WOOD PROCESSING IN GHANA

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1 Introduction

The development and promotion of a productive, competitive and sustainable industrial and manufacturing sector remain at the heart of the structural transformation agenda of several governments in developing countries. Many African economies are still heavily dependent on the production and export of primary products and consequently suffer from the associated risks of this dependence. The challenge facing Ghana, as with many other African countries, is the need to transform the economy from a resource-dependent one to a dynamic, diversified industrial economy. Incidentally, the SDGs suggest how to grow good jobs. Goal 9 sets as an objective to ‘by 2030, significantly raise industry’s (manufacturing’s) share of employment and gross domestic product’. The industry is prioritized because it is a high productivity sector capable of absorbing large numbers of moderately skilled workers.

The industrial and manufacturing sector has the potential of creating a large number of jobs for moderately skilled workers and offering living wages. This has been noted in the literature as an important mechanism for poverty alleviation as well as a vehicle for sustained economic growth and development. Value addition to primary commodities is expected to reduce the vulnerabilities of emerging economies to global commodities’ price shocks. To this end, governments have pursued various policies and strategies to boost the productivity and competitiveness of the industrial sector domestically and globally. These strategies have achieved mixed results due to a variety of factors including the lack of access to markets and credit, poor infrastructural base and unreliable supply of raw materials and manpower. These challenges are exacerbated by the difficulties in choosing an appropriate site for a firm.

Agglomeration happens to be an important solution that has been widely explored. It simply refers to the geographical clustering of firms and this has causal effects on cost, productivity or profits. The mechanisms central to the theory of agglomeration include factors such as spillovers (diffusing of innovations to other enterprises) and externalities (North, 1973).

An essential component of industrial policies in developing countries has focused on reducing the difficulties in locating manufacturing enterprises. Schmitz (1992) and Rogerson (2001) suggest that enterprise development in Africa is constrained by the lack of inter-firm cooperation and the absence of geographical proximity between firms. Industrial development policies have therefore paid attention to the creation of special industrial zones as a means of promoting inter-firm networking and promote, especially, the growth of small and medium scale manufacturing industries. Such industrial estates were to provide essential ancillary services that are expected to reduce the cost of production of firms operating within such zones. Such industrial zones or clusters are to provide a network of nodes and links between firms that will hasten the diffusion of knowledge, technology and promote innovations.

Clusters have been defined severally in the literature of the economics of industrial organizations. For instance, Tan (2006) defines an industrial cluster as “a territorial system of small and medium-sized firms, with spatially concentrated networks; often using flexible production technology and characterized by extensive local inter-firm linkages. Conversely, Porter (1998) defined a cluster as “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. These definitions highlight two main characteristics of industrial clusters. First, clusters involve geographically proximate firms, producing related goods. Second, clusters involve inter-firm networks that facilitate the exchange of knowledge and technology. The geographical proximity of enterprises may accrue benefits that may be unavailable to dispersed enterprises (McCormick, 1999). The definitions further highlight the fact that the
benefits to spatial agglomeration are maximized when the firms are operating in related industries, especially in developing countries.

McCormick (1999) identifies three channels through which industrial clusters affect the growth and performance of firms. First, firms operating within geographical proximity of one other create efficiency that leads to comparative advantages for firms. Second, clusters facilitate the growth of small firms through the diffusion of technology and knowledge. Lastly, closely related firms are able to respond to opportunities and risks collectively. The co-location of related firms and institutions within a cluster creates agglomeration effects that lead to low transaction costs, stimulate productivity and generate technology spillovers. The localization economies bestowed by clustering arises primarily from firms sharing networks and information such as suppliers, customers, and infrastructure (Rogerson, 2001). According to Cahiels and Romijn (2003), clustering helps firms to innovate and accumulate knowledge and technological capabilities. The advantages derived from industrial clusters create specialized and competitive firms as well as serving as an attraction for foreign direct investments.

The use of clustering as an industrial development strategy has gained attention in the economic literature. Such studies have focused on the experiences of the newly industrialized countries of South-East Asia and Latin America. The evidence from such empirical studies suggests that clusters serve as engines of local economic growth and hubs for innovations. The success of industrial clusters in the newly industrialized countries has convinced governments and international development agencies to promote clustering as an effective policy for small and medium enterprise (SME) and private sector development (Altenburg and Meyer-Stamer, 1999). Indeed, Rodriguez-Clare (2007) argues that developing countries should focus on industrial policies that promote the development of industrial clusters with high agglomeration economies potential rather than policies that lead to price distortions.

The focus of this study is to examine the potential of industrial clusters as a policy to promote industrial development in developing countries. To this end, the study aims to assess the growth potential of industry and firms in Ghana located in clusters. Using the wood processing cluster in Kumasi as a case study, this paper seeks to answer the following questions:

i) How does the structure of the cluster affect firm performance and what are the various forms of local inter-organizational collaborative interaction?

ii) How do firms upgrade (processes and products)?

iii) How do firms in the cluster create knowledge and how does knowledge transmission occur within the cluster?

iv) How can knowledge and technology be put to work to generate competitiveness?

v) What institutional support and policy interventions exist and how effective have they been in driving competitiveness of the clusters?

2 Literature review

Consistently, studies find positive effects of industrial clustering on firm performance, employment generation and knowledge creation (Marshall, 1920; Gilbert et al., 2009; McCann and Folta., 2011 and Delgado et al., 2014). The results of these studies suggest spatial agglomeration of firms as an effective strategy for industrial development. Particularly, industrial clusters facilitate innovations, fosters regional economic development through the creation of channels for learning and the diffusion of knowledge and creates intricate relationships of cooperation and competition between firms (Lee, 2009; Morosini, 2003; Dahl and Pedersen, 2004). Policy makers in less developed economies have tried to emulate the successes of industrial clusters in developed economies (OECD, 1999). However, Davenport
(2005) cautions against a one size fits all approach towards industrial clusters as this may be inappropriate. Rather country specific strategies towards the development of industrial clusters is more relevant to the development agenda of these countries.

As a development strategy, clusters provide a system of networks that facilitate co-operation between firms within production processes and value chains. Such co-operation results in collective learning (Belusi, 1999) and the inter-firm transmission of tacit knowledge through social capital which enables clustered firms to achieve synergies and leverage economic advantages from shared resources (Enright and Roberts, 2000; Dahl and Pedersen, 2004). The structure of industrial clusters involves two characteristics of the spatial agglomeration of firms. The first strand involves the degree of concentration of firms in terms of commonalities in production processes and technology use. Zhao et al (2009) identified two types of industrial clusters – vertically integrated and horizontally integrated clusters. Vertically integrated clusters are made up of industries that are linked through producer-consumer relationships. Horizontally integrated clusters include industries which might share a common market for the end-products, common technology, similar skilled labor and natural resources.

Steinle and Schiele (2002) identified both necessary and sufficient conditions that promote the clustering of firms within an industry, and the presence of these conditions within an industry promote the geographical agglomeration of firms. Eisingerich et al (2010) define network strength as a function of four elements. These elements are the frequency of interactions, the intensity of interactions, the stability of interactions and the level of trust between firms within the cluster. The productivity and knowledge-based advantages generated by the clustering of firms arise from the number and nature of linkages between firms suggesting that clusters that have multiple linkages among firms turn to exhibit stronger growth patterns (Morosini, 2003).

The greatest advantage of strong networks lies in the transfer of knowledge that is embedded in production processes (Grant, 1996). High frequency of interactions between firms develop complementarities, which enable firms to maximize the potential benefits of agglomeration. Trust between cluster members facilitate the exchange of knowledge and promote joint action in response to common shocks and risks. Eisingerich et al (2008) highlight that trust between firms within a cluster increases the willingness to exchange knowledge. Thus, whilst geographical proximity confers advantages on firms, Kale et al (2000) posits that it is the quality of interactions that enable firms to realize the full potential of co-location. The nature of interactions between firms in clusters in developing countries tends to be mostly informal and personal rather than formal, codified relationships between the firms. This study, will, therefore, assess the structure of clusters as well as identify potential pathways for industrial development of Ghana through the development of industrial clusters.

Industrial clusters have been identified as conduits for innovation and technological change (Eisingerich et al, 2010) that enhances firms’ competitiveness and capabilities. Lin et al (2006) further assert that the competitive dynamism of enterprises arises from the development and application of new production processes and adoption of new organizational systems. In the least developed economies with scarce research and development resources, competitive advantages are achieved through the transfer of technology between firms. Studies such as Suarez-Villa and Walrod (1997) and Beaudry and Breschi (2003) cautions that innovation requires more than the geographical agglomeration of firms. Evidence from Sonobe et al., (2011) and Gebreeyesus and Mohnen (2012) show strong effects of clustering on enterprise growth and innovation performance in metalwork clusters in Nairobi and Ethiopian footwear clusters. However, the lack of comprehensive industrial cluster and zoning policies constrain
the effect of geographical agglomeration of firms to promote technological absorption and innovation (Sonobe et al., 2011; Gebreeyesus and Mohnen, 2012). Newman et al., (2016) find the clustering effects are strongest in developing countries.

Knowledge creation involves the combination of existing production processes or the innovation of new processes. The process of knowledge creation involves interactions between firms and technologies (Lin et al., 2006), and geographical agglomeration facilitates such interactions. Baptista and Swann (1998) argue that technological knowledge is geographically localized, this is a major source of the existence and success of clusters, as it leads to knowledge externalities and spill-overs. The dynamics of knowledge transfers among clustered firms may be key to explaining differences in productivity among industrial agglomerations. Through the sharing of conditions and experiences, clustering increases the speed and ease of finding, accessing and transfer valuable knowledge that may not be codified (Eisingerich et al., 2010). In the case of most other developing countries, industrial clusters tend not to have existing formal and codified relationships to facilitate the dissemination of innovations and technology. Rather, interactions between firms tend to be based on personal relationships. As such, identifying the role of clusters in facilitating innovations and learning may be very complex in the context of developing countries.

There have been conflicting results on innovations and knowledge creation within industrial clusters. Bottazzi and Perci (2003) find that raising expenditure on research and development increases innovation within a region with minimal spill-over effects whilst Freel (2003) concludes that the innovations of small firms are locally embedded. Beaudry and Breschi (2000, 2001) assert that the positive association between cluster members and innovation is maximized when the cluster consists of firms in the same industry. Callois (2008), however, establishes a positive relationship between clustering and process innovation but a negative relationship with product innovation. Clustering increases process innovation through the sharing of common understanding of technical problems, sharing of fixed costs and risks associated with such problems. Product innovation, on the other hand, requires different bodies of knowledge which may not exist within a cluster of closely related or similar firms. Yu (2002) explains that knowledge spill-overs within clusters are commercial in nature rather than technical. The lack of technical knowledge spill-over accounts for the absence of geographical concentrations in the generating of new technologies.

Beal and Gimeno (2001) show that interfirm rivalry arising from clustering reduces a firm’s commitment to innovation. Auderstsch and Feldman (2004) suggest that the spill-over of technical knowledge involve substantial cost which may constitute a barrier to knowledge diffusion among small firms. Furthermore, they attribute low innovations within clusters to heterogeneity in firm knowledge. Lee (2009) finds that the effects of clustering on firm innovation depend on firm-level characteristics that enhance absorptive capacity. McCann and Folta (2011) find that younger firms with higher knowledge stocks benefit more from clustering. Evidence from these studies suggests that successful implementation of clustering as a policy towards the industrialization of low-income countries require an in-depth understanding of the knowledge creation process within existing industrial clusters.

