# Factors Affecting the Performance of Enterprises within Lahore Knitwear Cluster in Pakistan

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## Abstract

There exists a clear gap in the industrial development literature which does not take into account the characteristics of individual enterprises and factors affecting their performance. Using primary data collected from 59 finished knitwear exporting enterprises from Lahore in Pakistan, this study examines the factors affecting the performance of enterprises within a cluster and their contribution to quality improvement stage of cluster. The key findings are that operational experience determines the size of enterprises and older enterprises are larger than the new ones; schooling and operational experience contributes to adoption of better production organization; operational and marketing experience helps in attaining an improved marketing channel. The policy implications emanating from the findings are: government and multilateral donor agencies may support the activities which nurture multifaceted innovations in technology and production organization; they may subsidize the provision of training in merchandizing and marketing so that producers can improve their marketing channels and directly connect to the global buyers for stable orders and save brokerage commission; provision of uninterrupted supply of electricity and gas to the knitwear cluster is indispensable as enterprises are facing this challenge and provision of public infrastructure is the key responsibility of the government to nurture modern industries. This study integrates research, industrial development strategy and policy for low income countries.

**Key Words: Human Capital, Global Value Chain, Multifaceted Innovations (Improvements in Production and Management), Production   Organization**

# 1      Introduction

The development of industrial clusters and the factors affecting the performance of enterprises within a cluster continues to puzzle the development economists. Specially, the performance of enterprises which participate in the global value chains is important as enterprises have to continuously improve their production organization and product for their survival (Sonobe and Otsuka 2006). Hence, a major question is that whether enterprises are successful in improving their performance within a cluster in Lahore, a major city of Pakistan. Here I investigate the factors impinging on the performance of enterprises and their contribution to quality improvement stage of the cluster.

Only a few cluster studies have been conducted in Pakistan on the surgical instrument cluster of Sialkot (Nadvi 1999; Thompson 2005); the cutlery cluster of Wazirabad (Nadvi 1996). These studies found that how clustered enterprises responded to international challenges and evaluated the growth trajectory of clusters, but they did not focus on the characteristics of entrepreneurs and the performance of enterprises. Recently, Arif and Sonobe (2011) examined the factors affecting the performance of enterprises in the electrical fittings cluster of Sargodha which caters to the domestic needs. However, hardly any attempt has been made to investigate the factors affecting the performance of enterprises within clusters catering to the export market in Pakistan. Moreover, knowledge about the innovative entrepreneurs operating in industrial clusters of Pakistan is very limited and not yet fully explored. Understanding the innovative strategies and performance of enterprises is important; Tokatli (2007) argues knowing enterprise strategies assists in better understanding of an industry. This study will address these gaps.

This paper presents the findings of a cluster study based on the field survey conducted in one of the low income countries, Pakistan. I collected primary data on the characteristics and performance of 59 exporting enterprises in a prosperous Lahore knitwear cluster in 2011. The history of a cluster is traced as it originated around 30 years ago with small and medium enterprises. The growth of this cluster took place as a result of endowment; policy and an external factor i.e. Multi-Fibre Agreement. The advent of the World Trade Organization (WTO) regime since 2005 has intensified competition in Pakistan in general, and for the knitwear cluster in particular. This competition forced the inefficient enterprise to leave the cluster; but the efficient enterprises survived in this competition and are growing fast and become larger over time.

Cut throat competition in the international knitwear industry has compelled the producers to reduce product prices, increase quality and significantly shorten delivery times (Saheed 2011). On the international front, knitwear enterprises within Lahore cluster face challenges of quality and price [1]. Recently, the knitwear enterprises of Lahore have suffered from the challenges of gas, electricity rate hikes and load shedding. These international and local challenges have forced the knitwear enterprises of Lahore to cut cost through various innovations such as improved production organization, enhancing production efficiency and aggressive marketing in search of higher prices of products.[2] This simply means that knitwear enterprises are bound to innovate under intensified competition.

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[1] All respondents highlighted this point during the 2011 cluster survey.
[2] Mr. Usman Jawad, President of the Pakistan Hosiery Manufacturers Association (PHMA) Lahore mentioned this point.

The growth of enterprises within the knitwear cluster of Lahore is a successful case of industrial development and a worth probing one as it corroborates the existing body of cluster-based development literature in a different context i.e. Pakistan. Moreover, the major findings are that the multifaceted innovations such as large enterprise size and production organization are carried out by highly educated entrepreneurs and associated with their relevant production experience. Such innovations are the dire need of local enterprises to survive and prosper in either the export markets or global value chains (Sonobe and Otsuka 2006). Moreover, another innovation i.e. direct marketing with the global buyers has been carried out through relevant operational and marketing experience. Hence, it is plausible to say that after acquiring operational experience entrepreneurs resort to direct marketing channel to get stable orders from the global buyers and save brokerage commission.

The rest of the paper is organized as follows: The next section reviews the literature and state testable hypotheses. Section 3 describes the setting of the Lahore knitwear cluster. Section 4 discusses the data collection and describes the statistics. Section 5 presents the empirics along with results. And Section 6 brings out conclusion and policy implications.

## 2       Literature Review and Testable Hypotheses

A variety of different concepts and definitions of industrial clusters are depicted in the literature of business economics, innovation studies and development economics. The literature broadly conceives of cluster's in a geographical and sectoral sense. For instance, Porter (1990) defines a cluster as a geographic concentration of interconnected companies and institutions in a particular field; Schmitz and Nadvi (1999) and Schmitz (1995) define a cluster as a sectoral and geographical concentration of firms. Rosenfield (1995) defines it as a loose, geographically bounded agglomeration of similar, related firms. Sonobe and Otsuka (2006) define an industrial cluster as a geographical concentration or localization of enterprises producing similar or closely related products in a small area. This study uses the definition advanced by Sonobe and Otsuka (2006).

