36	29.55
Technological upgrading	25.00	45.45	29.55
Quality control	63.64	25.00	11.36
Joint labour training	50.00	31.82	18.18
<u>(3) Cooperation with customers</u>			
Exchange of information and experience	54.55	25.00	20.45
Negotiation of payment and delivery	50.00	29.55	20.45
Technological upgrading	29.55	43.18	27.27
Quality control	68.18	20.45	11.36
Setting of product specification	72.73	20.45	06.82
Product management	50.00	36.36	13.64
<u>(4) Cooperation with other garment firms</u>			
Exchange of information and experience	54.55	15.91	29.55
Sharing order	09.09	84.09	06.82
Joint product development	20.45	50.00	29.55
Lending machine	65.91	20.45	13.64
Joint marketing	15.91	59.09	25.00
Joint labour training	47.73	43.18	09.09
Joint purchase of materials	09.09	79.55	11.36
<u>(5) Cooperation with institutions</u>			
Joint products exhibition in abroad	31.82	38.64	29.54
Joint products exhibition in local market	22.73	56.82	20.45
Accessing new markets	50.00	34.09	15.91
Training participation	65.91	09.09	25.00
Sharing information	70.45	11.36	18.18

Source: Authors' survey

Table 3. Correlation between inter-firm cooperation and performance

Typology of inter-firm cooperation	Strong Performer (Sales, %)	Poor Performer (Sales, %)	Kendall Correlation Coefficient	Sig. level
<u>Cooperation with Suppliers</u>				
Exchange of information and experience	59.1	4.5	0.203	0.151
Negotiation of payment and delivery	52.2	7.8	-0.115	0.411
Joint product development	56.9	2.3	0.163	0.246
Quality improvement	63.6	4.5	0.142	0.318
Speeding up delivery	54.3	6.8	0.020	0.885
<u>Cooperation with Subcontractors</u>				
Exchange of information and experience	59.1	4.5	0.393	0.005
Negotiation of payment and delivery	50.0	5.5	0.293	0.038
Technological upgrading	55.6	0.0	0.329	0.019
Quality control	60.0	6.8	0.396	0.006
Joint labour training	59.1	2.3	0.582	0.000
<u>Cooperation with Customers</u>				
Exchange of information and experience	63.6	4.5	0.518	0.000
Negotiation of payment and delivery	54.6	5.8	0.148	0.290
Technological upgrading	47.7	4.5	0.208	0.137
Quality control	65.9	5.8	0.407	0.004
Setting of product specification	63.6	5.8	0.530	0.000
Production management	56.8	2.3	0.422	0.003
<u>Cooperation with Other Garment Firms</u>				
Exchange of information and experience	61.3	4.5	0.157	0.266
Sharing order	13.6	2.3	0.122	0.402
Joint product development	38.6	0.0	0.127	0.368
Lending Machine	63.7	6.8	0.272	0.056
Joint Marketing	34.1	2.3	0.215	0.130
Joint labour training	50.0	2.3	0.412	0.004
Joint purchase of materials	15.9	0.0	0.117	0.417
<u>Cooperation with Institutions</u>				
Joint products exhibition in abroad	52.2	2.3	0.434	0.002
Joint products exhibition in local market	46.3	4.5	0.263	0.062
Accessing new markets	56.9	6.8	0.405	0.003
Training Participation	65.9	9.1	0.497	0.001
Sharing information	68.2	6.8	0.510	0.000

Source: Authors' survey

Table 4. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FAC1	-						
FAC2	0.07	-					
FAC3	0.61**	-0.08	-				
FAC4	0.34*	0.16	0.22	-			
FAC5-1	0.24	0.06	0.23	0.06	-		
FAC5-2	-0.03	0.02	-0.06	-0.01	0.19	-	
FAC6	0.55**	-0.11	0.23	0.17	0.29	0.12	-

** and * statistically significant at 1% and 5% level, respectively.

Table 5. Estimated of the relationship between inter-firm cooperation and performance