Diffusion of technology is essentially concerned with learning. Two broad channels for knowledge sharing have been identified within industrial clusters. Formal channels include the operation of joint training facilities for employees and collaborations in research and development activities; whilst informal exchanges take place through personal contacts within a personal network. Exchanges through informal channels among rival firms generally involve
small ideas that do not harm the economic interest of the originator. However, interactions among firms vertically aligned with the value chain may involve the substantial exchange of knowledge and innovation. Fossas-Ollalla et al (2015) show that interactions between suppliers and manufacturers exert large and significant effects on product innovations. Generally, there exist little collaboration and linkages between firms and research and innovation centers. The lack of collaboration inhibits the role of industrial clusters to leverage the similarities between firms to the development and improve production processes and technologies.

The spatial agglomeration of rival firms with a cluster increases competition and among the firms. The trade-off between productivity-enhancing effects and increased competition among firms has implications for the development and effectiveness of clustering as hubs for innovation and technology diffusion. Newlands (2003) for example argues that rival firms within clusters often compete on the quality of outputs rather than prices. Such competition among firms spurs innovation in processes and products. Newman et al (2016) find evidence to support the trade-off between productivity-enhancing gains from clustering and competition from spatial proximity between rival firms. In a study of clusters in four low-income countries (Cambodia, Ethiopia, Vietnam, and Tunisia), Newman et al (2016) conclude that competition within clusters leads to price decreases, creating a disincentive for firms to agglomerate into a cluster. Further, Newman et al (2016) find that the increased competition within clusters exerts a negative effect on productivity within such clusters. Hoffman et al (2014) also demonstrate the knowledge transfer occurs within clusters in the absence of interfirm cooperation. Thus, cluster development policies must devise strategies that balance the productivity gains through cooperation among firms and reduce competition.

The post-2015 global development agenda recognizes the urgency of developing sustainable industries and fostering innovations as a support to economic development and human welfare. The goal aims to increase the share of industrial output in the gross domestic product, doubling industrial output in the least developed countries. The goal also aims to increase SMEs access to affordable credit and integrate such enterprises into values chains and markets. Further, the SDG goal on industrialization promises to upgrade resource-use efficiencies and the adoption of environmentally sound technologies. To upgrade the technological capacities of industries, the SDG encourages governments to pursue policies that promote innovations as well as increase public spending on research and development.

The evidence from these studies of the inter-relationships between firm clustering, knowledge creation and dissemination, and firm performance and competitiveness provides a framework to undertake sector-specific analysis in the context of developing countries. Specifically, this study focuses on firms located within the Sokoban Wood Processing Cluster in Kumasi. The wood processing cluster is an integrated network of players within the value chain from extraction (lumber) to marketing and distribution. The cluster provides a channel for the development and diffusion of technology and innovations among firms along the value chain. The agglomeration of firms in similar activities, on the other hand, increases competition among the firms. The study employs a mixture of a desk review, qualitative and quantitative data analysis to explore the dynamics and mechanisms of interactions among firms within the cluster. The analytical techniques adopted, however, do not assess the impact of clustering on knowledge creation and firm productivity and competitiveness.

3 Background - clustering and industrial policy in Ghana
In the period after Ghana gained political independence in 1957, the new government set out to pursue a rapid industrialization agenda. The government considered industrialization as a
key component of the structural transformation and modernization of the country. The agenda towards industrialization was seen as part of a broad set of policies to wane the newly independent state off its colonial masters as well as diversify the predominantly agrarian economy. At the heart of the Nkrumah-led industrialization, agenda was the creation of protected import substitution industries. Import substitution was preferred as the strategy that would reduce Ghana’s dependence on primary exports and break the cycle of poverty (Killick, 2010). Primarily, the new industries focused on value addition to domestic natural resources through processing. To achieve this objective, the government established a number of state-owned enterprises to spearhead the transformation agenda. The government further set up industrial clusters to serve as hubs for manufacturing and processing as well as promote private-sector participation in the sector. The clusters were provided with essential services and infrastructure. The foremost of these clusters is the Tema Industrial Zone. In spite of its shortcomings, the strategy led to significant increases in the share of manufacturing in gross domestic product.

After years of economic decline and the shrinking of the manufacturing sector, Ghana under the World Bank’s Economic Recovery (ERP) and Structural Adjustment Programs (SAP) sought to revive the sector to be internationally competitive. The ERP/SAP era marked a significant shift in the industrial policy paradigm of Ghana. The ERP-era industrial strategy focused on private sector lead initiatives. The focus of industrialization in this era was export-oriented as it was believed to help resolve the underlying macroeconomic imbalances. The ERP/SAP lead to a number of reforms such as the privatization of non-performing State-Owned Enterprises (SOEs), liberalization of the financial sector, interest and exchange rates markets and the rationalization of import licenses and tariffs. Industrial output and capacity utilization grew under the ERP/SAP inspired measures. However, the successful increases in industrial output were short lived.

The post-ERP era has seen governments implement several policies and strategies to revive the manufacturing subsector. Medium-term development programmes (GPRS I, GPRS II, GSGDA I & GSGDA II) have promoted the creation of spatially concentrated industries as a mechanism to facilitate the transfer of technology, knowledge, and innovation between small and medium firms. There exists a substantial level of clustering of manufacturing firms in Ghana. Ackah et al. (2013) assert that clusters in Ghana developed spontaneously or in response to a government or private intervention. For example, under the Ghana Trade and Investment Gateway Project, Ghana with the support of the World Bank established industrial parks under the Ghana Free Zones Board as export processing zones (EPZs). These EPZs were to serves as investment destinations to attract foreign direct investments.

The medium-term development objective of the country is to achieve a sustained high economic growth through the structural transformation of the economy via agricultural modernization, industrialization and value addition through a vibrant and competitive private sector within the framework of sustainable macroeconomic management and good governance. The national development objectives are anchored on increasing productivity and efficiency in the agricultural and manufacturing sectors through skills and technology upgrading to generate broad-based, inclusive and sustainable growth. In the medium term, the objective is the creation of decent and productive jobs, as well as opportunities for all in order to alleviate poverty and reduce social and economic inequalities. The ability of the country to achieve the medium-term objectives hinges on the accelerated development of the industrial sector. The transformation of this sector is based on a competitive light manufacturing subsector through supporting the development of import substitution industries in strategic sectors including automobile parts.
and metal fabrication. To actualise the medium-term development objectives, the Government of Ghana in 2010 initiated an Industry Sector Policy, designed to address the challenges of the industrial sector and promote the private sector to participate actively in the development process. The policy identifies four thematic areas:

i) production and distribution;
ii) technology and innovation;
iii) incentives and regulatory regime; and
iv) Cross-cutting issues.

4 The wood and wood products sector in Ghana

The wood processing sector is an essential downstream economic activity within the value-chain of the forestry subsector in Ghana. With a forest cover of about a third of the total land area of Ghana, the wood processing subsector is a major source of employment, value addition and foreign exchange earnings. In spite of the growth and employment potential of the subsector, wood processing has witnessed very little investment and development with no major transformation over the last three decades. As a resource and labour-intensive activity, the limited investment in the subsector has deprived the country from harnessing its growth and employment potential over time.

The value chain within wood and wood products industry could be categorised into three broad dimensions. The primary activities within the value chain involve logging and transportation of lumber to processing mills and for export. The secondary category of activities includes milling lumber into plywood, veneer and treated poles; this is largely dominated by medium and large-scale firms that target the export market. The secondary sector was estimated to employ about one hundred and thirty thousand (130,000) persons as at 2013. The downstream wood sector is a major source of employment and value addition within the value chain and mainly dominated by small-scale informal enterprises. It is estimated that about forty-one thousand (41,000) firms operate at this level, engaging in furniture making, furnishing (decorative wood accessories), and the manufacture of other end user products. However, the subsector faces a number of challenges that have slowed down the pace of innovation, technology transfer and value addition.

Over the past three decades, an increase in deforestation has depleted the forest reserves that serve as the primary source of raw materials to the industry. To avert the loss of forest resources and protect the forest reserves from further encroachment, the Timber Industry Development Division (TIDD) of the Ghana Forestry Commission has taken a number of measures under a reforestation programme aimed at reclaiming the lost forest reserve. However, these programmes have failed to achieve their targeted results, essentially due to low investment and commitment to the implementation of the programme.

In the downstream sectors, increased imports of cheaper furniture and other wood products has led to increased competition for local producers of furniture and other wood products. The low capacity of local processors and manufacturers of wood products as well as limited investment and technology transfer has stagnated the growth of the downstream wood processing sector. To enhance productivity and competitiveness at the local and international levels, improving human capital, innovation and facilitating the transfer of technology within the wood processing value chain is essential. Particularly, cost effective and efficient production process that reduces wastage and promote environmental sustainability must be enhanced. To improve production capacity through learning and skills and technology transfer among the informal small-scale wood processors, a number of informal clusters of small-scale wood processors
have been developed and upgraded across the country in recent years to facilitate collaboration between wood processors as well as activities within the wood industry. Most of these clusters can be found in the Ashanti, Greater Accra and Brong Ahafo regions of Ghana.

In terms of the regulatory regime of Ghana’s timber and wood industry, it has constantly evolved since the initial institutional attempts made in 1963 to establish the Ghana Timber Marketing Board (GTMB). GTMB was earlier tasked to promote timber exports through information dissemination and timber inspection grading which, among other things, encompassed provision of data on the timber industry, product development, quality control, contract verification, approval and issuance of export permit. In 1985, the government of the Provisional Nation Defence Council (PNDC), as part of the macro-economic policies and sectorial reform programme of its Economic Recovery Programme (ERP), enacted PNDC Law 123 and PNDC Law 117 to establish the Timber Export Development Board (TEDB) and the Forest Products Inspection Bureau (FPIB) to replace GTMB. TEDB was primarily responsible for export promotion and the dissemination of market information about the timber industry and FPIB was responsible for contract verification, timber and wood products inspection, approvals, training of graders and issuance of export permits.

In 1999, the Forestry Commission Act, No. 571 (Forestry Commission Act, 1999) was established under the Forestry Commission and this combined timber related functions in all public agencies, including the TEDB and the FPIB, under the Forestry Commission. The Commission performs the functions of protection, development, management and regulation of forests and wildlife resources. More specifically, the Timber Industry Development Division (TIDD), which was established in 2002 under the Forestry commission, was established to perform regulatory functions over the timber and wood industry in Ghana. The Forestry commission through TIDD uses the Timber Resource Management Regulations enacted in 1998 to regulate Ghana's Timber and wood industry to provide specialized services in promoting efficiency in product quality assurance and value-addition in the Timber Industry and Trade; this is to ensure consistency with best environmental practices.

5 The Sokoban Wood Village
The Sokoban Wood Village (SWV) is located in Kumasi in the Ashanti Region of Ghana and it is the nucleus of the wood processing sector in Ghana. The wood village is a twelve-hectare USD 10 million ultramodern facility funded by the French and Ghanaian governments, designed to accommodate about 1000 wood processors. The village was developed by relocating wood processors from the former cluster of wood processing firms at Anloga-a suburb of Kumasi. In addition, there are other informal wood processing clusters in Takoradi. Currently, there are about 1000 sheds in the enclave with an estimated population of about 1500 people which includes shed owners, operators of ancillary economic activities and management staff.