The history of industrial cluster dates back to the classical economic analysis of Alfred Marshall in "Principles of Economics". Marshall (1920) points out that localization economies creates due to presence of pooling of labour, availability of industry specific non-tradable goods at lower cost and technological spillover. Krugman (1991) argues that the underlying forces of increasing returns to scale and demand of products are important for a manufacturing cluster. He further states that increasing returns to scale and demand of products minimizes the transaction cost; but he emphasizes that reduction in transportation cost realizes economies of scale in a manufacturing cluster. He further argues that localization of enterprises along with pooled labour generates efficiency gains in a cluster.

On the contrary, Sonobe and Otsuka (2006) argue that reduction in transaction cost among enterprises in the industrial cluster is more important than the transportation cost. They go on to argue that transaction cost rather than transportation cost in the industrial cluster enhances the development of the division of labour, and facilitate the transactions of intermediate goods and services among enterprises. They further call industrial cluster as an "artificially created" community to reduce transaction cost. Finally, Sonobe and Otsuka (2006) particularly argue that apart from division of labour between manufacturers and part suppliers, division of labour between manufacturers and merchants is also significantly

important in the industrial cluster as clusters attract traders because they provide wider choice of products and producers to the traders.

Innovations play a significant role in industrial clusters but these innovations are Schumpeterian in character. Schumpeter (1912) argues that industries develop through a series of innovations and imitations, where innovation is nothing but a new combination of productive resources to increase profit. Schumpeterian innovations encompass the introduction of a new product or a new quality of product; new production method, and organization, new market, and the discovery of new materials and entrepreneurs are the carriers of such innovations.

The concept of "multifaceted innovations" which is closely related to Schumpeterian innovations has been introduced by Sonobe and Otsuka (2006) based on the findings of eight cluster studies on garments, motorcycle, machine tools and low-voltage electric appliances in East Asia. The review of existing literature shows the presence of multifaceted innovations in various clusters. For instance, the major innovations in the low-voltage electric appliances cluster of China are the introduction of quality inspection and its own branding (Sonobe, Hu and Otsuka 2004). Similarly, enterprises in a footwear cluster in Ethiopia increase the direct procurement of raw materials and direct sales of products through brand names (Sonobe, Akoten and Otsuka 2009).

On the other hand,  Knorringa (1999) shows that enterprises adopt different marketing channels in Agra footwear cluster to get stable orders and command higher prices of products. Bazan and Naves-Aleman (2004) argue that the shoe manufacturers in Sinos Valley, Brazil, adopt major innovation in marketing through branding to other parts of Brazil and neighbouring countries. Nam, Sonobe and Otsuka (2010) show in the knitwear cluster of Vietnam, the innovations are the entry into the export market of village enterprises and adoption of vertical integration. Otsuka and Sonobe (2011) summarise the findings of 19 case studies of industrial clusters from Asia and Africa and re-name these multifaceted innovations as improvement in production and management (IPM).

Sonoba and Otsuka (2006) further argue that these innovations are attempted by highly educated producers. Despite the general significance of human capital, the existing literature seldom tries to identify who are those producers contributing to the cluster development through multifaceted innovations (Schmitz 1995; Nadvi 1999; Schmitz and Nadvi 1999; Schmitz 2006a). A notable exception is Sonobe and Otsuka (2006) who empirically examine the role of human capital in the development process of industrial clusters  (Sonobe, Hu and Otsuka 2002; Sonobe, Kawakami and Otsuka 2003; Sonobe and Otsuka 2006). They further argue that entrepreneurs cannot innovate if high-quality human resources are lacking, because in the absence of human capital the cost of innovation is too high.

The measurement of human capital is difficult; however, a suitable proxy use in the literature is the number of years of formal schooling which is basically the generic human capital not specifically related to business sector and production activities.  As information processing ability is important for the adoption of new ideas and technologies, generic human capital plays an important role in economic growth (Nelson and Phelps 1966; Romer 1986; Barro 1991; Grossman and Helpman 1994). Similarly, the specific human capital acquired by operating and marketing experience facilitates the transition from quantity expansion stage to quality improvement stage (Yamamura, Sonobe and Otsuka 2003; Sonobe and Otsuka 2006; Nam et al. 2010). This specific human capital is attained through related trade, business and specialized experience (Hackler and Mayer 2008).  Reliance on generic human capital

usually underplays the significance of specific human capital which is acquired through learning by doing (OECD 2000).

Sonoba and Otsuka (2006) argue that the successful and unsuccessful clusters are differentiated by the presence of "multifaceted innovation" and this reflects entry in a quality improvement stage. This stage is characterized partly by productivity gains of the enterprises due to exit of inefficient enterprises and partly by the adoption of improved production methods and high quality products of surviving enterprises. Another feather of this stage is the emergence of large enterprises which produce high quality differentiated products and start direct selling or exporting to the foreign buyers, and thus enter the global value chain (Appendix 1).

Sonobe, Akuten and Otsuka (2009) further argue that higher quality of differentiated products along with shorter delivery times has forced the producers in Ethiopia to adopt vertical integration. These vertically integrated enterprises are preferred by global buyers, as they can check the quality of products under one roof (Rana and Khan 2009). El-Haddad (2008) argues that producers of high quality garments possess a high degree of vertical integration to ensure timely delivery. So, specific human capital acquired by operational experience facilitate the adoption of vertically integrated enterprises in a knitwear cluster of Vietnam (Nam et al. 2010).

