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Clusters, Knowledge and Firm Performance

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Abstract

The challenge facing Ghana, as with many other African countries, is the need to transform from a resource-dependent economy to a dynamic, diversified industrial economy. To this end, governments have pursued policies and strategies to boost the productivity and competitiveness of the industrial sector, both domestically and globally. Agglomeration, referred to as the geographical clustering of firms, has been widely explored as a potential solution. The focus of this study is to examine the potential of industrial clusters for promoting industrial development in developing countries. To this end, the study aims to assess the growth potential of clustered industries and firms in Ghana, using the wood processing cluster in Kumasi as a case study. The Sokoban Wood Village is located in Kumasi, and is the nucleus of the wood processing sector in Ghana. The wood village is a 12 hectare, USD 10 million, ultramodern facility funded by the French and Ghanaian Governments, and is designed to accommodate about 1,000 wood processors. Currently, there are about 1,000 sheds in the enclave with an estimated population of 1,500 carpenters, lumber millers/sellers, hardware retailers, plywood sellers and saw millers engaged in a range of economic activities. To examine how the cluster has affected performance, we asked respondents to provide the average values of their revenues from 2012 to 2016. From this measure of performance, we found that both sales revenues and profitability have been disappointing. Profitability, in particular, has declined over the last five years for almost all the actors in the cluster. However, when respondents were asked to rank the extent to which they thought operating within the cluster had affected their profitability and sales revenue, most of the respondents were of the view that

the cluster had had positive impacts on their profitability and sales. This is an interesting finding in that it suggests that the firms may have been worse off if it were not for the cluster. In general, the means through which the cluster exerted positive effects on the firms were: training programs, commercial recognition, cheaper procurement and operational support.

Keywords Industrial Policy • Clustering • Innovation • Knowledge Sharing • Firm Performance

JEL Classification O14 • O25 • O30 • L10 • R12

Introduction

The development and promotion of a productive, competitive and sustainable industrial and manufacturing sector remain at the heart of the structural transformation agenda for many developing countries. Many African economies are still heavily dependent on the production and export of primary products and, consequently, suffer from the risks associated with this dependence. The challenge facing Ghana, as with many other African countries, is the need to transform from a resource-dependent economy to a dynamic, diversified industrial economy. The Sustainable Development Goals (SDGs) also highlight the importance of creating good jobs. Goal 9 includes a target to 'significantly raise industry's share of employment and gross domestic product.'

The industrial and manufacturing sector has the potential for 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. Adding value to primary commodities is expected to reduce the vulnerability of emerging economies to global commodity price shocks. To this end, governments have pursued policies and strategies to boost the productivity and competitiveness of the industrial sector both 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 infrastructure and an unreliable supply of raw materials and manpower. These challenges are exacerbated by the difficulties in choosing appropriate sites for firms.

Agglomeration has been widely explored as a potential solution. This refers to the

geographical clustering of firms and the effects this has on cost, productivity or profits. The mechanisms central to the theory of agglomeration include factors such as spillovers (diffusion of innovations to other enterprises) and the creation of externalities by the transfer of technology and knowledge (North, 1973).

An essential component of industrial policies in developing countries is the focus on alleviating 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 lack of geographical proximity between firms. Industrial development policies have, therefore, focused on creating special industrial zones as a means of promoting inter-firm networking and supporting the growth of small- and medium-scale manufacturing industries. Industrial estates provide essential ancillary services that are expected to reduce the cost of production for firms operating within these zones. These industrial zones or clusters provide a network of nodes and links between firms that facilitate the diffusion of knowledge and technology, as well as promote innovation.

Clusters have been defined in different ways in the literature on 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.” Porter (1998), on the other hand, defines 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 of the main characteristics of industrial clusters. Firstly, clusters involve

geographically proximate firms, producing related goods. Secondly, clusters involve inter-firm networks that facilitate the exchange of knowledge and technology. The geographical proximity of enterprises may provide benefits that are not available to dispersed enterprises (McCormick, 1999). The definitions also highlight the fact that the benefits of spatial agglomeration are maximized when firms are operating in related industries, especially in developing countries.

The use of clustering as an industrial development strategy has garnered attention in the economic literature. Such studies have focused on the experiences of the newly industrialized countries of Southeast Asia and Latin America. The evidence from these empirical studies suggests that clusters serve as engines of local economic growth and hubs for innovation. The success of industrial clusters in newly industrialized countries has persuaded 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 the potential for agglomeration economies rather than policies that lead to price distortions.

The focus of this study is to examine the potential of industrial clusters for promoting industrial development in developing countries. To this end, the study aims to assess the growth potential of clustered industries and firms in Ghana. 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 the competitiveness of the clusters?