The enclave houses carpenters, lumber mills/sellers, hardware sellers, plywood sellers and saw millers with economic activities ranging from the sale of food, wood and wood products to hardware accessories for woodwork. The enclave has access roads, a communication centre, a car park and a two-story administrative block with a 50-seater capacity conference room. There are also health and police posts, some financial institutions, a school and sanitary facilities within the enclave. Figure 1 shows a block plan of the Sokoban wood village.
Figure 1: Block Map of the Sokoban Wood Village

Source: Adopted from ASSCU Plan, 2016

Figure 2: Thematic network on the structure of the cluster

Source: Sokoban Wood Village Survey, 2017
Figure 2 provides a structure of the cluster and how the actors interact based on discussions with the managers of the cluster. Basically, the cluster is structured into four levels based on functions and membership. The highest level is occupied by a local public institution called the Kumasi Metropolitan Assembly (KMA). KMA manages the entire village and performs the functions of maintaining good sanitation, providing security and generating revenue within the cluster. This is done through a site manager and other KMA supporting staffs. The second level of the structure is a management committee that is made up of heads of all associations in the clusters and the site manager. This is the level where public policy engagements take place. The committee is tasked to manage the site and enhance the growth of the cluster. The third level of the structure is occupied by the different activities that takes place in the village. There are as much as eleven different activities taking place in the village. This ranges from lumbering, carpentry, hardware sellers and a group of different transporters. The fourth level of the structure is occupied by the individual firm who operate within SWV. While most individuals in the cluster belongs to an association, there are a few who operate in isolation.

The structure of the cluster in SWV is dynamic. Discussions with the site management suggests the structure of the cluster has been changing overtime. Initially, a private investor was managing the cluster. The private investor was subsequently replaced because of poor management. In more than one incident, individual firms in SWV split into different clusters, increasing the number of sub clusters within the enclave.

6 Data and methodology

In order to meet the objectives of the study and address the research questions, a portfolio of analytical methods involving a combination of desk review, quantitative and qualitative methods was employed. Being mindful of the four central themes identified, the empirical strategy entails a quantitative and qualitative analysis of primary data collected from a survey of enterprises within the wood sector in Kumasi, the second largest city of Ghana. In addition, in-depth interviews of key actors, focus group discussions (FGD) as well as case studies were conducted to deepen the understanding that was obtained from the quantitative data.

6.1 Survey design and data collection

We are aware that the choice of appropriate data collection tools and techniques for the survey should be governed by very comprehensive and highly integrated methodology involving the survey design, actual fieldwork and validation of collected information. The main technical approach employed in this study entailed the collection of micro data through a questionnaire-based survey of the main actors in the value chain of the wood and wood product industry as well as focus group discussions with executives of the association of the various actors. Typically, the main activities in the supply chain of wood include: forestry/harvesting, the production process (at the Sawmills); value-added production by micro and small enterprises (veneer/plywood/board manufacturers/drying and preservation); transportation and sales in domestic market and in the regional and overseas markets (see Figure 3).

Our main focus is in understanding the performance of actors within the SWV located in Kumasi. The actors herein include sawn-millers/lumber dealers (lumber sellers), veneer/plywood/board manufacturers (wood sellers), carpenters and other auxiliary actors such the retailers of hardware materials (nails, hammer, etc.) and transport services. Generally, there are more lumber sellers in the village that any other actors. This is based on the number of such associations. The definitions of these categories of actors are provided as follows (Table 1).
Both qualitative and quantitative analysis was used in evaluating the effect of clusters on firm performance as well as innovation and knowledge transfer among the firms in the cluster. A wide range of methods was employed to study the relationship between selected dependent variables (performance and learning) and various explanatory variables including the location of the firm, the type of product (sub-sector) manufactured by the firm and the number of firms producing similar products within the SWV. We assess how both government/public and non-governmental organizations policies have over the years enhanced the development of the wood cluster in Kumasi. We further assess how these policies have influenced innovation and knowledge transfer in the cluster as well as their effect on performance of firms.

The definitions of the selected dependent variables are essential to establishing the potential of clustering as an industrial development strategy in least development economies. Firm performance, for the purpose of this study, focuses on the production performance of manufacturing firms. Particularly, firm performance will focus on the strategies that firms adopt towards cost reduction and product quality to stay competitive. Additionally, performance of firms will involve assessing the technical and resource efficiencies of firms. Learning on the other hand is defined as the degree of interaction between firms and personnel in the exchange of knowledge and technology.
The study also employed qualitative methods to establish the relationship between clusters, knowledge and firm performances as well as deepen our understanding of processes and mechanisms through which clusters affect firm performance. This entailed the conduct of in-depth interviews with stakeholders/industry actors (firms, institutional actors, government agencies, key informants, and other relevant bodies), as well as FGDs among selected firms within the wood processing industrial cluster. A comprehensive semi-structured interview guide was prepared based on the thematic areas specified and the interview sessions were recorded and later transcribed. The responses were analyzed using thematic analysis.

6.2 Data collection
The main objective of the study was to probe into the factors that underpinned the performance of actors in the SWV. To accomplish this, the following were identified as the main actors: Lumber sellers, Wood (veneer/plywood/board) sellers, carpenters, transporters, and hardware sellers. Given the diverse nature of these respondents, a general interview guide was developed for the executives and selected members of the various associations, while a quantitative questionnaire was developed for lumber sellers, wood sellers and the carpenters. The interview guide was in five sections broadly aligned with the main research questions. The questionnaire on the hand consisted of seven sections, eliciting responses on the: background information of actors; production, inputs, revenue and assets; employment; innovation and technology; cluster effects; business support; and perceptions on broader business environment. The main weaknesses of the survey instruments had to do with the inability to observe overtime various dynamics of the various issues been examined and the reliance on recall data to deal with that.

Given the nature of the assignment and the fact that all the respondents are in the same location, a sample of 300 was chosen as appropriate and representative for a population of about 1000 firms. In addition, five interviews were proposed for the executives of the association of the different actors: lumber sellers, wood sellers, carpenters, hardware and transporters (GPRTU). For each of the interviews, either a minimum of 5 or a maximum of 10 participants were selected. This is to ensure that the interviews are conducted in an orderly manner, devoid of frequent interruptions and to ensure that the recordings are audible enough.

7 Characteristics of Respondents
As indicated earlier, information was obtained from four categories of respondents: firm managers, association executives as well as public and private sector institutions that have had working or policy relations with the cluster. While focused group discussions were held with the firm managers and the association executives, interviews were conducted with the public and private sector institutions that have had working or policy relations with the cluster. Some supporting quantitative information were also provided by the firm managers. Two hundred and ninety-two (292) firm mangers were interviewed for the survey. This included 33 lumber sellers (11%), 69 wood sellers (24%) and 190 carpenters (65%). This is specified in Table 2.

<table>
<thead>
<tr>
<th>Table 2: Distribution of Respondents (in Percentages)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Lumber</td>
</tr>
<tr>
<td>Wood</td>
</tr>
<tr>
<td>Carpenters</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

1 GPRTU: Ghana Private Road Transport Union.
With regards to ownership, most of the firms sampled were owned by local private individuals (96%) (see Table 3). For instance, all the lumber sellers, 92.8% of wood sellers, and 96.3% of carpenters are private Ghanaians. For the distribution which reflected joint venture with foreign entrepreneurs, the foreign individuals involved are mostly from the West African sub region.

**Table 3: Type of Ownership (in Percentages)**

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private local</td>
<td>100.0</td>
<td>92.8</td>
<td>96.3</td>
<td>79.45</td>
</tr>
<tr>
<td>Joint local/foreign</td>
<td>0.0</td>
<td>7.2</td>
<td>3.7</td>
<td>16.44</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>69</td>
<td>190</td>
<td>292</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

**Table 4: Employment**

<table>
<thead>
<tr>
<th>Year</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>2012</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2013</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2014</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2015</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2016</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

These firms are typically micro in size with average employment of about 4 persons. For instance, average employment was highest among the wood sellers, between 4-5 persons for the last five years (2012 to 2016), whilst the lumber sellers engaged on average 3 workers. For the carpenters, average employment is between 3 and 4 for the same time period. This notwithstanding, some wood sellers and carpenters could employ as much as 20 or 30 casual workers during the peak season (see Table 4).

Most of the firms were established by their current owners (80%), even though some few were acquired through inheritance (16%) and mergers (3%). For the owner founded firms, 90.9% are lumber sellers, 81.2% are wood sellers and 78.4% are carpenters. The inherited and merged components are between 10 – 20%; 17.4% of both wood sellers and carpenters inherited their businesses (Table 5).

**Table 5: How Firm was Started (in Percentages)**

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Founded</td>
<td>90.91</td>
<td>81.16</td>
<td>78.42</td>
<td>80.48</td>
</tr>
<tr>
<td>Inherited</td>
<td>9.09</td>
<td>17.39</td>
<td>17.37</td>
<td>16.44</td>
</tr>
<tr>
<td>Merger</td>
<td>0</td>
<td>1.45</td>
<td>4.21</td>
<td>3.08</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>69</td>
<td>190</td>
<td>292</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

Regarding the age distribution of the firms, about 63% of the respondents have been in existence for between 11 and 30 years, with some 17.1% aged 31 years and over (see Table 6).
Table 6: Firm Age (in Percentages)

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10</td>
<td>21.21</td>
<td>24.64</td>
<td>17.37</td>
<td>16.52</td>
</tr>
<tr>
<td>11 - 20</td>
<td>42.42</td>
<td>31.88</td>
<td>42.11</td>
<td>39.73</td>
</tr>
<tr>
<td>21 - 30</td>
<td>21.21</td>
<td>33.33</td>
<td>20.53</td>
<td>23.63</td>
</tr>
<tr>
<td>31 and above</td>
<td>15.15</td>
<td>10.14</td>
<td>20</td>
<td>17.12</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>69</td>
<td>190</td>
<td>292</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

In terms of bookkeeping culture, it emerged that more than half of the firms (55%) did not keep records of their transactions (see Table 7). The poor record keeping of transactions was prevalent amongst the lumber and wood sellers.

Table 7: Bookkeeping (in Percentages)

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>All transactions</td>
<td>18.18</td>
<td>17.39</td>
<td>5.26</td>
<td>9.59</td>
</tr>
<tr>
<td>Some transactions</td>
<td>57.58</td>
<td>43.48</td>
<td>27.89</td>
<td>34.93</td>
</tr>
<tr>
<td>No bookkeeping</td>
<td>24.24</td>
<td>39.13</td>
<td>66.84</td>
<td>55.48</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>69</td>
<td>190</td>
<td>292</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

8 Research results

This section discusses the findings from the data analysis based on the data from the qualitative focus group discussions as well as the quantitative survey. In line with the research questions stated earlier, the data analysis seeks to answer the questions regarding how the structure of the cluster affects firm performance and what the various forms of local inter-organizational collaborative interactions are; how firms in the cluster create knowledge and how knowledge transmission occur within the cluster; how knowledge and technology can be put to work to generate competitiveness and what institutional support and policy interventions exist; and how effective have they been in driving competitiveness of the clusters. Thematic analysis was used to analyse the qualitative data in three levels of themes: basic themes, organizing themes and global themes (see Attride-Stirling, 2001 for a discussion on thematic analysis). Basic themes are text quotes extracted from transcribed audio recordings of conducted FGDs and Key Informant Interviews (KIs). The underlining contribution in two or more basic themes were categorized under an organizing theme that described the basic themes’ address to the study’s research questions. Global themes summarized all emerging themes under each research question. Coding was both inductive and deductive. A deductive coding scheme was constructed based on reviewed literature and report from an initial explorative study to the SWV (the study area). Themes with high frequencies across (FGDs) and other consensual themes among discussants were inductively coded. The process of profiling, coding frequencies, thematic frameworks and thematic networks are detailed in qualitative section of the results for procedural clarity. The analysis of the quantitative survey was basically descriptive.