Schmitz (2006) argues it is more likely that foreign buyers purchase directly from a small number of capable producers who can supply a huge amount of quality products within short delivery times than buying from a large number of small producers or buying through their local agents from the standpoint of transaction cost. The entrepreneurs' prior marketing experience contributes to improving the direct transaction of local enterprises with the foreign buyers in garments clusters of China and Japan (Sonobe and Otsuka 2006). Some capable producers export directly to the foreign buyers, and thus directly connect to the global value chain. The opening of markets has increased the sourcing options of foreign buyers as they choose from a growing number of developing country producers. The number of sourcing countries of knitwear apparel and clothing (item code 61) to the US in 1995 was 139 and became 157 in 2009 (UN 2010). Similarly, the number of knitwear exporting countries (item code 61) to the EU-27 increased from 177 in 2000 to 185 in 2009 (UN 2010).

Based on the literature, the following hypotheses are proposed for this study:

*Hypothesis 1: Human capital has a direct and positive impact on the size of a firm within a Lahore cluster.*

*Hypothesis 2: Level of human capital contributes to the adoption of vertically integrated enterprises. i.e. production organization.*

*Hypothesis 3: Superior operational experience along with superior marketing ability acquired by prior marketing experience contributes to improved marketing channel of enterprises.*

## 3    The Setting: Lahore Knitwear Cluster

The share of knitwear of total exports of Pakistan was 9.3 % in 2010-11 (Table 1). The share of knitwear hovers around 8 % to 12 % from 1995 to 2011 in the total exports of Pakistan.

Specifically, the exports remained almost remain stagnant from 2005 to 2010 and jumped in 2011. Although, the knitwear exports increased from US $ 688.5 million in 1995 to $ 2305.55 million in 2011, yet the percentage share of knitwear in total exports slightly increased from 8.46 to 9.29 during the period (Table 1). The knitwear industry is the highest value-added sector and labour intensive in Pakistan (Memon 2010). Being a highly value added sector, it earned valuable foreign exchange per kilogram of cotton converted in finished garment for the country as reported by the Pakistan Hosiery Manufacturers Association (PHMA 2011).

Table 1: Exports and knitwear share of total exports

| Year | Total exports ($ million) | Knitwear exports ($ million) | Knitwear share of total exports (%) |
|---|---|---|---|
| 1995 | 8137.20 | 688.50 | 8.46 |
| 1996 | 8707.10 | 703.40 | 8.08 |
| 1997 | 8320.30 | 688.90 | 8.28 |
| 1998 | 8627.70 | 696.70 | 8.08 |
| 1999 | 7779.30 | 742.20 | 9.54 |
| 2000 | 8568.60 | 886.70 | 10.35 |
| 2001 | 9201.60 | 911.40 | 9.90 |
| 2002 | 9134.60 | 845.90 | 9.26 |
| 2003 | 11160.20 | 1146.70 | 10.27 |
| 2004 | 12313.30 | 1458.70 | 11.85 |
| 2005 | 14391.10 | 1635.00 | 11.36 |
| 2006 | 16451.20 | 1751.50 | 10.65 |
| 2007 | 16976.20 | 1798.50 | 10.59 |
| 2008 | 19052.30 | 1732.10 | 9.09 |
| 2009 | 17688.00 | 1714.90 | 9.70 |
| 2010 | 19290.00 | 1765.00 | 9.15 |
| 2011 | 24810.42 | 2305.55 | 9.29 |

Source: Trade Development Authority of Pakistan (2011)

The knitwear industry is mainly concentrated in four cities: Karachi, Lahore, Faisalabad and Sialkot. The knitwear cluster of Lahore is considered as the "home of Knitwear" (Memon 2010). Therefore, our study site was Lahore, the capital of the province of Punjab, the second largest and an industrialized city of Pakistan with a total land area of 404 km² (UNIDO 2006). The knitwear enterprises are located in the suburban areas across the city; however, most of the enterprises are located around Ferozpur Road, Kotlakhpat Industrial Estate and along the Defense road in a radius of 10 sq. km.

The knitwear cluster of Lahore started to evolve around 30 years ago and is still growing (UNIDO 2006). The cluster initiated through small enterprises and mainly caters for the low value-added products. In the beginning, the garments were sold in the domestic market so the quality requirements were not high, and outdated machinery was employed in the cluster (Rana and Khan 2009). However, the export of knitwear garments started from this cluster in 1987 through the Ammar textile company and the enterprise attracted many international labels to Pakistan and cluster connected to medium value added products (Rana and Khan

2009). This also supports the existing findings that foreign technologies spurt the development of cluster (Otsuka and Sonobe 2011). The major advancement in the Lahore knitwear cluster took place during the early 1990s when for the first time automatic and computerized knitting machines were introduced (UNIDO 2006).

The cluster began to expand and flourish in 1995 mainly owing to endowments such as availability of good quality raw material, machinery part suppliers, surplus labour and different government incentives including an export refinance facility, duty drawback and soft loans from commercial banks (UNIDO 2006). A contributing factor behind the growth of cluster was the Multi-Fibre Agreement which gave access to the North American market, and local manufacturers enjoyed huge margins as foreign buyers were bound to purchase from them until 2004 (Rana and Khan 2009).

Another contributing factor to the growth of the cluster was the policies pursued by successive governments during the 1990s and early 2000. The government pursued various schemes including export refinance facility, sales tax refund, duty drawback and soft loans introduced by commercial banks (UNIDO 2006). Finally, the growth of the cluster also took place due to the external factor i.e. the Multi-Fibre Agreement as  this agreement gave access of knitwear garments to the North American market (Rana and Khan 2009). The local manufacturers enjoyed stable orders and huge margins as foreign buyers were bound to purchase from them until 2004 (Rana and Khan 2009). Moreover, the cluster expanded and grew very fast as a result of stable orders and prices from the foreign buyers by the turn of this century.