Literature Review

Industrial clustering within geographical regions has been found to have some effects on firm performance and knowledge creation (Marshall, 1920; Gilbert et al., 2009; McCann and Folta, 2011 and Delgado et al., 2014). These effects, which are largely positive, could be due to a variety of factors. For instance, Lee (2009), Morosini (2003), and Dahl and Pedersen (2004) have shown how industrial clusters can facilitate innovation and foster regional economic development through the creation of channels for learning and the diffusion of knowledge, thereby creating intricate relationships of cooperation and competition between firms. Belusi (1999), Enright and Roberts (2000), and Dahl and Pedersen (2004) have also shown how industrial clusters can provide a system of networks that facilitates cooperation between firms within a production process or value chain. This cooperation is possible because of collective learning (Belusi, 1999) and the inter-firm transmission of tacit knowledge – a form of social capital. This enables clustered firms to achieve synergies and leverage economic advantages from shared resources (Enright and Roberts, 2000; Dahl and Pedersen, 2004).

Through the sharing of conditions and experiences, Eisingerich et al, (2010) have shown how industrial clustering increases the speed and ease of finding, accessing and transferring valuable knowledge that may not be codified. In most developing countries, industrial clusters tend not to have formal and codified relationships to facilitate the dissemination of innovations and technology. Rather, interactions between firms tend to be based on personal relationships. In this context, identifying the role of clusters in facilitating innovation and learning may be more complex.

McCormick (1999) identifies three channels through which industrial clusters affect the growth and performance of firms. Firstly, proximity creates efficiency that leads to comparative advantages. Secondly, 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 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 arise primarily from firms sharing networks and information, suppliers, customers and infrastructure. 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 help attract foreign direct investment.

However, studies by Suarez-Villa and Walrod (1997) and Beaudry and Breschi (2003) caution that innovation requires more than just geographical agglomeration. Indeed, while evidence from Sonobe et al., (2011) and Gebreyesus and Mohnen (2012) shows significant effects of clustering on enterprise growth and innovation performance in metalwork clusters in Nairobi and Ethiopian footwear clusters, the lack of comprehensive industrial cluster and zoning policies constrained the effect of geographical agglomeration of firms to promote technological absorption and innovation.

Bottazzi and Perci (2003) also find that investment in research and development increases innovation within an industrial cluster, but with minimal spillover effects on other firms, while Freel (2003) concludes that the innovations of small firms are localised.

Beal and Gimeno (2001) show that inter-firm rivalry arising from clustering reduces firms' commitment to innovation. Auderstsch and Feldman (2004) suggest that the spillover of technical knowledge involves substantial cost, which may be a barrier to knowledge diffusion among small firms. Furthermore, they attribute low levels of innovation within clusters to heterogeneity in firm knowledge. Lee (2009) finds that the effects of clustering on firm innovation depends on firm-level characteristics that are related to the firm's absorptive capacity.

The post-2015 global development agenda recognizes the urgency of developing sustainable industries and fostering innovation to support economic development and human welfare. SDG 9 includes a target to increase the share of industrial output in gross domestic product, doubling industrial output in least developed countries. It also aims to increase the access of SMEs to affordable credit and integrate such enterprises into value chains and markets; and to increase resource-use efficiency and the adoption of environmentally sound technologies. To upgrade the technological capacities of industries, the SDGs encourage governments to pursue policies that promote innovation as well as increase public spending on research and development.

Background — Clustering and Industrial Policy In Ghana

In the period following Ghana's independence in 1957, the new government set out to pursue an agenda for rapid industrialization. The government considered industrialization as a key component of the structural transformation and modernization of the country. The agenda was seen as

part of a broader set of policies to wean the newly independent state off its colonial masters, as well as to diversify the predominantly agrarian economy. At the heart of Nkrumah's (Ghana's first president) industrialization agenda was the creation of protected import substitution industries. The government believed this strategy would reduce dependence on primary exports and break the cycle of poverty (Killick, 2010). Primarily, 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 also set up industrial clusters to serve as hubs for manufacturing and 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 industrial sector and make it internationally competitive. The ERP/SAP era marked a significant shift in the industrial policy paradigm in Ghana. The ERP-era industrial strategy focused on private sector-led initiatives. The focus of industrialization was on exports as it was believed that this would help to resolve the underlying macroeconomic imbalances in the country. These programs led to a number of reforms such as the privatization of non-performing state-owned enterprises, the 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 increases in industrial output were short-lived.

The post-ERP era has seen subsequent governments implement a range of policies and strategies to revive the manufacturing subsector. Medium-term development programs (GPRS I, GPRS II, GSGDA I and GSGDA II) were implemented to promote the creation of spatially concentrated industries as a mechanism for facilitating the transfer of technology, knowledge and innovation between small- and medium-sized firms. There is 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 government or private interventions. For example, under the Ghana Trade and Investment Gateway Project, Ghana, with the support of the World Bank, established industrial parks – or export processing zones (EPZs) – under the Ghana Free Zones Board. These EPZs were to serve as investment destinations for attracting foreign direct investment (FDI).