8.1 Cluster Structure and Firms Performance

To examine how the structure of the cluster has affected firm performance the survey sought the views of the respondents on these issues. As indicated earlier, the Sokoban Wood village
has a four-level structure comprising: KMA, management committee, sub-activities (lumbering, carpentry, hardware sellers as well as a group of different transporters) and individual firms. The responses linking structure and performance were collated at the end of the structure: individual firm level. Individual firms were thus asked some questions related to the profits they made because of their presence in the structure, the extent to which their sales revenue has been affected and other conveniences in being located at a particular site.

The contributions from the FGDs suggested some positive effects of the cluster’s structure on firm profitability but limited inter-organizational collaborations. Figure 4 summarizes the emerging themes on the cluster effect on firm performance and various inter-organizational collaborations within the Sokoban wood village.

Figure 4: Thematic network on cluster structure and firm performance

From the discussions, it was established that the main conduits through which the cluster exerted positive effects on the firms were through training programs, commercial recognition, cheaper procurement and operational support. The benefits of the commercial recognition appeared largely relative to the other factors. This is because, the existence of the cluster provides a lot of convenience to customers in terms of executing their transactions. Customers are aware that there exists a one-stop-shop for most of the items they will need which will not only reduce their transaction cost in terms of transportation costs, but also give them the opportunity to scout for relatively less expensive and quality items. All these together reflect positively in the volumes of sale and increased profitability. Indeed, this sentiment is encapsulated in the quotation below that:

“... but now if someone wants to carry their load they know that we are in Sokoban here at this place and they come to us because we have our association here…” Discussant in FGD with transporters.

Related to the above is the external view that the SWV is noted for producing particular products and services, which provides a further boost for their business engagements. Another positive cluster effect, which emerged from the discussions, was the fact that firms within the
enclave enjoyed some form of supplier credit both from external and internal sources. This is rightly expressed in the quote below:

“...some of us get things on credit because they know that we are all here, because you don’t know when tomorrow I can help you and we are all here so they don’t fear giving us supplies for us to pay small, small...” Discussant in FGD for Carpenters.

Membership within an association in the cluster was also beneficial in terms of providing individual firms with some form of solace and support when they either breach regulations dealing with unapproved products or suffer extortion from law enforcement agencies due to their ignorance. In addition, firms in the cluster also got training opportunities from mostly non-governmental organizations and on few occasions from state agencies because their membership in the cluster. Firm owners admitted that some performance enhancing training opportunities were only accessible to firms within the cluster:

Some members of the cluster sometimes organized the purchase of some inputs required by firms in bulk. The cluster assisted with procurements, which reduced individual cost incurred by member firms. This helps the firms to purchase inputs at lower prices as purchases are done on wholesale basis. A discussant selling hardware shared this quote below:

“...when you go there to buy you have to pay your own transport in and out and buy at higher price but sometime ago the association leaders took names of people who wanted to buy and their monies and asked them to supply to us here, you see? That one was cheaper than going there one by one to buy, because we were buying in bulk they brought it here...”

Discussant in FGD with hardware dealers.

To check for the robustness of the above findings, we made use of the responses from the firms from the quantitative survey regarding their average values of sales and revenues from 2012 to 2014. The firms were also asked to rank the extent to which they thought operating within the cluster had affected their profitability and sales revenue. The responses, from 2012 to 2014, are presented in Table 8. The figures are adjusted for price changes using the consumer price index for the respective years with 2012 as the base year. Typically, these figures have followed a declining trend since 2012 but increased in the year 2015 for lumber sellers and carpenters and the year 2016 for wood sellers. Based on the average annual sales data, it appeared 2012 was the best year, for all the actors in the cluster, since they experienced the highest average sales revenue. However, when their average profits were calculated by subtracting their average cost of production from their average sales revenue, a different picture emerged. Average profit mostly declined for the entire period and negative for lumber sellers in the year 2012 and 2016 and negative for wood sellers in the year 2016 (see Table 9). The negative profits were due to a couple of factors including the check on illegal lumbering by state authorities and the general decline in the known-varieties of some wood species.

Table 8: Distribution of average sales and production cost (in GHC)

<table>
<thead>
<tr>
<th>Year</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>6,454.8</td>
<td>8,507.7</td>
<td>5,363.3</td>
<td>6,766.2</td>
<td>6,509.9</td>
<td>3,820.4</td>
</tr>
<tr>
<td>2013</td>
<td>4,535.6</td>
<td>5,990.1</td>
<td>3,787.0</td>
<td>4,087.8</td>
<td>4,490.0</td>
<td>2,684.1</td>
</tr>
<tr>
<td>2014</td>
<td>3,741.4</td>
<td>5,184.5</td>
<td>3,180.9</td>
<td>3,439.6</td>
<td>3,867.7</td>
<td>2,246.9</td>
</tr>
<tr>
<td>2015</td>
<td>3,526.8</td>
<td>5,480.1</td>
<td>3,126.8</td>
<td>3,335.9</td>
<td>4,197.4</td>
<td>2,186.6</td>
</tr>
<tr>
<td>2016</td>
<td>3,772.5</td>
<td>7,120.2</td>
<td>3,863.8</td>
<td>3,801.2</td>
<td>7,161.5</td>
<td>2,732.6</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017
Table 9: Distribution of average profits (in GHC)

<table>
<thead>
<tr>
<th>Year</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>-311.4</td>
<td>1,997.8</td>
<td>1,542.8</td>
</tr>
<tr>
<td>2013</td>
<td>447.8</td>
<td>1,500.1</td>
<td>1,102.9</td>
</tr>
<tr>
<td>2014</td>
<td>301.8</td>
<td>1,316.7</td>
<td>934.0</td>
</tr>
<tr>
<td>2015</td>
<td>190.9</td>
<td>1,282.7</td>
<td>940.1</td>
</tr>
<tr>
<td>2016</td>
<td>-28.7</td>
<td>-41.3</td>
<td>1,131.2</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

On the question concerning the extent to which the respondents thought the cluster had affected their profitability, most of the respondents were of the view that the presence of the cluster had had positive impacts on the profitability and sales of their businesses (see Table 10 and 11 respectively). For the Lumber Sellers, close to 58% had their profitability affected either to a large extent or very large extent due to the presence of the cluster. About 81% of the respondents from the wood sellers suggested that their profitability had been positively impacted by the presence of the cluster either to a large extent or very large extent. In addition, about 76% of the respondents from the carpenters believed that the cluster had either impacted to a large extent their profitability or to a very large extent for same (Table 10).

Table 10: The extent to which the cluster has affected profitability

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A very large Extent</td>
<td>21.2</td>
<td>30.4</td>
<td>42.1</td>
<td>37.2</td>
</tr>
<tr>
<td>Large Extent</td>
<td>36.4</td>
<td>50.7</td>
<td>33.7</td>
<td>37.9</td>
</tr>
<tr>
<td>No Extent</td>
<td>42.4</td>
<td>18.8</td>
<td>24.2</td>
<td>24.9</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

A similar pattern of responses was obtained in terms of the extent to which the cluster had affected their sales revenue (see Table 11). About 85% for the lumber sellers, 83% for the wood sellers and 77% of the carpenters indicated that the cluster had improved upon their profitability either to a large extent or to very large extent.

Table 11: The extent to which the cluster has affected sales revenue (%)

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A very large Extent</td>
<td>24.2</td>
<td>24.6</td>
<td>39.8</td>
<td>33.9</td>
</tr>
<tr>
<td>Large Extent</td>
<td>60.6</td>
<td>58.0</td>
<td>36.8</td>
<td>45.2</td>
</tr>
<tr>
<td>No Extent</td>
<td>15.1</td>
<td>17.4</td>
<td>23.7</td>
<td>20.9</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

8.2 Local Inter-Organizational Collaborative Interactions

The focus of this section was to understand the extent and areas that firms collaborated amongst themselves to undertake their activities. Basically, discussions from the focus group discussions suggest collaboration in SWV was in joint procurements, contract executions and business referrals. Regarding contract executions firms admitted instances where customer demands were either overwhelming or outside their stock at the time of requests. In those instances, firms who received the contracts collaborated with other firms to meet customer demands. Evidence of such collaborations was revealed as follows:

“… sometimes you have to take some from other people, it is true that you received the contract but when you cannot supply all you take from someone and you give them their money, that one we do it, so the person knows the price you are giving it out for and the two
of you supply or you take from them and you supply to the customer...” Discussant from FGD with lumber dealers.

Though rarely done, business referrals were a form of both vertical and horizontal collaborations between firms in SWV. The few business referrals mentioned were from lumber sellers to carpenters and between hardware firms as reflected in these quotes:

“...we have worked with the carpenters before; the contract came to us and we shared. So, there is nothing wrong with that. I showed the person who to go to after he bought from me...” Discussant in FGD for lumber dealers.

“...the times you don’t have you direct the customer to someone who has, provided you do not sell what they want, if you sell but you have run out of stock you go and take from someone else and sell to your customer otherwise you can lose the customer...” Discussant in FGD for hardware dealers.

There were few instances where some firms expressed negative sentiments about the presence of the cluster which tended to undermine effective inter-firm collaboration. Some firm owners admitted losing customers to other firms within the cluster. These respondents had a pessimistic view of the competitive nature of horizontal firms in the same cluster.

Another factor that seem to impede effective collaboration was expressed by the carpentry section, to the effect that some of their colleagues did not possess certain specialized skills required for joint collaborations.

To further deepen our understanding of the types of interactions and how they translate into positive and negative outcomes, these qualitative responses were complemented by some views from the quantitative survey. Firm managers were asked to indicate the main medium through which firms mostly interact amongst themselves. The dominant response is through training programs organized by agencies such as NGOs. Even with this type of interaction, Table 12 indicates that only the carpenters had a higher proportion of their members benefiting (41%). Fewer lumber sellers (18%) and wood sellers (27%) were involved in such interactions.

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>18.18</td>
<td>27.54</td>
<td>41.05</td>
</tr>
<tr>
<td>No</td>
<td>81.82</td>
<td>72.46</td>
<td>58.95</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>69</td>
<td>190</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

8.3 How Firms in Cluster Upgrade Their Process and Products

To identify the areas in which the firms innovated, the respondents were asked if they had introduced new products or processes over the past years. From the focus group discussions, it emerged that most of them introduced new processes than products. This finding was probed further to establish the reasons why firms decided to upgrade their processes than products, how firms often upgraded their operations and identify key actors in the process upgrades. Discussions centred on the experiences of firms during process upgrades and what firm managers thought were the appropriate channels of upgrading the processes of doing
businesses. Figure 5 summarizes the emerging themes from the discussions and this is discussed under three themes in the subsequent sub-sections.

Figure 5: Thematic network on firm level process upgrades within cluster

8.3.1 Reasons for process upgrades
To understand the main reasons why most firms upgraded their processes rather than products, the firms were asked to provide a justification. It was established that firms upgraded their processes mainly in response to changing demands in the wood market. For the case of product upgrades, it was rare because of the inadequacy of known timber species within Ghana’s forest zones. Discussants shared instances where they adopted better ways of production to meet customer specifications. Examples of such instances are provided below:

“…when Dahmoa (local name for timber species with botanical name Piptadenia Africana) started becoming scare we began introducing Essia (local name for timber species with botanical name Petersia Africana) but customers were complaining about the smell of Essia, because if the wood is new like that it smells, so we started drying the Essia for longer periods of time to stop the smelling because customers were complaining about the smell. We also learnt to spray the Essia with medicines\(^2\) to stop the smell…” Discussant in FGD with lumber dealers.