The cluster experienced an external shock in 2005 with the advent of the WTO regime. The facility of quota under the Multi-Fibre Agreement expired, and the enterprises were exposed to fluctuating international markets. A chunk of manufacturers invested in the latest machinery because of prevalent low interest rates during 2001-05 on the presumption that they would obtain stable orders even in the quota-free regime. However, most of the leveraged enterprises closed down after 2005 owing to inefficiencies that arise out of lack of management and training of the labour force and organization methods  (Rana and Khan 2009). The record of the Pakistan Hosiery Manufacturers' Association (PHMA) shows that 47 units closed by November 2007, as there were 126 exporters in 2005; 15 of the closed enterprises were vertically integrated ones. The closure of these vertically integrated enterprises paved the way for 'cut to pack' ones- which carry out operations from cutting to packing and are called garment making enterprises and being new entrants they are smaller in size. The process flow of vertically integrated and a 'cut to pack' enterprise are depicted in Appendix 2.

The presence of these vertically integrated enterprises were the result of lack of development of knitwear fabric suppliers in late 1980s and unwillingness of suppliers to invest in knitting and dyeing at that time  (Rana and Khan 2009). This also confirmed that in the initiation stage entrepreneurs have to procure and sell the final products directly to the buyers. Being a mature cluster, the Lahore knitwear cluster has already passed through the initial and quantity expansion stages of cluster development. It is also evident that the abolition of the quota regime under the WTO has increased global competition among the producers to reduce prices, shorten delivery times and ensure strict quality as demanded by foreign buyers since 2005 (Rana and Khan 2009). Such cut-throat competition has compelled the knitwear producers to adopt multifaceted innovations to enter the quality improvement stage.

## 4        Data and Descriptive Statistics

An enterprise level survey was conducted from September to November 2011 to collect detailed financial and non-financial information for a sample of 59 finished knitwear manufacturing enterprises in the Lahore knitwear cluster.  Annual exports from the cluster were estimated around $ 430 million in 2010-11 (Table 2). The cluster mainly produces men products;  polo t-shirts, hoods, sweat shirts,  crew neck, jackets in large quantities, while similar women and children products in small quantities along with trousers and shorts. Moreover, the cluster produces and exports various kinds of sports, dress and medical socks. The details of the cluster are given in Table 2

Table 2: Highlights of the Lahore knitwear cluster in 2011

| Exports | $ 430 Million approx. |
|---|---|
| Cluster Structure | 85 exporters 190 subcontractors |
| Direct Employment | 35000 approx. |
| In- direct Employment | 10000 approx. |
| Main Markets | US, EU |
| Competitive Advantage | High quality raw material and cheap labour |
| Key Challenge | Electricity and gas load shedding |

Source: The 2011 cluster survey

There were around 85 finished garment exporting enterprises operating in the Lahore cluster along with 190 sub-contractors who either cater for domestic market or for the exporting enterprises. Of the exporting enterprises, 25 were vertically integrated while the rest were 'cut to pack'. The oldest existing enterprise in the cluster was established in 1987. The enterprises were selected through a random sampling procedure, but I just observe the surviving enterprises so there may be a selection issue and I cannot do Heckman selection because of cross sectional sample. The population was 85, as 81 enterprises were registered with (PHMA) and four with the Pakistan Readymade Garments and Exporters Association (PRGMEA). Of 85, 60 enterprises produced finished knitwear garments and 21 produced socks, while two enterprises manufactured sweaters and gloves respectively.

The knitwear cluster created direct and indirect employment as shown in the Table 2. It all together generated 45000 jobs which manifested a high potential of labour intensive sector. The major markets of cluster products were the United States and the European Union. The competitive advantage of the cluster was the presence of high quality raw material and availability of cheap labour. The key challenges were the frequent electricity and gas load shedding which were creating difficulties for the enterprises to meet the strict deadlines. The cluster also formed voluntarily by private enterprises without much assistance from the government: (The 2011 cluster survey).

Although both garment and socks producers fall into the knitwear sector, the production processes are quite different. There are four main stages of finished garment production namely knitting, dyeing, cutting and stitching. The standard method for knitting fabrics is to run a circular knitting machine loaded with yarn to produce fabrics, while the standard method for making garments from fabrics is to use an assembly line of sewing machines and operators. On the other hand, sock production also follows four main stages: sock knitting, toe linking/over-locking, bleaching/dying and finishing. As the process flows, machinery and production of finished garments, socks, gloves and sweaters are different so the cluster

survey focused on finished knitwear garments and omitted the others owing to their small population and different process details. The small sample size of 21 sock manufacturing enterprises did not allow regression analysis and comparison with results for finished garment producers. Moreover, one of the finished garment producing entrepreneurs refused to provide information so the sample size is 59.

A structured and purpose-designed questionnaire was completed for each enterprise through direct interview either with the entrepreneur or with the general manager. Since specific information was sought on each enterprise's marketing channel, key individuals in merchandizing department were approached. It is important to mention here that an effort was made to examine the quality improvement stage of the cluster so data was collected from all leading finished garment producers. The information on entrepreneurs' years of schooling, age, prior marketing experience, years of operation, spin off, prior occupation and family business was collected in the 2011 cluster survey.

Table 3 presents the data on the characteristics of the entrepreneurs in the sample. The average number of years of schooling of entrepreneurs was 15.4 which contribute to determine the size of enterprises. Entrepreneurs had an average of 2.3 years of prior marketing experience before they established the enterprise. Similarly, the average year of operation of sample enterprises was 11.2, which play an important role in the development of cluster through the introduction of innovation and were consistent with hypothesis 1 and 2. The number of spin off-entrepreneurs were the workers in the other enterprises, was 39 which is approximately 66 % of the sample. Of the 59 entrepreneurs, 15 were the merchants which were 25 % of the total sample, so moderate percentage of merchants was present in the total sample. So this moderate percentage supported the finding that knitwear garment is merchant led industry (Sonobe and Otsuka 2006).