The current medium-term development objective is to achieve sustained economic growth through the structural transformation of the economy via agricultural modernization, industrialization and value addition – through a vibrant and competitive private sector, within a framework of sustainable macroeconomic management and good governance. The national development objectives are based on increasing productivity and efficiency in the agricultural and manufacturing sectors through the upgrading of skills and technology, 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 success of the country in achieving its medium-term objectives hinges on the accelerated development of the industrial sector. The transformation of this sector is based on developing a competitive, light manufacturing subsector by supporting the development of input substitution industries in strategic sectors including automobile parts and metal fabrication. To realize the medium-term development objectives, the Government of Ghana initiated an Industry Sector Policy in 2010, designed to address the challenges facing the industrial sector and promote the active participation of the private sector in the development process.

The policy identifies four thematic areas:

- i) production and distribution
- ii) technology and innovation
- iii) incentives and a regulatory regime
- iv) cross-cutting issues

The Wood and Wood Products Sector in Ghana

Wood processing is an essential downstream economic activity within the value chain of the forestry subsector in Ghana. With a forest cover of about one third of the total land area of Ghana, the wood processing subsector is a major source of employment, value addition and foreign exchange earnings. Despite the growth and employment potential of the subsector, there has been very little investment or development in wood processing, with no major transformation over the last three decades. As wood processing is a resource- and labor-intensive activity, the lack of investment in the subsector has undermined the country's growth and employment potential over time.

The value chain within the wood and wood products industry can be divided into three broad categories. The primary activities within the value chain involve logging and transportation of lumber to processing mills and to export markets. The second category 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 130,000 people, as of 2013. The subsector is primarily dominated by small-scale informal enterprises. An estimated 41,000 firms operate at this level, engaging in the manufacture of furniture, furnishing (decorative wood accessories) and 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 degraded the forest reserves that serve as the primary source of raw materials for 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 to reclaim the lost forest reserve. However, these reforestation programs have failed to achieve their intended results, essentially due to limited investment and a lack of commitment to the implementation of the program.

In the downstream sectors, increased imports of cheaper furniture and other wood products have led to increased competition for local producers. The limited capacity of local processors and manufacturers of wood products, as well as limited investment and technology transfer, have stagnated the growth of the downstream wood processing sector. To enhance productivity and competitiveness at the local and international

levels, it is essential to enhance human capital and innovation, and facilitate the transfer of technology within the wood processing value chain. In particular, this involves developing cost-effective and efficient production processes that reduce wastage and promote environmental sustainability. To improve production capacity through learning, and skills and technology transfer among 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 and activities within the wood industry. Most of these clusters can be found in the Ashanti and Brong Ahafo regions of Ghana.

The regulatory regime for Ghana's timber and wood industry has evolved since the initial institutional attempts made in 1963 to establish the Ghana Timber Marketing Board (GTMB). GTMB was previously tasked with promoting timber exports through information dissemination, and timber inspections and grading. This included, among other things, providing data on the timber industry, product development, quality control, contract verification, approval and issuance of export permits. In 1985, the Provisional National Defence Council (PNDC) – the ruling military government – as part of its macroeconomic policies and sectoral reforms under the Economic Recovery Program (ERP), enacted PNDC Law 123 and PNDC Law 117 to establish the Timber Export Development Board (TEDB) and the Forest Products Inspection Bureau (FPIB) as a replacement for the GTMB. TEDB was primarily responsible for export promotion and the dissemination of market information about the timber industry; FPIB was responsible for verifying contracts, inspecting timber

and wood products, granting approvals, training graders and issuing export permits.

In 1999, the Forestry Commission Act, No. 571 was enacted. This combined the timber related functions of all public agencies, including the TEDB and the FPIB, under the Forestry Commission. The Commission is responsible for the protection, development, management and regulation of forests and wildlife resources. Infact, the Timber Industry Development Division (TIDD), which was established in 2002 under the Forestry Commission, was established to regulate the timber and wood industry through Ghana. The Forestry Commission, through TIDD, uses the Timber Resource Management Regulations enacted in 1998 to regulate Ghana's timber and wood industry. It provides specialized services for promoting efficiency in product quality assurance and value addition in the timber industry and timber trade, to ensure adherence with environmental best practice.

The Sokoban Wood Village

The Sokoban Wood Village (SWV) is located in Kumasi in the Ashanti Region, and is the nucleus of the wood processing sector in Ghana. The wood village is a 12 hectare, USD 10 million, ultramodern facility funded by the French and Ghanaian Governments and is designed to accommodate about 1,000 wood processors. The village was developed in 2008 by relocating wood processors from Anloga in Kumasi. The relocation was primarily part of an urban transport project that sought to ease traffic at the main entrance to the city, while increasing productivity in the wood sector. Currently, there are about 1,000 sheds in the enclave with an estimated population of 1,500 people. The population includes carpenters, lumber millers/sellers, hardware retailers, plywood sellers and saw millers engaged in a range of economic activities, from the sale

of wood and wood products to hardware accessories.