Firms equally changed their means of production to increase the value of the products. Some innovative ways of producing resulted in improving the finishing, which increased the price of the product because the final product had more preferred market outcomes. Firms shared their experiences with value addition gained through the process upgrades in the following ways:

“…that time we were using the chain saw to cut the woods. The woods were rough and the finishing was not smooth but now with sawmill, the cutting is finer and the surface is smoother, when you sell the wood like that it is better…” Discussant in FGD with lumber dealers.

\(^2\) The respondent was referring to a form of chemical compound used by the firms to treat the wood in order to minimize the foul odour.
Process upgrades were also means by which waste and cost of production is moderated. Firms identified ways of reducing waste by upgrading the processes involved in producing lumber and other wood products. In the process two things happen; firms maximise the harvest of lumbers through the improved processes and also explore alternative uses for the waste products which were previously discarded. Waste reduction as a function of process upgrade occurred among carpenters and lumber sellers.

8.3.2 How firms upgraded their processes
Firms shared their experiences on how they upgraded their processes as well as recommended ways of process upgrade within the cluster. The discussions revealed that most firms acquired their own skills, innovative tools and business insights to upgrade their processes. Some other firms upgraded their processes through trainings, workshops and sensitization platforms, technological advancements and adaptive innovations. It appeared trainings, workshops and sensitization engagements were tried and tested platforms on how firms upgraded their processes which also became the recommended way firms can upgrade their processes in future. In sharing their experiences, firm managers revealed key insights about training workshops that lead to process upgrades as evident in the quote bellow:

“…they taught us how to keep records and organize our data well, so now after the training workshop those who took the exercise serious have good records and data of everything. They also taught us why to keep data and records, these documents can help when you any institution wants to work with your firm to show your activities so some of the firms benefit from the trainings others, others too don’t mind…” Discussant in FGD with carpenters.

Sensitizations of alternative wood that could serve the same purpose for the customer were also mentioned and recommended as ways of upgrading processes as illustrated by this respondent:

“…for instance, with the carpenters we need to meet with them when a new variety is coming up to make them understand that this one you can use this wood to do this or that so that they know. Otherwise they will still say we want red wood, we want red wood meanwhile it is not available in the bush again. So if there is money like we organize meetings with the carpenters whenever we are about to bring up a new variety…” Discussant in FGD with lumber dealers.

Apart from gaining insights into how to upgrade processes, firms also upgraded their processes by adopting specific technological advancement in their area of production. Technological advancements adopted by the firms include improvement in devices and equipment used as well as better knowledge on how to operate these devices and equipment.

Adaptive technologies were other means firms changed the process of production to align with more customer demands. Adaptations were more knowledge based than device based and mostly informal innovations by firms based on their market knowledge.

8.3.3 Key actors in process upgrades
The firms were further asked to identify key actors that spear-headed innovation within the cluster. It was discovered that most process upgrades were spearheaded by non-governmental organizations, government agencies and firms within the cluster. The Forestry Commission, Kumasi Metropolitan Assembly and Technical and Vocational Education and Training Institutions were some of the state agencies involved in process upgrades. Other non-state agencies like Bosch, GIZ and DANIDA initiated both knowledge and device-based process upgrades within the cluster. More knowledge-based process upgrades came from actors within
the cluster. These were either vertically or horizontally related firms. The following quotes reveal all three actors and their roles in process upgrades in the cluster.

“…the research was by an NGO, they showed us about 130 species of wood in Ghana. So, we have wood here only we do not want to change from one variety. For instance, some people taught, oh as for Essia it is for firewood because of how we treated it, but now it is becoming hard to even get so it is good that we know…” Discussant in FGD with lumber dealers.

8.3.4 Results from Quantitative Survey about Process and Product Innovation

Generally, the responses from the quantitative survey generally supported those obtained from the focus group discussion. In that regard, most carpenters did better in innovating (39% and 42% respectively for product and process innovation). There was no clear pattern as to whether the proportion of firms innovating are increasing or decreasing for all firms except carpenters where the trend has been increasing throughout (Table 13).

Table 13: Product and process innovation (%)  

<table>
<thead>
<tr>
<th>Year</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>9.1</td>
<td>5.8</td>
<td>30.0</td>
<td>9.1</td>
<td>31.8</td>
<td>34.21</td>
</tr>
<tr>
<td>2013</td>
<td>9.1</td>
<td>2.9</td>
<td>31.6</td>
<td>9.1</td>
<td>33.33</td>
<td>36.32</td>
</tr>
<tr>
<td>2014</td>
<td>9.1</td>
<td>2.9</td>
<td>40.5</td>
<td>12.1</td>
<td>31.88</td>
<td>43.68</td>
</tr>
<tr>
<td>2015</td>
<td>9.1</td>
<td>7.2</td>
<td>44.7</td>
<td>12.1</td>
<td>33.33</td>
<td>45.79</td>
</tr>
<tr>
<td>2016</td>
<td>9.1</td>
<td>15.9</td>
<td>48.9</td>
<td>9.1</td>
<td>36.23</td>
<td>49.47</td>
</tr>
<tr>
<td>Average</td>
<td>9.1</td>
<td>7.0</td>
<td>39.2</td>
<td>10.3</td>
<td>33.33</td>
<td>41.894</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

For instance, the trend in product innovation remained unchanged for lumber sellers throughout the period under consideration, while that for process innovation increased in only 2014 and 2015. For wood sellers, the trend in product and process innovation witnessed some fluctuation; there were higher changes in product innovation than process innovation. The mode of developing product and process innovation vary amongst the different actors (see Table 14). While most lumber sellers developed their new products by either modifying their original goods or simply relying on other enterprises (33%), they developed their processes together with other enterprises within the cluster (35%). For wood sellers, most developed their products and their processes together with other enterprises within the cluster (67% and 77% respectively for product and process innovation). For carpenters, the development of new processes and products is mostly through the modification of their original goods (43% and 45% respectively for product and process innovation).

Table 14: Who developed the innovations (%)  

<table>
<thead>
<tr>
<th></th>
<th>Product Innovation</th>
<th>Process innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lumber</td>
<td>Wood</td>
</tr>
<tr>
<td>Enterprise by itself</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>With other enterprises</td>
<td>27</td>
<td>67</td>
</tr>
<tr>
<td>Enterprise by adopting or modifying goods</td>
<td>33</td>
<td>8</td>
</tr>
<tr>
<td>Other enterprises</td>
<td>33</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

In terms of the sources of the different innovations, the results show that a relatively higher proportion of the respondents knew about them through business associations; 50% for lumber
sellers, 50% for wood sellers, and 37% for carpenters (Table 15). These business associations were defined to include both those found in the cluster and those outside. Surprisingly, few respondents made use of sources such as the internet or trade shows: 5% for lumber sellers, 4% for wood sellers and 10% for carpenters.

Table 15: Source of innovations

<table>
<thead>
<tr>
<th>Source of Innovations</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through the Internet</td>
<td>5%</td>
<td>4%</td>
<td>10%</td>
</tr>
<tr>
<td>Conference Attended</td>
<td>23%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>From Parent Company</td>
<td>0%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>From Attending Trade Shows</td>
<td>0%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Through Business Association</td>
<td>50%</td>
<td>50%</td>
<td>37%</td>
</tr>
<tr>
<td>Others</td>
<td>23%</td>
<td>28%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

Unfortunately, not many respondents indicated they do receive training on innovation activities: 18% for lumber sellers, 29% for wood sellers and 37% for carpenters (see Table 16).

Table 16: Innovation training (%)

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>82.3</td>
<td>70.8</td>
<td>62.1</td>
</tr>
<tr>
<td>Yes</td>
<td>17.6</td>
<td>29.2</td>
<td>37.9</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

Mixed responses were obtained when the respondents were asked about the extent to which the cluster had promoted both product and process innovation. Whilst the carpenters were quite positive in their responses, same could not be deduced from the wood and lumber sellers. The proportion of the lumber sellers who indicated that the cluster has had no effect on their product innovations were 67%; 64% of wood sellers and 47% of the carpenters (Tables 17 and 18). Similar responses were provided for process innovation; 67% for lumber sellers, 43% for wood sellers and 45% for carpenters. However, a considerable proportion of carpenters indicated the cluster had affected their product and process innovations (46% and 41% respectively).

Table 17: Extent to which the cluster has affected product innovation (%)

<table>
<thead>
<tr>
<th>Extent to which the cluster has affected</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A very large Extent</td>
<td>9.1</td>
<td>10.1</td>
<td>7.4</td>
</tr>
<tr>
<td>Large Extent</td>
<td>24.2</td>
<td>26.1</td>
<td>45.8</td>
</tr>
<tr>
<td>No Extent</td>
<td>66.7</td>
<td>63.8</td>
<td>46.8</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

Table 18: Extent to which the cluster has affected process innovation (%)

<table>
<thead>
<tr>
<th>Extent to which the cluster has affected</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A very large Extent</td>
<td>9.1</td>
<td>15.9</td>
<td>13.8</td>
</tr>
<tr>
<td>Large Extent</td>
<td>24.2</td>
<td>40.6</td>
<td>41.3</td>
</tr>
<tr>
<td>No Extent</td>
<td>66.7</td>
<td>43.5</td>
<td>45.0</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017
8.4 Knowledge Creation and Knowledge Transmission

There are both formal and informal means of knowledge creation and transmission within the cluster. This notwithstanding, the formal means of knowledge creation appear to dominate the informal, and the former is driven by the activities of both state and non-state actors. Figure 6 summarizes the emerging themes from the discussion on knowledge creation and transmission.

Figure 6. Thematic network on Knowledge Creation and Transmission in Cluster

![Thematic network on Knowledge Creation and Transmission in Cluster](image)

The formal means of knowledge creation is led independently by both state and non-state actors. Occasionally, some occur through private public partnerships. These actors organize institutional training programs on a variety of issues pertaining to the wood sector. A typical example is the case where a private institution shared knowledge on new policy developments within the wood sector that required a change in operations from the then popular chain saw to artisanal milling. One of the respondents shared this in the quote below:

“…those days we had to organize training programs on the artisanal milling because that was what the policy required; so, we met with some of the chain saw operators and we shared the knowledge on artisanal milling with them, we couldn’t meet all of them the first time…” KII3

The other contributions to formal knowledge creation was in the form of the dissemination of research findings, mostly on the wood sector. These research activities are mostly funded by private institution, even though they are conducted by state institutions as expressed below:

“…we (referring to a state research institute in forestry) were working with a private organization who contracted us to get the properties of some timber species, we have been doing this for some time. The last one we did they published it and we shared the results with the clusters, so we also do our part to educate them…” KII4

There are also cases where sub-clusters a SWV request for formal training on specific issues within the wood sector. This is mostly from executives of these sub-clusters. For cases where funding was limited for the training of all firm managers within a particular sub-cluster, the training of trainer’s approach was adopted. The approached required the selection of some cluster members, who are trained and later expected to train other firm managers in the village.
The informal means of knowledge creation is basically through observation, since the entire value-chain can be found in one particular location. Some firm managers described instances where they acquired knowledge through interactions with firms vertical and horizontal related.