Most of the enterprises in the cluster were managed by entrepreneurs solely, while a few were managed through association of persons. Approximately 40 % and 30 % of the entrepreneurs were executives and merchants respectively either in the existing enterprises or in the enterprises which have been closed. Moreover, 20 % and 10 % of the entrepreneurs moved to this cluster through other businesses and family connection respectively. Among the entrepreneurs, approximately 75 % graduated after finishing 16 years of education, while 23 % of the total finished 14 years. This reflects a very high level of human capital in comparison with the existing literature of cluster development.

Specifically, the findings of 19 case studies across Asia and Africa revealed that the maximum average years of schooling of entrepreneurs among the selected cases was 15.1 (Otsuka and Sonobe 2011). Interestingly, 36 % of the entrepreneurs were production executives before setting up their own enterprise and it became a dominant category in the sample. Around 14 % of the entrepreneurs took up the business from their founding fathers. The cluster survey also shows that the sons of the founding fathers obtained higher education from abroad than did their fathers. Around 25 % of entrepreneurs became owners by moving from other businesses because of existence of buying houses.

Table 3: Characteristics of sample entrepreneurs before the establishment of enterprise

| | |
|---|---|
| Average number of years of schooling | 15.4 |
| Average years of Prior marketing experience | 2.3 |
| Average years of operation | 11.2 |
| Average age of entrepreneurs in 2011 | 46.3 |

| | |
|---|---|
| Number of spin off | 39 |
| Merchants | 15 |
| Production executive | 21 |
| Family business | 8 |
| Others | 15 |
| Number of enterprises | 59 |

Source: The 2011 cluster survey

Table 4 shows the distribution of marketing channel of sample enterprises. The composition shows that around 15 % of sample enterprises directly sold their products to the global buyers mainly located in the United State and the European Union; 52 % of enterprises sold their products through buying houses, located in Lahore. One of respondents reported that they compete with just five international competitors when global buyers place orders with the developing countries' suppliers and this is consistent from the point of view of transaction cost as argued by Schmitz (2006). The respondents reported long-term relations with the buying houses. These relationships may be called "putting out" arrangements as the term coined by Sonobe and Otsuka (2006). In these arrangements, designing, marketing and procurement instructions are given by merchants or "putters" while manufacturing is performed by the enterprises. These putters brought samples to local enterprises for replication purposes. Hence, enterprises depend on these putters for sampling, product development and marketing information.

The local knitwear producers are encouraged to export directly to global buyers as direct exports command higher prices, stable export orders and eliminate the intermediate channel of local or foreign buying houses, hence saving the brokerage's commission. The enterprises did depend either on local buying houses or foreign buying houses for obtaining and executing their orders. So 33 % of enterprises transacted either directly or indirectly through buying houses. Most of the respondents reported that they diversify their marketing strategy in order to overcome the uncertainty associated with the orders given to them by global buyers. These figures are consistent with the Hypothesis 2. The marketing channels are depicted in Appendix 3.

Table 4: Marketing channel of sample enterprises

| Direct transaction | Transaction through buying houses | Transaction directly and also through buying houses |
|---|---|---|
| 9 | 31 | 19 |

Source: The 2011 cluster survey

The Table 5 further breaks down the marketing channels of enterprises on the basis of years of operation. The vertical columns show the modes of transaction, years of operation and overall average percentages. The years of operation have been sub-categorized in three: 0- 5 years, 6 to 14 years and more than 15 years. The horizontal rows are divided in three: percentage of direct transaction of enterprises with the global buyers of the total sample; percentage of enterprises transacting either through directly or through buying houses of the total sample; percentage of transaction through buying houses of total sample.

The enterprises up to five years of operation were new and only 1.6 % of the total sample transacted directly with the global buyers for orders. In this sub-category, 8.5 % of the total enterprises either transacted directly or through the buying houses. Moreover, 22 % of the

total sample transacted solely through the buying houses. These percentages reflect that new enterprises mainly depended on buying houses to executive their orders, followed by a mixed mode of direct transaction and buying houses and direct transaction respectively. The second sub-category of enterprises from 6 to 14 years of experience manifests the same pattern of transaction with much higher percentages than the new enterprises. In this sub-category, 20.3 % of the total enterprises executed their orders through buying houses, followed by 11.9 % through mixed modes and only 3.4 % directly connected to global buyers.

The third sub-category with 15+ years of experience marked a different pattern of transaction from the other two sub-categories. In this sub-category, 10.2 % of the sample enterprises transacted directly and through buying houses each, while 11.9 % of the total enterprises exploited the mixed modes of transaction. These percentages show that the sub-category of the oldest enterprises adopted more direct marketing channels than the other two sub-categories. The last column of Table 5 shows the overall average percentages by summing up the years of operation of enterprises. More than half which is 52.5 % of the total sample enterprises solely dependent on the buying houses to execute their orders. Only 15.3 % of the total enterprises directly transacted with the global buyers to by-pass the intermediate channel of buying houses, while 32.2 % of the total sample adopted a mixed mode of transaction to execute their orders.

On my inquiry to respondents about the adoption of direct transaction with the global buyers, they reported that their profitability was better than the counter enterprises due to savings of brokerage commission. They further reported that direct transaction assisted in better understanding the aspirations and requirements of the global buyers. On my further inquiry about mixed modes of transaction, the respondents confirmed the adoption of the strategy to minimize risk by invoking buying houses under intensified global competition. If the overall average percentages of Table 5 are combined with the presence of merchants which constituted 25 % of the total sample, the Hypothesis 3 is supported that operational and marketing experience help in attaining improved marketing channel.