Before the relocation, the firms involved in timber production in Anloga were all scattered across different locations. In some cases, it was virtually impossible to meet clients or offload wood products on site because of the lack of organization in the area. Generally, sales were low, largely because of the decline in timber nationally and non-compliance with domestic laws on the felling of timber. Timber sellers were constantly being arrested by the police and the authorities for flouting the law. At the same time, the country's forest reserves were gradually being depleted. There was an urgent need for the relevant authorities to properly organize and regulate the wood sector. While the cluster was involved in creation and dissemination of knowledge, little was done in the area of exploring new varieties of timber.

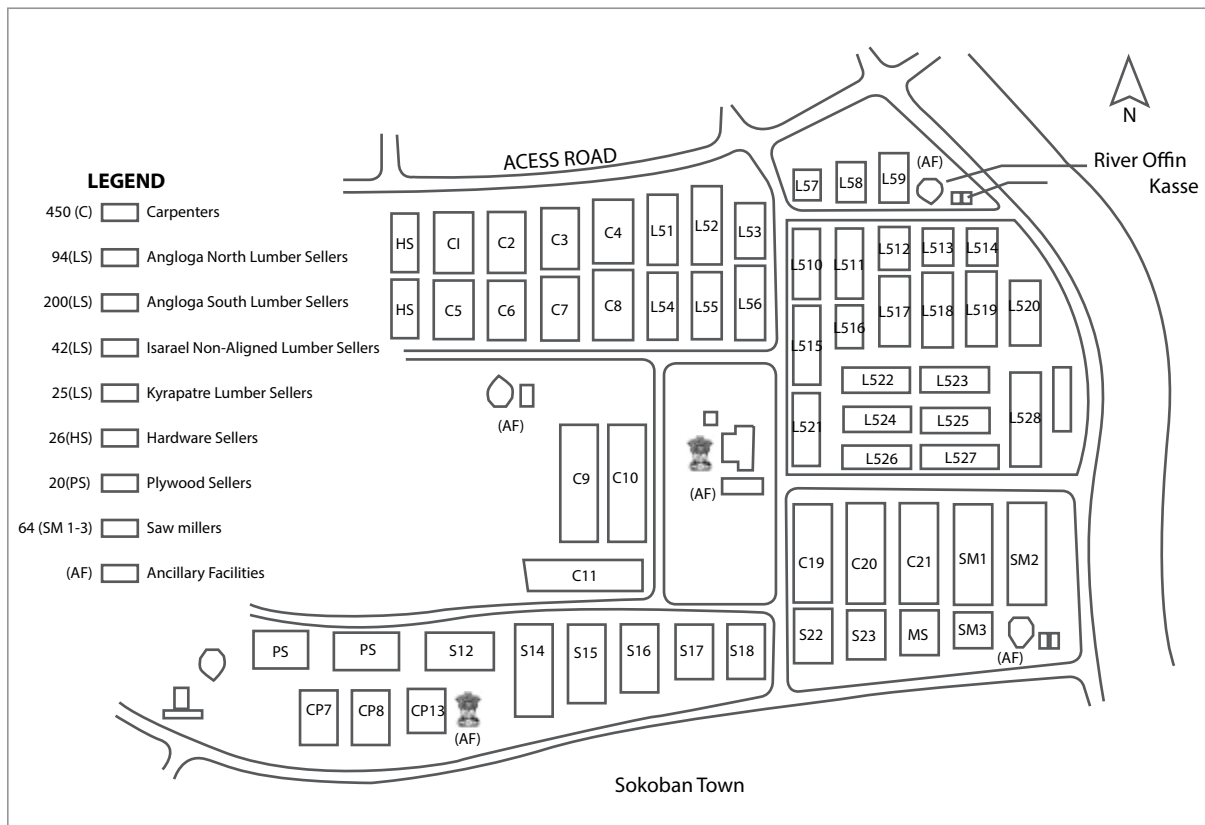
The Sokoban Wood Village has access roads, a communication center, a car park and a two-story administrative block with a conference room that can seat up to 50 people. There are also health and police posts, financial services, a school and sanitary facilities within the enclave. Figure 1 shows a plan of the Sokoban Wood Village.

Figure 2 depicts the structure of the cluster and the interactions between actors – based on discussions with the managers of the cluster. The cluster is structured around four levels based on function and membership. The highest level is made up of the Kumasi Metropolitan Assembly (KMA), a local public institution. KMA manages the entire village and is responsible for maintaining sanitation, providing security and generating revenue within the cluster. This is done through a site manager and KMA support staff. The second level is a management committee that is made up of the heads of all the associations

in the cluster and the site manager. This is the level where public policy engagements take place. The committee is tasked with managing the site and enhancing the growth of the cluster. The third level is comprised of the different activities that take place in the village. There are as many as 11 different types of activity, ranging from lumbering, carpentry, the sale of hardware and transportation. The fourth level is made up of the individual firms who operate within the SWV. While most individuals in the cluster belong to an association, there are a few who operate in isolation.