In some other instances, knowledge was informally created out of interactions with clients. Some clients requested products that require more sophisticated knowledge in executing. A carpenter shares his experience inspired by his client in this quote

“...I have a customer, she travels from abroad to buy most of her things. She wanted some furniture, so I looked at it and said told her that she should not import this furniture, I will do the same thing for her, she didn’t believe me at first so I looked at the picture and I did it for her. She was surprised, now I do all he works for her. Some of the customers will make you create new designs because of what they want…” FGD1

The responses from the quantitative analysis do not seem to be different from those obtained from the qualitative analysis. As indicated in Table 19, 5 out of 10 lumber sellers indicated knowledge was obtained through training from their local association (50%), whilst a relatively higher proportion of wood sellers (44%) and a majority of carpenters (64%) attributed it to observations (44% and 64% respectively).

| Source: Sokoban Wood Village Survey, 2017 |

Table 19: Most likely means of gaining knowledge in the cluster

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observing</td>
<td>17%</td>
<td>44%</td>
<td>64%</td>
</tr>
<tr>
<td>Training from NGOs</td>
<td>27%</td>
<td>26%</td>
<td>13%</td>
</tr>
<tr>
<td>Training from Association</td>
<td>50%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>External Sources</td>
<td>6%</td>
<td>13%</td>
<td>7%</td>
</tr>
</tbody>
</table>

When the respondents were further asked whether they believed knowledge and technology could be used to generate competitiveness in the cluster, most of the responses were in the affirmative (see Table 20): 84% for lumber sellers, 90% for wood sellers and 96% for carpenters. Unfortunately, the respondents do not believe that enough skills and financial capacity exists in the cluster for this to be realised (see Table 21); 79% of lumber sellers do not believe; 68% for wood sellers and 55% for carpenters.

| Source: Sokoban Wood Village Survey, 2017 |

Table 20: Knowledge, technology and competitiveness in the cluster (%)

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>84.8</td>
<td>89.9</td>
<td>96.3</td>
</tr>
<tr>
<td>No</td>
<td>15.1</td>
<td>10.1</td>
<td>3.7</td>
</tr>
</tbody>
</table>

| Source: Sokoban Wood Village Survey, 2017 |

Table 21: Skills and financial capacity (%)

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>21.2</td>
<td>31.9</td>
<td>45.3</td>
</tr>
<tr>
<td>No</td>
<td>78.8</td>
<td>68.1</td>
<td>54.7</td>
</tr>
</tbody>
</table>

| Source: Sokoban Wood Village Survey, 2017 |
8.5 Institutional Support and Policy Interventions and their Effect on Cluster Competitiveness

Activity in the wood processing sector in Ghana are shaped by a number of institutions, policies and regulations. Key amongst these institutions is the Ministry of Land and Natural Resources, which is vested with the oversight responsibility of the forestry and related sectors in Ghana. The primary agency under the ministry for executing the policies and programmes of the ministry is Forestry Commission. The Commission is responsible for the regulation pertaining to the utilization of forest and wildlife resources, the conservation and management of those resources as well as coordination of policies related to the sector. The Commission through the Timber Industry Development Division provides specialized services in promoting efficiency in product quality assurance and value-addition in the Timber Industry and Trade consistent with best environmental practices.

Since 1996, a number of policy frameworks have implemented to regulate and co-ordinate activities within the sector. The Forestry Development Master Plan of 1996 provided a framework that introduced strategic interventions to improve the forestry and logging subsector. A key component of the plan was the improvement of livelihoods for sustainable poverty reduction. In 2016, the Master Plan was updated to address emerging issues within the sector and guide policies within the sector for the next two decades. A central theme of the revised plan is the dissemination and absorption of improved and environmentally-friendly technologies in the downstream sector to boost employment-generating avenues within the sector. The plan also aims at improving efficiency, productivity and profitability of wood processing to increase competitiveness of local processors by setting up support centres as well as develop an incentive scheme to retrain existing processors to increase output. To facilitate the enhancement of skills, technology transfer and promote collaboration between processors, suppliers and research institutes, as well as reduce the operational and transaction costs within the secondary and tertiary subsectors, the plan envisages the development of wood processing-based clusters.

We examined the effects of public and private institutional interventions and policies on the competitiveness of clusters within the SWV using qualitative data collected from key informant interviews from five public institutions and two private institutions. The selected institutions had been involved in at least one intervention for the cluster in the last twenty-four (24) months prior to the data collection. Table 22 profiles the interviewed institutions. Quoted respondents will be identified by their IDs in Table 1.

Table 22: Profile of interviewed respondents

<table>
<thead>
<tr>
<th>Respondent ID</th>
<th>Name</th>
<th>Type of Institution</th>
<th>Key focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Tropenbos International Ghana</td>
<td>Private</td>
<td>Policy/infrastructure/ Formalization</td>
</tr>
<tr>
<td>R2</td>
<td>Forestry Research Institute of Ghana</td>
<td>Public</td>
<td>Research/Formalization and policy</td>
</tr>
<tr>
<td>R3</td>
<td>Bosch Group, Ghana</td>
<td>Private</td>
<td>Training and Process upgrading</td>
</tr>
<tr>
<td>R4</td>
<td>Kumasi Metropolitan Authority (KMA)</td>
<td>Public</td>
<td>Management</td>
</tr>
<tr>
<td>R5</td>
<td>Timber Industry Development Division (TIDD)</td>
<td>Public</td>
<td>Formalization/certification</td>
</tr>
<tr>
<td>R6</td>
<td>Member of Parliament</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td>R.7</td>
<td>Resource Management Support Centre (RMSC)</td>
<td>Public</td>
<td>Formalization and</td>
</tr>
</tbody>
</table>
The activities of firms in the SWV cluster are supported by both private and public-sector institutions through the assistance of infrastructure development and management of the cluster. Other support services come in the form of assistance in formalizing the operations of the cluster, capacity building and knowledge management training as well as empowering the cluster to be able to contribute to policy within the wood sector. It emerged that all the institutions were enthusiastic in working with the cluster compared with firms outside the cluster because the set-up of the cluster presented an organized way of dealing with actors in the wood supply chain. Again, the cluster can easily be accessed, even with fewer resources. Indeed, some of the respondents were explicit in saying, it conforms to their “training of trainers’ approach. This view is reflected in the quotation by Tropenbos International Ghana below:

“…the project couldn’t have covered every small and medium scale enterprise that is why in the first place we picked peer trainers so that in WAG (name of cluster) we have somebody who has been trained to go and train others in their association, but we can’t say we are going to train individual firms and ask them to train other individual firms because they are not in any group association that is the same approach we took in Sokoban…”

8.5.1 Site development and management
The management of the cluster has gone through various phases. The cluster was initially managed by a private consultancy firm, however the local government (KMA) took over the management as result of perceived mismanagement on the part of the private firm. According to one of our key informants, the private consulting firm was unable to generate adequate revenue for the appropriate functioning of the cluster. The reasons for the changeover was described in the quote below:

“…Sokoban was managed by a private consultant for a long time. KMA just took over the management because the private consultant was unable to raise enough funds to provide the required development projects in the village and also repatriate revenue to the KMA. That was why KMA took over just a while ago…” R4.

Currently, KMA has setup a management structure at the cluster to oversee the daily functioning of the SWV. Management of the facility generates revenue through payments of periodic fees by firms operating within the cluster. A portion of the generated funds is used to address sanitation and security issues within the cluster. The management mandated by the KMA to oversee the running of the village work in tandem with the executives of the various sub-clusters in SWV. The activities of the management are summarized in the quote below:

“…KMA (Public institutions that manages the cluster) is here to ensure revenue generation, proper sanitation and public safety. That is why KMA is here in Sokoban…”

Infrastructural development within SWV are funded by both private and public organisations and this decision is based on the interest and mandate of the organization, and in certain cases when essential needs of the cluster are identified. For instance, to enhance education of firms in the village a private organization established a public-address system in the cluster. Additionally, an administration block equipped with offices and conference facilities was provided by a private entity for the development of village. The KMA, a public institution, provided the village with street lightening system to address the insecurity at the village at night, providing the opportunity for firms to increase their working hours. The provision of
these infrastructural developments was the product of interactions between the institutions and the executives of the various associations within the cluster.

8.5.2 Formalizing operations

Firms located within the enclave have undertaken various upgrades in their operations to enhance their competitiveness, and these upgrades have been consistent with standards within the wood sector. Firms have received assistances from both the private and public institutions for upgrades they have undertaken over the years and this explains why the upgrades are consistent with the industry’s standards. Three specific instances cited by respondents to describe how their engagements with SWV transformed their operations from formerly illegal practices to current institutionally acceptable standards of operations as reflected in the following quotes:

“…The idea was to convert those who were into illegal chain saw milling into artisanal milling so the whole production chain were gathered in clusters, so they had the head porters, the people who actually use the chain saw to log and the firm owners who fund the logging into clusters. They were trained technically in chain operations and business management. On pilot basis, we gave some of those clusters artisanal machines so that they would move from doing the illegal thing to doing the legal thing…” R.1.

“…The Timber Industry Development Division wanted to organize wood depots in the country and that also coincided with the establishment of the wood village. The intension was to use Sokoban as a large wood depot where the TIDD can regulate the activities of illegal logging by turning illegal logging activities into legal operations that can still supply the local market…” R.6.

“…when we go and check their loading we educate them on the proper ways of acquiring and managing the timber. And the thing is that because we have to issue the certificate before they travel outside Kumasi with their wood they listen to us. We have our challenges but we have been able to get some of them to do the right thing. So that one too has helped them....” R5.

A respondent from a public institution shared with us a technological advancement that the institution will be initiating to check and verify wood species sold on the market as a way of ensuring that the firms in the cluster comply with transparent marketing policies. This has become necessary as firms turn to sell alternative wood species to unsuspecting consumers, as the original species are extinct. This view was expressed by the Forest Research Institute of Ghana and it’s quoted below as:

“…another challenge is identification, when you go to the market they (wood clusters) will tell you that there is Wawa and there is pure Wawa; meanwhile these are too different species all together. So, we have identified all those things, because it is difficult to get Wawa they use the juvenile wood and that easily deforms. The way forward is that now we have what we call the Xylothrone, and the Xylothrone we are going to input data from about hundred common species and their properties so that when you are buying your wood we identify the exact wood you are buying within seconds this will help to improve the marketing practices to higher standards …”

There are public institutions charged with the responsibility of regulating the operational activities of the cluster. These institutions are legally mandated to design policies that regulate wood exploitation activities. These policies become laws that formalized the activities of firms in the cluster.
8.5.3 Policy engagements
Once the public institutions assist in formalizing the operations of the cluster, the firms are empowered to dialogue and engage with higher level regulatory institutions. The formalization of their activities as a group give the firms a leverage to negotiate directly with government to address the needs of the industry. This is evident in the quote below.

“...at first, they were not even able to meet with the FC (Forestry commission), but now they come together and interact with the FC. They admit the things they do wrong and FC also accepts what they can do right. Now they can express their issues without any antagonism even at the highest level...” R1.

We also found evidence which suggest that both public and private institutions have collaborated to provide assistance to the firms in the cluster and this has enabled the firms to contribute to the Domestic Lumber Market Policy and the Public Procurement of Local Wood Market Policy. The private institution created interactive platforms that allowed the cluster representatives and policy makers to dialogue. The quote below describes how an institution was able to empower the cluster in this direction:

“...particularly in Sokoban, I do not know if you have heard of this Domestic Lumber Traders Association, DOLTA. Small scale traders in wood were organized under one umbrella -DOLTA so that they can have influence and leverage in designing policies that affect the trade and the firms. The members were therefore given training in policy advocacy and bringing them together as a group gives them a voice. Through this creation and training the project and together with the traders came up with the Domestic Lumber Market Policy, helping the Ministry of Lands and Natural Resource to formulate the public procurement policy for legal wood for domestic market…” R1.