Table 5: Percentages of marketing channels by years of operation of sample enterprises in 2011

| Modes of Transaction | Years of operation | | | Overall average percentages |
|---|---|---|---|---|
| | 0-5 years | 6 to 14 years | 15+ | |
| % of Direct transaction of total sample | 1.6 | 3.4 | 10.2 | 15.3 |
| % of Direct transaction through buying houses of total sample (Mixed Mode) | 8.5 | 11.9 | 11.9 | 32.2 |
| % of Transaction through buying house of total sample | 22 | 20.3 | 10.2 | 52.5 |

Source:  The 2011 cluster survey

## 5      Empirics

To test the hypotheses of Section 2, I examine the determinants of three dependent variables: (i) enterprise size through value added and sales, (ii) vertical integration of enterprise through a binary response variable and (iii) fraction of sales revenue from direct marketing through censoring. Thus, the regression equation would be of the following form:

$$Y_i = X_i\,\alpha_i + e_i$$

Where Y is the vector of the dependent variables including value added, sales, binary response variable and censoring. α is the vector of parameters consisting of years of schooling, operational experience, spin-off dummy, prior years of marketing experience and father's dummy to be estimated, and e is an error term.

To test the validity of Hypothesis 1, I use a cluster based industrial development model and estimate the regression function that determines the enterprise size. If the variables representing general and specific human capital are found to be significant, it will positively affect the enterprise size. I measure the size of enterprise in three different ways. The first measure is the sales revenue which is widely used by researchers to determine the size of enterprise. I regress sales revenue on the vector of parameters stated above. Here the father dummy variable takes a value of 1 if the father of entrepreneur was in knitwear business and 0 otherwise. Similarly, a dummy variable is created that takes a value of 1 if the entrepreneurs work in the knitwear enterprises before and 0 otherwise. By employing the first measure, I get a slightly significant schooling coefficient and highly significant years of operation of enterprises which is specific human capital coefficient. The other variables remain insignificant for this regression. To address the problem of hetroskedasticity in the sample, I employ the heteroskedasticity consistent standard errors proposed by White (1980).

The second measure for the enterprise size is the value added without subtracting the subcontracting cost. In the definition of value added here, I subtract raw material cost and input costs from the sales revenue. The results show that general human capital is significant at around the 6 % level and specific human capital is highly significant while the rest of variables remain insignificant. This is consistent with Hypothesis 1. The third measure to determine the enterprise size is value added less the subcontracting cost. In this definition of value added, I subtract raw material cost, intermediate input cost and subcontracting cost from the sales revenue. The coefficient of general human capital is significant at the 5.4 % level and specific human capital is highly significant. The remaining coefficients remain insignificant. The results are again consistent with Hypothesis 1. So the results are robust for three definitions of enterprise size and are shown in Table 6

Table 6: Determine the enterprise size

| 2010-11 | ln(Value Add) | ln(Sales) | ln(Value Add)* |
|---|---|---|---|
| Years of schooling | 3.906473 (2.048058) · | 4.349980 (2.144780)* | 4.070401 (2.085968) · |
| Operational experience | 1.0612 (0.207180) ** | 1.1322 (0.217223 )** | 1.08452(0.21329)** |
| Spin off dummy | -0.200109 (0.431106) | -0.210813 (0.432494) | -0.197078 (0.437099) |
| Prior years of marketing experience | -0.025995 (0.029759) | -0.031837 (0.030423) | -0.027841 (0.030168) |
| Father 's dummy | 0.179083 (0.439146) | 0.238634 (0.448712) | 0.200294 (0.444754) |

| | | | |
|---|---|---|---|
| Constant | 5.378660  (5.792898) | 4.914040 (6.042342   ) | 4.745984  (5.899557) |
| R-square | 0.5527 | 0.5801 | 0.5589 |
| No. of enterprises | 59 | 59 | 59 |

Notes: Figures in parentheses are standard errors. . Significant at 10 % * Significant at 5 % and ** significant at 1 %

Value Added:  Sales - Raw Material Cost - Intermediate input cost
Value Added *: Sales-Raw Material Cost- Intermediate input cost-subcontracting cost

The variable that is highly significant in all these models is operational experience.  This implies that operational experience matters in determining the enterprises size. Enterprises grow larger over time and specifically former enterprises are larger than the new enterprises. It further implies that larger enterprises survive in difficult times and absorb the external shocks. The slight significance of schooling coefficient in the two measures of enterprises size shows that higher education of entrepreneurs matters less than the operational experience in determining the size of enterprise.

To test the validity of Hypothesis 2, I regress the vertically integrated enterprise on the vector of parameters stated above. Here the vertically integrated enterprises are those which conduct all operations under one roof as discussed earlier and shown in Appendix 3. So the vertically integrated enterprises will take value 1 while the cut-to- pack ones will take the value 0 because they carry out a few operations within their premises. Since it becomes a binary response variable, I employ Probit estimator to estimate the function explaining vertical integration. Again, the result shows that highly educated entrepreneurs and years of operation positively and significantly affect vertical integration. This lends support to the Hypothesis 2 that general and specific human capital plays a positive and significant role in adoption of vertical integration enterprise. Moreover, the result shows that prior marketing experience is not significant in adoption of vertical integration enterprise along with father's dummy and spin- off dummy. The results are shown in Table 7

Table 7: Vertical integration of enterprise

| 2010-11 | Estimates |
|---|---|
| Years of schooling | 0.69102  (0.34403)* |
| Operational experience | 0.10334  (0.04532)* |
| Spin off dummy | -0.19256 (0.64063) |
| Prior years of marketing experience | -1.24200  (121.263) |
| Father's dummy | 0.86494   (0.58987) |
| Constant | -12.44671 (5.57107)* |
| Residual deviance | 29.786 |
| Number of Fishing Scoring iterations | 19 |
| No. of enterprises | 59 |

Notes: Figures in parentheses are standard errors. * Significant at 5 % and ** significant at 1 %

Again the positive significance of years of schooling shows that highly educated entrepreneurs prefer to adopt a multifaceted innovation i.e. production organization. This further implies that education helps in attaining a production system which reduces the

logistic problems associated with cut-to-pack enterprises. Moreover, the statistical significance of operational experience also shows that learning by doing assists in enhancing the adoption of technology.