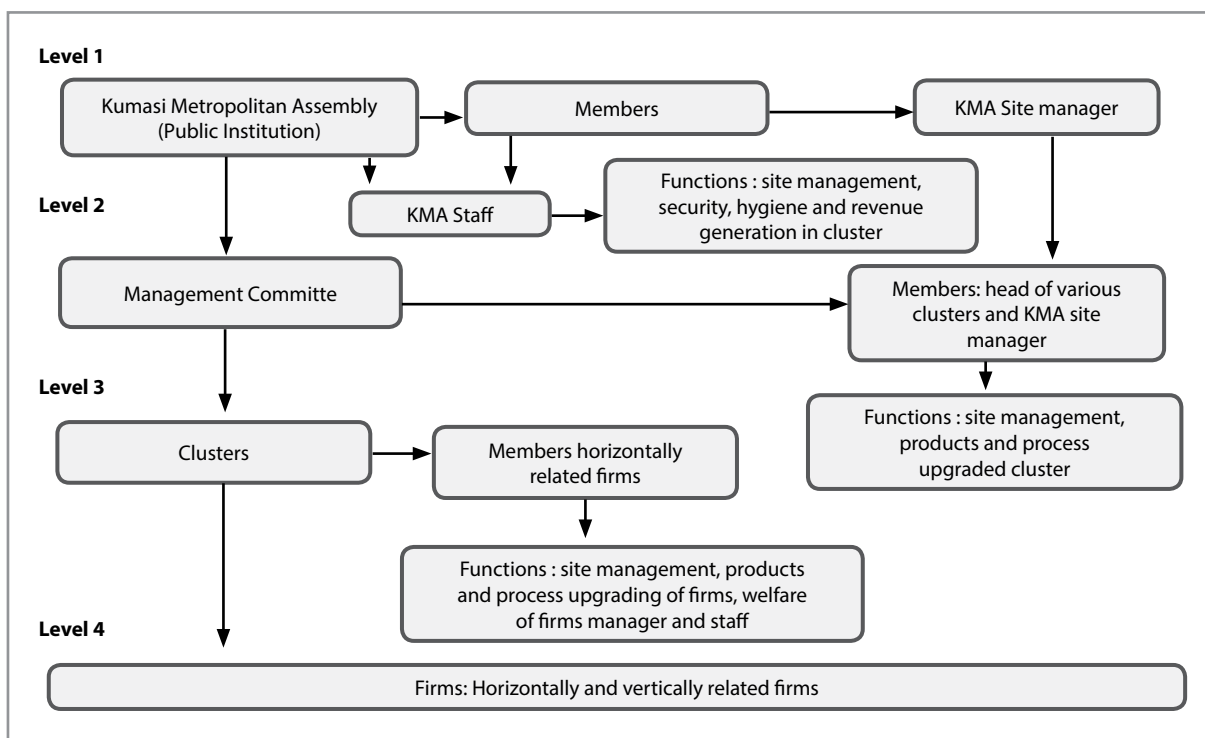
Discussions with the site management suggest that the structure of the cluster in the SWV is dynamic and has evolved over time. Initially, the facility was managed by private sector operators; however, the government has taken over the running of the facility due to mismanagement by the private firm. On several occasions, individual firms in the SWV have split into different clusters, increasing the number of sub-clusters within the enclave.

Figure 1: Map of the Sokoban Wood Village



Source: Adapted from Anloga Small Scale Carpenters Union (ASSCU) Plan, 2016

Figure 2: Thematic structure of the cluster



Source: Sokoban Wood Village Survey, 2017

Data And Methodology

In order to meet the objectives of the study and address the research questions, a range of analytical methods were employed, involving a combination of a desk review, and quantitative and qualitative methods. To address the four central themes, 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 in Ghana. In addition, in-depth interviews of key actors, focus group discussions (FGDs) and case studies were conducted to deepen the understanding that was obtained from quantitative data.

Survey design and data collection

The choice of appropriate data collection tools and techniques for the survey should

be governed by a comprehensive and highly integrated methodology involving survey design, fieldwork and validation of collected information. The methodological approach employed in this study entailed the collection of microdata through a questionnaire-based survey of the main actors in the value chain of the wood and wood product industry, as well as FGDs with executives of the associations of the various actors. Typically, the main activities in the wood supply chain include: forestry/harvesting; the production process (at the sawmills); value-added production by micro and small enterprises (veneer/plywood/board manufacturing, drying and preservation); transportation; and sales in domestic, regional and overseas markets (see Figure 3).