8.5.4 Training/capacity building and knowledge management
Some institutions provided training programmes on technical operations of the firms in the cluster, leading to process and product upgrades. The firms turn to receive these training sessions from both private and public organizations. In certain cases, the executives of the cluster acquire the services of consultants to develop proposals for funding of training programmes for their members. A key informant from a public institution shared his institutional experience with training programs that led to process upgrades among the firms in the cluster in the quote below

“…that project which we called TILCAP had two parts, one, to train small scale firms which were mostly informal to be able to comply with the Timber Legality Assurance System of the VPA (Voluntary Partnership Agreement). And secondly because the VPA arrangements were going to affect their business, a research by --- (Name truncated) who is now he is now an MP showed that as at the time where the VPA arrangements were made more than eighty percent of the wood products in Sokoban were illegally acquired so it was necessary that an intervention went in to help them know about the VPA and the second component was how to get them to build a voice for advocacy…” R1.

In addition to the provision of technical skills training, public institutions conducted research and disseminated findings that informed the operations of clusters as described below:

“…through research we have realized that they (reference to wood clusters) do not know the technical properties in the lesser known lesser used species. So we do the studies every year
and there are a number of species with their technical properties that we publish for the clusters to learn from. We have successfully promoted thirty-four species and as I speak today these are the species making the industries survive....” R.2.

8.5.5 Challenges in implementing interventions and policy engagements

Some of the institutions lamented the divisive attitudes of some of the firms in the cluster that tended to impede the success of interventions in Sokoban. Different institutions described their experiences with project interventions that were unsuccessful because of the divisive nature of clusters in the quotes below:

“...There is a point worth noting about Sokoban in Particular, when you go there you will see that they are very divisive, when you go there right now you will see over 15 groups. So it is difficult just bringing them together like this to do something. So one thing we did was to respect the existing grouping but also have like an umbrella group so that all the leaders of the representatives can be part, because it is very difficult breaking that grass root groupings so that is why the various executives of Sokoban are representatives of the various clusters in the wood village...” R.1.

Further probing into the negative impact of the divisive attitude among some of the firms in the SWV revealed that national institutional interventions which were successful in other clusters in the country were unsuccessful in SWV due to these negative tendencies.

“...Interviewer: Then I don’t think that DOLTA was successful in terms of sokoban but maybe nationally yes
Respondent: Yes nationally yes but Sokoban it was not successful basically because of their divisions over there, the different, different groups were too much...” R1.

A comparison of firms in the SWV with other clusters on the issue of the divisive tendencies revealed that this negative attitude could be traced to the activities of the existing associations and some entrenched interest prior to relocation to Sokoban. This points to the fact that the functional relationship amongst the various associations in the cluster is quite weak.

Other respondents were of the perception that struggling for power among the associations in the cluster also contributes to the divisive tendencies in SWV. Both the public and private institutions cited lack of funds as a key challenge to institutional interventions. They expressed concerns that their activities were constrained due to inadequate funds and in the process, they had to vary the coverage of some of the projects implemented.

8.5.6 Sponsored training programmes

This section reveals both positive and negative impacts of institutional and public policy interventions on competitiveness of clusters. Clusters in SWV received sponsorship for training programs from public institutions. Cluster members who benefitted from training programs funded by public institutions indicated that the skills they acquired from such training engagements helped their cluster to upgrade its products and processes of operations in ways that made the cluster competitive on the market. The quote below shows how cluster competitiveness was expressed as a result of public funded training programs.

“...those of us who took the training serious are benefitting. When you draw your patterns well and you know how to do nice finishing it helps to increase the price of your product. When people complain about the price of the doors and they go to other places they come
back and they see that the doors you have made is very quality so most of them will come and buy from you after comparing your work with other works, so the trainings help us …”

Discussant from FGD with carpenters.

The extent to which public funded cluster level trainings enhanced competitiveness depended on adoption and application of acquired skills by firm managers. A discussant expressed this assertion in this quote during the discussion on the benefits of public funded training programs below

“…the cluster will get the trainings, but some of the firm managers will act like they have didn’t receive any trainings. We have been trained on safety but if I take you round the enclave you will be surprised when you see what some firms are doing. You will see someone using their bare hands to handle wood from a running machine. Most of us do not like to learn…” Discussant in FGD with carpenters.

In addition to state sponsored training programs, the firms in the cluster have also received assistance from government agencies towards attaining some sector accreditation. The Voluntary Partnership Agreement (VPA) certification was the most cited wood sector certification that government supported the cluster to attain. Attaining VPA certification increased the marketing opportunities for the clusters by making them eligible to export to European markets.

In some instances, respondents perceived some public policies to be having negative effects on the cluster’s performance. Some discussants indicated that government environmental control policies that regulated extraction of minerals, negatively affected their access to wood as a critical natural resource required by the cluster for operations.

In summary government institutions made more positive impacts towards making the clusters more competitive, there were few instances where outside cluster public policies indirectly affected cluster competitiveness negatively. There were also private institutions who actively training programs to firms located within the SWV.

8.5.7 Respondents View on Institutional Support and Policy Interventions
To determine the types of institutional support as well as policy interventions that are available for the wood cluster and how effective they have been, the respondents were asked whether they had received any business support within the past twelve months. Most lumber sellers (64%) had received some business support, while wood sellers (64%) and carpenters (57%) had not received any such business supports (see Table 23). The business support is usually in the form of skills training (94%). Surprisingly, very little attention is given to development of innovative ideas (5%) and technological diffusion (1%). The skills training support was offered by the government, NGOs, and business associations (see Table 24). The innovative ideas were mainly supported by NGOs/Donors.

<table>
<thead>
<tr>
<th></th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>63.6</td>
<td>36.2</td>
<td>43.2</td>
<td>43.8%</td>
</tr>
<tr>
<td>No</td>
<td>36.4</td>
<td>63.8</td>
<td>56.8</td>
<td>56.2%</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017
Table 24: Types of business support and who offered the support (%)

<table>
<thead>
<tr>
<th>Support Type</th>
<th>Government</th>
<th>NGO/Donor</th>
<th>Business Association</th>
<th>Private Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skills Training</td>
<td>96.2</td>
<td>83.3</td>
<td>95.8</td>
<td>100</td>
<td>93.7</td>
</tr>
<tr>
<td>Developing an Innovative Idea</td>
<td>2.5</td>
<td>12.5</td>
<td>4.2</td>
<td>0</td>
<td>4.7</td>
</tr>
<tr>
<td>Technology Diffusion</td>
<td>1.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>4.2</td>
<td>0</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total Number</strong></td>
<td><strong>79</strong></td>
<td><strong>24</strong></td>
<td><strong>24</strong></td>
<td><strong>1</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

When the respondents were subsequently asked how supportive the public sector has been for the wood sector, most of them indicated they were less supportive. Indeed, 79%, 74% and 59% of lumber sellers, wood sellers and carpenters respectively indicated the policies were less supportive (see Table 25).

Table 25: Government’s support for the sector (%)

<table>
<thead>
<tr>
<th>Support Type</th>
<th>Lumber</th>
<th>Wood</th>
<th>Carpenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>More supportive</td>
<td>9.1</td>
<td>7.2</td>
<td>14.7</td>
</tr>
<tr>
<td>Equally supportive</td>
<td>12.1</td>
<td>18.8</td>
<td>26.3</td>
</tr>
<tr>
<td>Less supportive</td>
<td>78.8</td>
<td>73.9</td>
<td>58.9</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

The respondents were also asked whether in their view they thought infrastructure - roads, power/energy, telecommunication, water and transport - had improved. As indicated in Table 26, about 91% of respondents were of the view that the state of the roads had gotten worse. Nearly half of the respondents confirmed that the power/energy situation had improved. The study goes further to assess the major obstacles to the operations of businesses within the cluster currently (see Table 26). In relation to the wood industry value chain, the study found that inadequate/unreliable supply of raw materials evidently stands out as the major challenge (91%) (see Table 27). Furthermore, we found that the high costs of raw material has been a concern for about 84% of the respondents, followed by a concern about the poor quality of raw materials (58%) and the lack of access to finance (57%).

Table 26: Infrastructural Improvement (in Percentages)

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Roads</th>
<th>Power/Energy</th>
<th>Telecommunication</th>
<th>Water</th>
<th>Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved</td>
<td>2.7</td>
<td>48.3</td>
<td>38.7</td>
<td>31.5</td>
<td>27.7</td>
</tr>
<tr>
<td>Worsened</td>
<td>91.1</td>
<td>21.6</td>
<td>6.5</td>
<td>19.2</td>
<td>25.3</td>
</tr>
<tr>
<td>Not changed</td>
<td>6.2</td>
<td>30.1</td>
<td>54.8</td>
<td>49.3</td>
<td>46.9</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017
Table 27: Biggest obstacles to business (%)

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>No obstacle</th>
<th>Minor obstacle</th>
<th>Moderate obstacle</th>
<th>Major obstacle</th>
<th>Very severe obstacle</th>
<th>Does Not Apply</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor Quality of Raw Materials</td>
<td>13.7</td>
<td>8.6</td>
<td>19.5</td>
<td>33.6</td>
<td>24.3</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Inadequate/Unreliable Supply of Raw Materials</td>
<td>1.4</td>
<td>2.4</td>
<td>4.4</td>
<td>30.5</td>
<td>61.0</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>High Costs of Raw Materials</td>
<td>2.4</td>
<td>2.4</td>
<td>11.3</td>
<td>37.7</td>
<td>45.9</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Access to finance</td>
<td>5.5</td>
<td>11.0</td>
<td>24.7</td>
<td>33.6</td>
<td>22.9</td>
<td>1.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Tax Rates</td>
<td>29.4</td>
<td>32.2</td>
<td>25.3</td>
<td>9.9</td>
<td>2.0</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Tax Administration</td>
<td>29.8</td>
<td>25.0</td>
<td>18.5</td>
<td>8.2</td>
<td>2.7</td>
<td>8.9</td>
<td>6.8</td>
</tr>
<tr>
<td>Corruption</td>
<td>31.2</td>
<td>12.0</td>
<td>14.0</td>
<td>19.9</td>
<td>12.0</td>
<td>7.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Courts</td>
<td>45.5</td>
<td>14.7</td>
<td>7.9</td>
<td>2.4</td>
<td>1.0</td>
<td>20.9</td>
<td>7.5</td>
</tr>
<tr>
<td>Political Business Cycles</td>
<td>22.6</td>
<td>22.3</td>
<td>17.1</td>
<td>18.8</td>
<td>9.6</td>
<td>7.2</td>
<td>2.4</td>
</tr>
<tr>
<td>Inadequately Educated workforce</td>
<td>53.8</td>
<td>25.7</td>
<td>11.0</td>
<td>4.1</td>
<td>0.3</td>
<td>3.8</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Source: Sokoban Wood Village Survey, 2017

9 Conclusion

The focus of this study was to examine the potential of industrial clusters in promoting industrial development in developing countries. Using the wood processing cluster in Ghana’s second largest city of Kumasi as a case study, this paper sought to assess the growth potential of industry and firms in Ghana located in the wood cluster.

To examine how the cluster has affected performance, the survey sought from the respondents their average values of sales and revenues from 2012 to 2014. In addition, the respondents were asked to rank the extent to which they thought operating within the cluster had affected their profitability and sales revenue. On the objective measures of performance, we found that both sales revenues and profitability have been lacklustre. In particular, profitability has been on a declining trend over the last five years in particular for almost all the actors in the cluster.