To test the validity of Hypothesis 3, I regress the direct transaction ratio on vector of parameters stated above. Since the direct transaction ratio is limited between 0 and 1, I cannot employ OLS, and have to use the two limit Tobit estimator in estimating the function explaining direct transaction ratio. The result supports the Hypothesis 3 that operational experience and prior marketing experience are positive and significant. Finally, the father's dummy remained insignificant which shows that having a father in the knitwear business do not have any effect in acquiring improved marketing channel. The results are shown in Table 8

Table 8: Improved marketing channel

| 2010-11 | Estimates |
|---|---|
| Years of schooling | -0.06006    (0.11356 ) |
| Operational experience | 0.04950    (0.02133) * |
| Spin off dummy | -0.07411    (0.28850) |
| Prior years of marketing experience | 0.07438    (0.02798) ** |
| Father's dummy | 0.02301    (0.27892) |
| Log Sigma | -0.44016 (0.15297) ** |
| Constant | 0.30937    (1.78378) |
| Newton Raphson Maximization | 8 iterations |
| Log-likelihood | -47.39039 on 8 Degrees of freedom |
| No. of enterprises | 59 |

Notes: Figures in parentheses are standard errors. * Significant at 5 % and ** significant at 1 %

The positive statistical significance of operational experience implies that older enterprises have attained operational excellence and subsequently they prefer to improve their marketing channel i.e. direct transaction with the foreign buyers to save brokerage commission and obtain stable orders. Interestingly, specific operational experience has played a statistically significant role in adoption of improved marketing channel which is different from the findings of Sonobe and Otsuka (2006). Specifically, prior marketing experience in merchandizing is highly significant which shows entrepreneurs with prior marketing experience are in a better position to adopt improved marketing channel due to their expertises.

## 6        Conclusion and Policy Implications

This paper has investigated the factors impinging on the performance of enterprises within a given cluster; that of knitwear in Lahore, Pakistan.  With regard to factors affecting the performance of enterprises within the cluster, the findings are: operational experience determines the size of enterprises and older enterprises are larger than new ones; schooling and operational experience contributes to adoption of better production organization; operational and marketing experience helps in attaining an improved marketing channel. Hence, it is plausible to say that after acquiring operational experience entrepreneurs resort to direct marketing channel to get stable orders from the global buyers and save brokerage commission.

Keeping in view the employment and export potential of the Lahore knitwear cluster, the policy implications emanating from the findings of this paper are consistent with the industrial development strategy for low income countries proposed by Otsuka and Sonobe (2011). The strategy to promote industrialization in low income countries should be entrepreneurial-led and government-assisted (Otsuka and Sonobe 2011). Based on the findings of research, the policy implications include: government and multilateral donor agencies may support the activities which nurture multifaceted innovations in technology and production organization to sustain quality improvement; donors may subsidize the provision of trainings in merchandizing and marketing so that innovative producers can directly connect to the global buyers and save brokerage commission; provision of uninterrupted supply of electricity and gas to the Lahore knitwear cluster is indispensable as enterprises have to meet the strict time deadlines of global buyers, and  investment in social infrastructure such as roads, electricity, gas and communication systems assist in nurturing modern industries (Otsuka and Sonobe 2011).

Finally, the findings here corroborate to the existing body of knowledge on enterprise performance within a cluster that the results from Lahore may extend to other locations. Caveats to generalising the findings from this case study include: this is a cross sectional study and a pool cross sectional study is recommended to observe the performance of enterprises over time in order to understand the dynamics of cluster; another requirement is the understanding of local socio-economic environment; there may be a selection issue as the study observed the surviving enterprises and cannot do Heckman correction due to cross sectional sample.

Appendix 1: Endogenous model of cluster based industrial development

| Stage | Prior experience of entrepreneurs | Education level | Imitation, innovation and productivity growth | Institutions |
|---|---|---|---|---|
| Initiation | Merchants/Engineers | Low | Imitate Foreign Technology directly or indirectly | Internal Production of parts, components and final products |
| Quantity Expansion | Spin-off and entry from various fields | Mixed | Imitate imitated technology: stagnant productivity and declining profitability | Market transaction; Division of labor; Formation of industrial cluster |
| Quality Improvement | Second generation of founders and newcomers with new ideas | Very High | Multi-faceted Innovations; Exit of many enterprises; Increasing Productivity | Reputation and brand names; Direct transaction with buyers; Vertical Integration and Emergence of Large enterprises |

Source: Sonobe and Otsuka (2006)