Our main focus is on understanding the performance of actors within the SWV in Kumasi. The actors here include saw-millers/ lumber dealers (lumber sellers), veneer/ plywood/board manufacturers (wood sellers), carpenters and other auxiliary actors such as retailers of hardware materials (nails, hammer,

Figure 3: A Simple Wood Value Chain

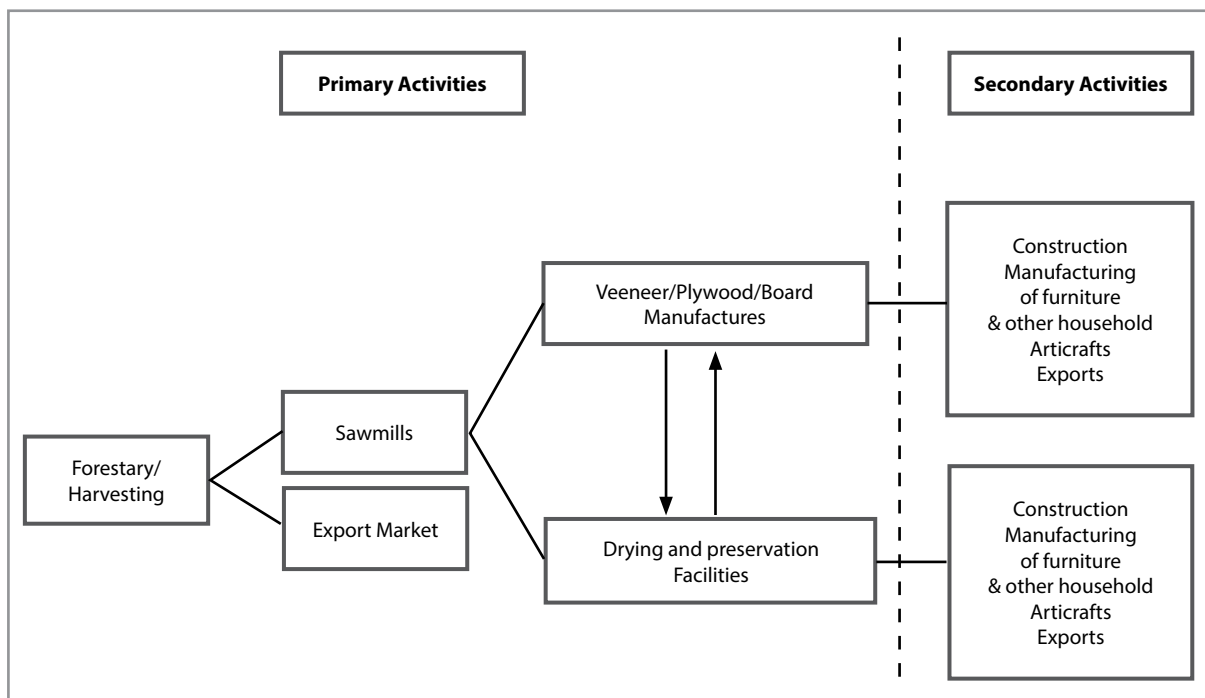


Table 1: Definition of the main actors

Actor	Services Provided
Wood sellers	Sell veneer/plywood/board
Carpenters	Manufacture of furniture
Lumber sellers	Sell lumber
Hardware retailers	Sell tools, machines and provide training
Transport operators	Transport timber, logs and timber products

Source: Sokoban Wood Village Survey, 2017

etc.) and transport operators. The definitions of these categories of actors are provided in Table 1.

Both qualitative and quantitative analyses were used to evaluate the effect of clusters on firm performance, as well as on innovation and knowledge transfer among the firms in the cluster. A wide range of methods were 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 manufactured by the firm and the number of firms producing similar products within the SWV. Researchers assess how the policies of both government/public and non-governmental organizations have, over the years, enhanced the development of the wood cluster in Kumasi. We then assess how these policies have influenced innovation and knowledge transfer in the cluster, as well as their effect on the performance of firms.

The definition of the selected dependent variables is critical to establishing the potential of clustering as an industrial development strategy in least developed economies. For the purposes of this study, the assessment of firm performance focuses on the production performance of manufacturing firms. In particular, it focuses on the strategies that firms adopt towards cost reduction and product quality to stay

competitive. It also involves 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 understanding of the processes and mechanisms through which clusters affect firm performance. This entailed conducting in-depth interviews with stakeholders/ industry actors (firms, institutional actors, government agencies, key informants and other relevant bodies), as well as FGDs with selected firms within the wood processing industrial cluster. A comprehensive semi-structured interview guide was prepared based on the specified thematic areas and the interview sessions were recorded and later transcribed. The responses were analyzed using thematic analysis.

Data collection

The main objective of the study was to analyze the factors that underpin the performance of actors in the SWV. The main actors are defined as lumber sellers, wood (veneer/plywood/board) sellers, carpenters, transporter operators and hardware retailers. 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 carpenters. The interview guide was in five sections, broadly aligned with the main research questions. The questionnaire, on the other hand, consisted of seven sections, eliciting information on: the background of actors; production; inputs; revenue and assets; employment; innovation and technology; cluster effects; business support; and perceptions of the broader business environment.