Explanatory variables	Models				
	(1)	(2)	(3)	(4)	(5)
FAC2	0.13	0.13	0.13	0.13	-0.07
FAC3	0.61***	0.61***	0.61***	0.61***	0.15
FAC4	0.21*	0.21*	0.21*	0.21*	0.15
FAC5-1	-0.06	0.10	0.10	0.10	0.11
FAC5-2	-0.04	0.00	0.00	0.00	-0.06
FAC6	0.30**	0.30**	0.30**	0.30**	0.25**
LOGFA		0.12			
LOGFS		0.25**			
Ds (less than 100 workers)			-0.20*		
FAC3xDs			0.14		
FAC4xDs			0.16		
FAC6xDs			0.25**		
DI1 (less than 300 workers)				-0.24**	
FAC3xDI1				0.32**	
FAC4xDI1				0.23**	
FAC6xDI1				0.12	
DI2 (less than 500 workers)					-0.23**
FAC3xDI2					0.86***
FAC4xDI2					0.11
FAC6xDI2					0.08
Adjusted R ²	0.422	0.422	0.455	0.422	0.509
df	6	1	1	1	1
Durbin-Watson	1.678	1.578	1.822	1.578	1.679
P-value	0.00	0.00	0.00	0.00	0.00

***, ** and * statistically significant at 1%, 5% and 10% level, respectively.

Variance Inflation Factor (VIF) of all variables vary from 1.00 to 3.78

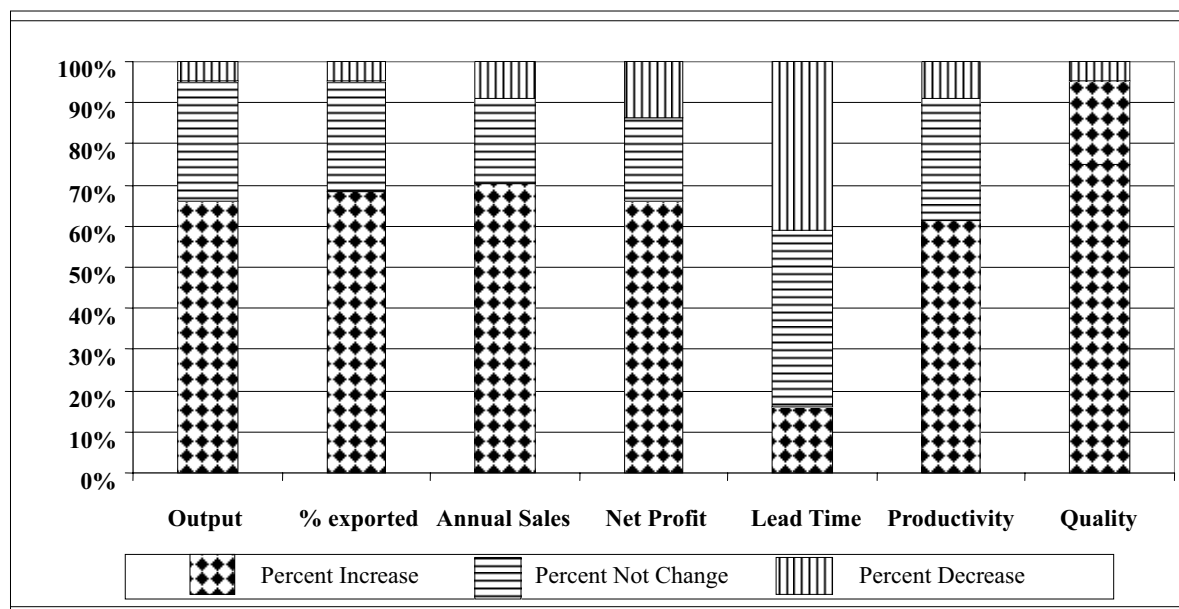


Figure 1. Performance improvement

Source: Authors' survey