However, when we examined the qualitative responses on the extent to which they believed the cluster had affected their profitability, most of the respondents were of the view that their location within the cluster has had positive impacts on their profitability and sales. This is an interesting finding in that it suggests that the firms could have been worse off but for the cluster. In general, the conduits through which the cluster exerted positive effects on the firms were through training programs, commercial recognition, cheaper procurement and operational supports. The benefits of the commercial recognition appeared largely relative to the other factors. This is because the existence of the cluster provides a lot of convenience to customers in terms of executing their transactions.

The study also sought to understand how firms located within the cluster upgraded their products and processes. It emerged from the study that most of the innovation that took place within the cluster are in processes - most firms introduced new processes than new products. More often than not firms-initiated process upgrades because they want to adapt to changing demands, reduce waste (cost) and add value to their products. When probed about the sources of the different innovations, it emerged that business associations were the main vehicles for transmission of innovation. Surprisingly, few respondents made use of sources such as the internet or trade shows. We investigated the extent to which the cluster had promoted both
product and process innovation. The responses were mixed but they pointed to the fact that the role of the cluster in promoting innovation was minimal. Unfortunately, not many respondents indicated they do receive training on innovation activities.

There are a number of institutions, policies and regulations that govern the wood processing sector in Ghana. The activities of firms in the SWV cluster are supported by both private and public-sector institutions through the assistance of infrastructure development and management of the cluster. Other supports come in the way of assistance in formalizing the operations of the cluster, capacity building and knowledge management training as well as empowering the cluster to be able to contribute to policy within the wood sector. Despite the availability of institutional support (both public and private), issues such as scarcity, cost, quality of raw materials, and the lack of access to finance have hindered the growth of industry.

There are a couple of policy implications from this paper. First, there is the need to recognize that clusters can boost industry growth, but this can mostly be effective when the institutional frameworks that support their existence are strengthened. Second, clustering can facilitate knowledge creation and knowledge transmission and both can be enhanced by institutions (both public and private). Lastly, there is the need to recognise that the wood sector in Ghana is facing some difficulties in recent times and it is important that policy makers re-prioritise it.
10 References


11 Appendix: Supporting Transcriptions

A1. Cluster Structure and Firms Performance
i. A carpenter describing how SWV to be noted for particular products and services:
   “…you have your customers and I have mine, you see? That one is there, and when somebody wants something they know that we the carpenters are here so they come, even some people get their contracts and bring it here because they know we are all here…”
   Discussant in FGD with carpenters.

ii. A transporter sharing an experience where his membership in the transport cluster in SWV prevented him from incurring heavy losses:
   “…as for the small monies on the road you will pay but onetime I got into trouble with the police and I called chairman to help me out. They seized my load on the road. So, if you are a member you can call for someone to speak on your behalf when you get into trouble. They know our group leaders…”
   Discussant in FGD with transporters.

iii. A lumber dealer explaining how training opportunities was accessible to some firms
   “…the last time we went for a training program. They taught us how to treat wood that will make good finishing. Those who were members of the cluster were invited because the invitation came to the cluster and them later those who did not want to be part of the cluster were bitter about why they were not invited meanwhile nobody has asked them not to be part of the cluster…”
   Discussant in FGD with lumber dealers.

A2. Local Inter-Organizational Collaborative Interactions
i. A carpenter expressing concern about the competitive nature of firms in the cluster
   “… it happens. Your fellow carpenter will take your customer away from you. As for me I do not even trust my brother. If I do not have what my customer wants I will take the order and give to you but I will not make you meet my customer. They do it a lot here…”
   Discussant in FGD with carpenters.

ii. A carpenter expressing a view about factors that can impede effective collaboration
   “…it is good to work with ourselves, but some people do not know how to do the job the contract wants and if that happens that will spoil the work for all of us, I am a frame specialist and not everyone can work to my standard so it becomes hard to work with some carpenters here…”
   Discussant in FGD for carpenters.

A3. Reasons for process upgrades
i. Carpenters and lumber sellers explained how wastes products became useful after upgrading process in the quotes below
   “…we keep on learning as time goes on, now we don’t throw away the small pieces of wood anymore we join them together and use them when roofing houses…”
   Discussant in FGD with carpenters.

   “…initially we were not using the firewood for anything because they were small, but now we split them into two by fours and two by tows for roofing so we so not waste them anymore…”
   Discussant in FGD with lumber dealers.
A4. How firms upgraded their processes
i. Lumber sellers expressing their views on technological advancements
   “...it was forestry commission and some NGO who did some research and said that the
   machines they were using to cut the wood was not good, it was wasting a lot of the wood so
   they brought about new machines. The new machines were capital intensive so they came up
   with artisanal machines, maybe you people will know about it. So we started using the
   artisanal machines to improve the cutting and that one the cutting was better...” Discussant
   in FGD with lumber dealers.

   “...those days carpenters were using Odum (local name for a timber species with botanical
   name Milicia Excelsa) to make furniture frames. Everyone wanted Odum, so it got to a time
   Odum was getting scare, but the customer also wants that kind of frame, so they started using
   Essia for the furniture frames and it was like the Odum...” Discussant in FGD with lumber
   dealers.

A5. Knowledge Creation and Knowledge Transmission
i. A respondent from a public institution and an executive of an association shared their
   experiences
   “...sometimes you will be there and you receive a call from that .... Dr. this is our cluster,
   then they tell you their new name. They will ask you to call them for seminars to share some
   of the things we find out. So we get some of their associations get the members to learn new
   things, we share our results with the lumbers and carpenters on the speech...” KII2

   “...we write to COTVET and other organizations. We write proposals to them and sometimes
   they respond and give us trainings for us to acquire knowledge...” FGD1

ii. A key informant from a private institute described how training was organized with limited
    funds
   “...we were supposed to train artisans from all over Ghana so we decided to invite some to
   come for the training. We had funding challenges so for Sokoban we brought in some
   lumbers to take part in the training and the plan was that they will go and train their other
   cluster members, you know they have different lumber groups so we picked from all the
   groups and that worked...” KII2

iii. Some firm managers described instances where they acquired knowledge through
     interactions with firms vertical and horizontal related:
     “...as for the learning, sometimes you see someone doing something different, you watch and
     learn. There are nice designs. Somethings I also create something and other colleagues see it
     they will also learn from me...” FGD1

     “...knowledge is not in one person’s head. We all learn from each other, so if you see
     another master (firm manager) doing something that you do not know you pay attention and
     you learn from that person...” FGD1

A6. Site development and management
i. A key informant describes the activities of KMA:
   “... KMA (name of public institution) brought the street lights here. There `were no street
   lights here. We provided street lights, now you can see that there are street lights all over
   here, these are some of the things we can also do to help them ...”
ii. A key informant describing how infrastructural developments are brought to SWV
“...to start with even the project didn’t have that component, so it came up as a need along the line so we needed to adjust our budget to suit that information center because we realized that it was a good exist strategy, the name of the project was TILCAP. That is Timber Legality and Compliance and Advocacy Project…” R1.

A7. Formalizing operations
i. A key informant describing how their engagements with SWV transformed their operations from formerly illegal practices to current institutionally acceptable standards of operations
“...it was a very good thing for illegal chain saw operators in the wood village to come and say we want to cut from legal sources than going to the reserves at night. So we assisted them to start the plantation so that they can harvest later from a legal source...” R.7.

ii. A Key Informant Interviewee (KII) describes how their policy directives have formalized the activities of clusters in the quote below:
“...we the RMSC that is the Resource Management Support Center, as a branch of the Forestry Commission; we are the technical wing. We produce documents, we come up with guidelines that guide activities in the forest so all the firms in the cluster operate with the guidelines that we have put together... R.7.

A8. Policy engagements
i. The formalization of their activities as a group give the firms a leverage to negotiate directly with government to address the needs of the industry.
“...there (Clusters) were also in a discussion to get exemption from input duties, in this regard they met with government officials and this was made possible because the firms find themselves in a cluster. They got far with the discussions. They have been asked to prepare a technical paper that would be used to finalize the process. So they have a voice at the high level…” R.6.

A9. Training/ capacity building and knowledge management
i. A key informant from a public institution shared his institutional experience with training programs that led to process upgrades among the firms in the cluster
“...we are interested in the efficient utilization of wood in the Sokoban wood village so we came together with Tropenboss (name of private institution) to train some of the clusters. I call it portable milling but it was also called artisanal milling by some of the project….” R.2.

“...we announce our trainings through the information center. Some of them come for training. They gather around and we teach them how to use the machines…” R.3.

“...it is good that they have the information center, so now we go there to educate them on VPA, climate change and the rest. Even though some of them are stubborn like as for us we will not listen, as for us we will not listen (local chant of objection) a lot of them too listen and they put the information to use, now the Chain saw activities have drastically gone down it is not like before so the more we talk to them the more they change their attitude…” R.7.

A10. Challenges in implementing interventions and policy engagements
i. Key informants describing challenges at the SWV
“...Sokoban their main problem is that they have to come together. They have too many groups. The wood village is a very big place that if they write proposals we they can do a lot
of great things. The organizations are doing their best but the clusters today they are this group and then tomorrow they are this group…” R.7.

“… I think so too, because before Sokoban when they were by the road side some found themselves in Oforikrom at the back there (reference to location of previous cluster before SWV) so they knew themselves from those places and they brought those divisions to Sokoban, so those divisions always existed even before Sokoban…” R.1.

“…the problem is the many associations coming up, they have DOLTA, FAWAG and the WAG and the reason why they have all these groupings is the struggle for power which is not heloing them…” R.2.

“…we have to do a lot of research on the species and processing but we do not have enough funds…” R.2.

“…the project could not reach the entire wood village because we did not have enough funding so now the clusters on the other side are also complaining that we could not get there…” R1

“…there were a lot of things we have to do but we need money to be able to check undertake those activities well…” R5.

A11. Sponsored training programmes

A discussant’s perception of the negative impacts of some government regulations on the performance and competitiveness of clusters

“…the ‘galamsey’ (illegal small-scale mining in Ghana) operators have negatively affected our work with what they do. I say this because since the government decided to stop galamsey operations it has affected our access to wood because now the sawmills operators do not get enough wood so now we are also suffering because we are not getting enough wood to work with…” Discussant in FGD for carpenters.
## A12: List of Associations

<table>
<thead>
<tr>
<th>Name</th>
<th>Focus Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana Sawn Timber Association</td>
<td>Timber logging</td>
</tr>
<tr>
<td>Israel Lumber Sellers Association</td>
<td>Timber logging</td>
</tr>
<tr>
<td>Real Israel Lumber Sellers Association</td>
<td>Timber sellers</td>
</tr>
<tr>
<td>Sapatre Lumber Sellers Association</td>
<td>Lumber selling</td>
</tr>
<tr>
<td>North Lumber Sellers Association</td>
<td>Lumber</td>
</tr>
<tr>
<td>Firewood (offcuts) Lumber Sellers Association</td>
<td>Lumber</td>
</tr>
<tr>
<td>Hardware and plywood Association</td>
<td>Hardware</td>
</tr>
<tr>
<td>Small scale carpenters/Anloga Carpenters Association</td>
<td>Carpentry</td>
</tr>
<tr>
<td>Freedom Carpenters Association</td>
<td>Carpentry</td>
</tr>
<tr>
<td>Wag carpentry Association</td>
<td>Carpentry</td>
</tr>
<tr>
<td>GPRTU</td>
<td>Transportation</td>
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</table>