Given the nature of the assignment and the fact that all the respondents are in the same location, a sample of 300 was deemed appropriate and representative of the approximate 1,000 firms. In addition, five interviews were proposed for the executives of the associations of the different actors: lumber sellers, wood sellers, carpenters, hardware retailers and transport operators (GPRTU).¹ For each of the interviews, a minimum of five and a maximum of ten participants were selected. This was to ensure that the interviews were conducted in an

orderly manner, with minimal interruptions, and that the recordings were audible.

Characteristics of Respondents

As indicated earlier, information was obtained from four categories of respondents: firm managers, association executives, and public and private sector institutions that have had working or policy relations with the cluster. While FDGs were held with the firm managers and the association executives, interviews were conducted with the public and private sector institutions. Some supporting quantitative information was also provided by the firm managers. A total of 292 firm managers were interviewed for the survey. This included 33 lumber sellers (11%), 69 wood sellers (24%) and 190 carpenters (65%). The breakdown is shown in Table 2.

With regards to ownership, most of the firms sampled (96%) were owned by local private individuals (see Table 3). More specifically, all the lumber firms, 92.8% of wood processing firms, and 96.3% of carpentry firms are

Table 2: Survey respondents (in percentages)

Activity	Number	Percentage
Lumber	33	11.30
Wood	69	23.63
Carpenters	190	65.07
Total	292	100

Source: Sokoban Wood Village Survey, 2017

Table 3: Type of ownership (in percentages)

	Lumber	Wood	Carpentry	Total
Private, local	100.0	92.8	96.3	79.45
Joint local/foreign	0.0	7.2	3.7	16.44
Total	33	69	190	292

Source: Sokoban Wood Village Survey, 2017

1. GPRTU: Ghana Private Road Transport Union.

privately owned by Ghanaians. For the joint ventures with foreign entrepreneurs, the foreign individuals are predominantly from West Africa.

The firms in the SWB are typically micro-firms with an average of about four employees. Average employment was highest among the wood sellers – between four to five workers over the five-year period (2012 to 2016) – while the lumber firms engaged, on average, three workers. Carpentry firms, on average, employed between three and four people for the same time period. During the peak season firms also took on extra casual workers, particularly wood processing and carpentry firms: the number went up to as many as 44 to 30 of employees respectively (see Table 4).

Most of the firms (80%) were established by their current owners: 90.9% of lumber firms, 81.2% of wood firms and 78.4% of carpentry firms. The rest were acquired through inheritance (16%) and mergers (3%). The inherited and merged components form between about 9% – 20%; 17.4% of both wood sellers and carpentry firms inherited their businesses (Table 5).

In terms of the age of the firms, about 63% of the respondents have been in existence for between 11 and 30 years, while 17.1% have been running for 31 years or more (see Table 6).

In terms of bookkeeping, it emerged that more than half of the firms (67%) did not keep records of their transactions (see Table 7). The poor record keeping of transactions was prevalent among the lumber and wood sellers.

Table 4: Employment

Year	Lumber			Wood processing			Carpentry		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
2012	3	1	8	4	1	20	3	1	30
2013	3	1	8	5	1	44	3	1	30
2014	3	1	8	4	1	15	3	1	18
2015	3	1	8	5	1	30	4	1	18
2016	3	1	8	4	1	20	4	1	20

Source: Sokoban Wood Village Survey, 2017

Table 5: How firms were started (in percentages)

	Lumber	Wood	Carpentry	Total
Founded by current owner	90.91	81.16	78.42	80.48
Inherited	9.09	17.39	17.37	16.44
Merger	0	1.45	4.21	3.08
Total	33	69	190	292

Source: Sokoban Wood Village Survey, 2017

Table 6: Firm age (in percentages)

	Lumber	Wood	Carpentry	Total
Less than 10	21.21	24.64	17.37	16.52
11 - 20	42.42	31.88	42.11	39.73
21 - 30	21.21	33.33	20.53	23.63
31 and above	15.15	10.14	20	17.12
Total	33	69	190	292

Source: Sokoban Wood Village Survey, 2017

Table 7: Bookkeeping (in percentages)

	Lumber	Wood	Carpentry	Total
All transactions	18.18	17.39	5.26	9.59
Some transactions	57.58	43.48	27.89	34.93
No bookkeeping	24.24	39.13	66.84	55.48
Total	33	69	190	292

Source: Sokoban Wood Village Survey, 2017

Research Results

This section discusses the findings from the analysis of the data from the qualitative FGDs and the quantitative survey – in response to the research questions stated earlier in the introduction.