Appendix 2: Vertically integrated and cut-to-pack enterprises and process flow of knitwear
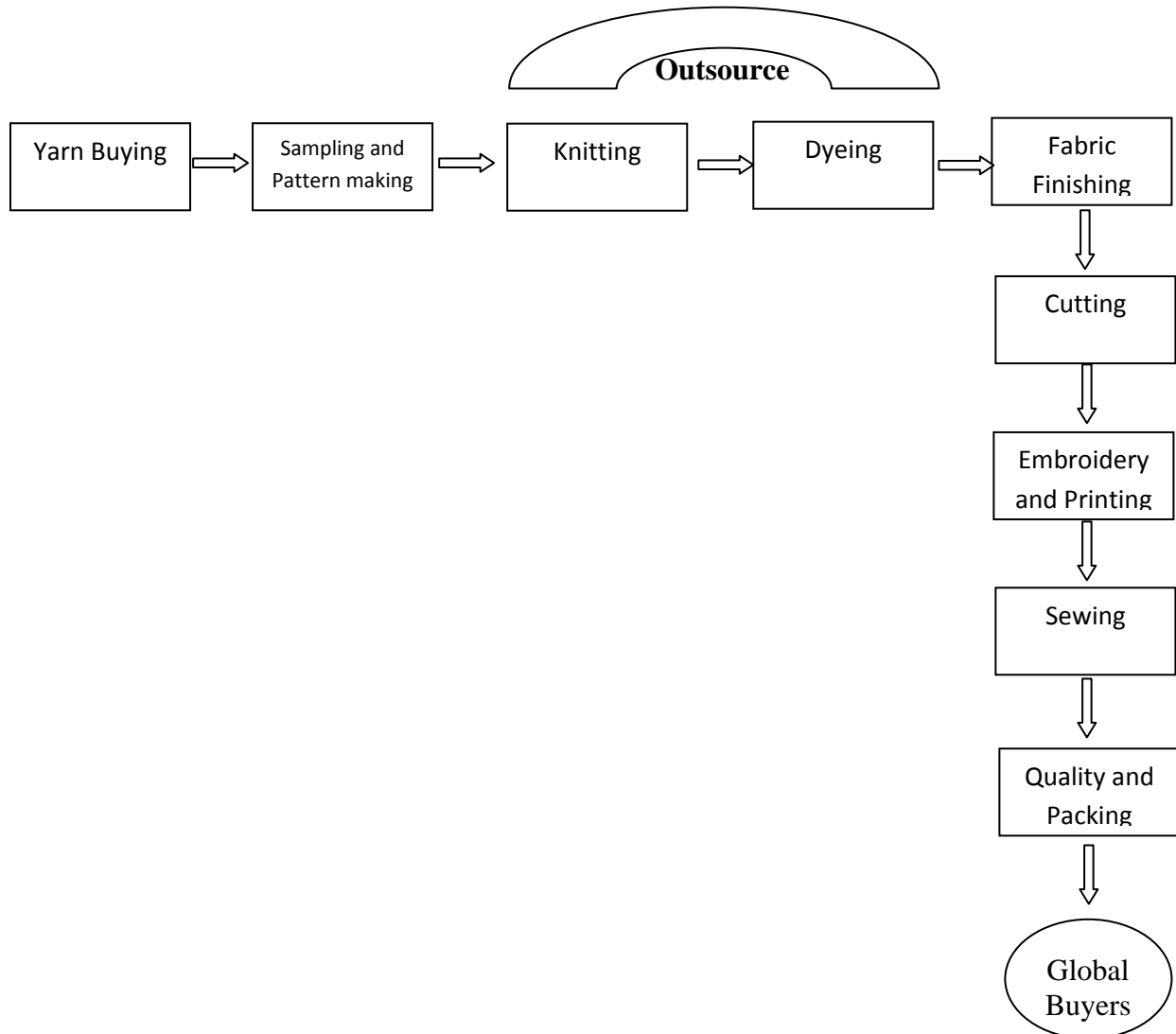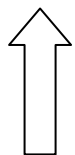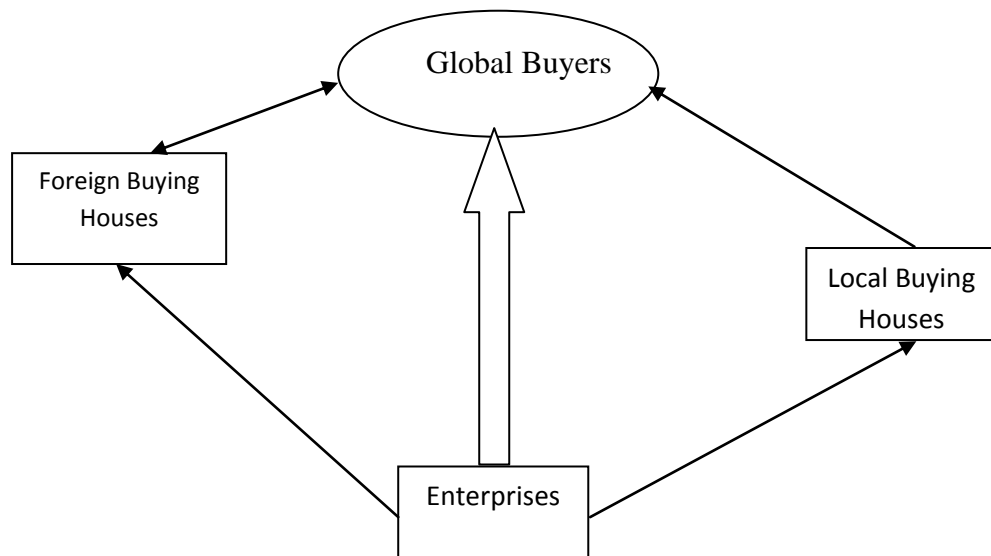


Notes: Vertically Integrated Enterprise: All operations from yarn buying to shipment with minor outsourcing

Cut- to- pack Enterprise: Outsource knitting and dyeing operations and perform the rest

Source: The 2011 cluster survey

Appendix 3: Marketing Channels



This arrow represents direct transaction among enterprises and the global buyers

This arrow shows the relationship between local and foreign buying houses as they work on the behalf of global buyers.

Source: The 2011 cluster survey

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