Three themes were used to categorize data for a thematic analysis: basic themes, organizing themes and global themes (see Attride-Stirling, 2001 for a discussion on thematic analysis). Basic themes consist of quotes extracted from transcribed audio recordings of the FGDs and Key Informant Interviews (KIs). The process of profiling, coding frequencies and developing thematic frameworks and thematic networks are detailed in the qualitative results. The analysis of the quantitative survey was essentially descriptive.

Cluster structure and firm performance

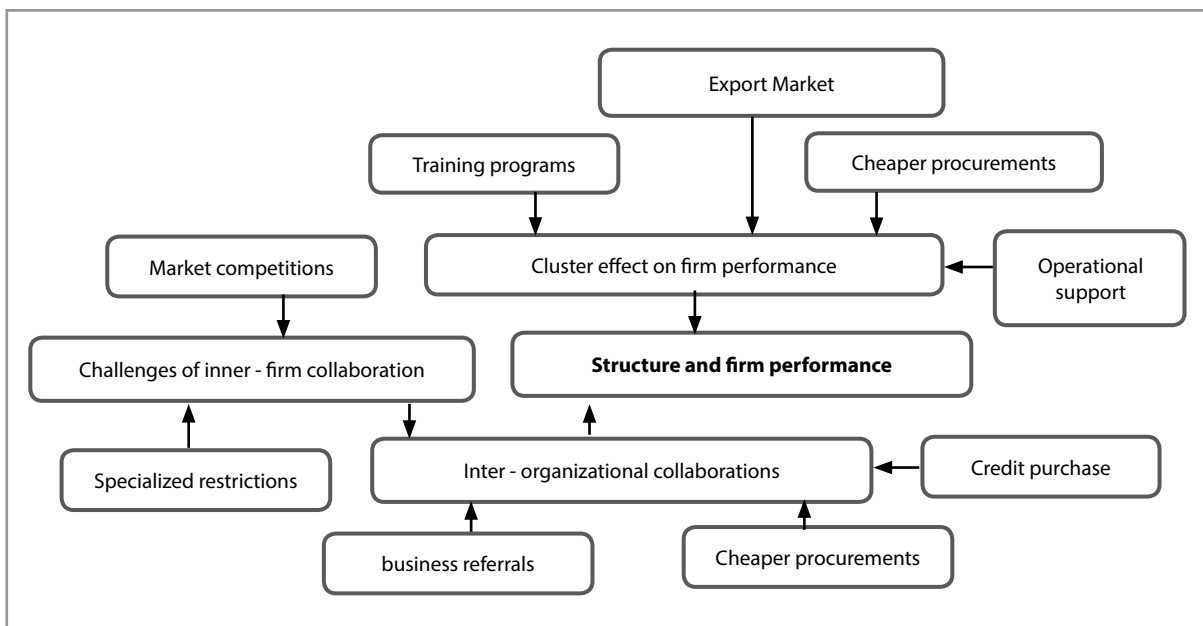
The survey was designed to examine how the structure of the cluster has affected

firm performance. As indicated earlier, the Sokoban Wood Village has a four-level structure: the KMA, the management committee, the main activities (lumbering, carpentry, the sale of hardware and transportation) and individual firms. The responses on the relationship between structure and performance were collated at the firm level. Firms were asked about their profits and the extent to which their sales revenue has been affected by being in a cluster.

The responses from the FGDs suggested some positive effects of the cluster’s structure on firm profitability but limited effects on inter-organizational collaboration. Figure 4 summarizes the emerging themes for the cluster effect on firm performance and inter-organizational collaboration within the Sokoban Wood Village.

From the discussions, it was found that the main channels through which the cluster exerted positive effects on the firms were through training programs, commercial recognition, cheaper procurement and

Figure 4: Thematic network for cluster structure and firm performance



Source: Sokoban Wood Village Study, 2017

operational support. This was typically not the case when the firms were in Anloga. Commercial recognition, in this case, comes from the fact that the cluster offers greater convenience to customers in terms of facilitating their transactions. Customers see the cluster as a one-stop-shop for most of the items they need. This not only reduces their transportation costs but also gives them the opportunity to scout around for cheaper and better-quality items. All of this reflects positively in the volumes of sales and increased profitability. This is encapsulated in the quotation below:

“... 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...”
Participant in FGD with transport operators.

Similarly, the SWV is noted for producing particular products and services, which provides a further boost to businesses.

Another positive effect that emerged from the discussions, was the fact that firms within the enclave enjoy some form of supplier credit, both from external and internal sources. This is expressed in the quote below:

“...some of us get things [raw materials] on credit because they [suppliers] know that we are all here [located in the cluster]; because you don't know when tomorrow I can help you [suppliers may also seek assistance from other firms located in the cluster at future date], and we are all here, so they don't fear to give us supplies for us to pay small, small...”
Participant in FGD for Carpenters.

Membership of an association in the cluster was also beneficial in terms of providing individual firms with support when they either breach regulations relating to unapproved products, or suffer extortion

from law enforcement agencies. In addition, there are training opportunities for firms – predominantly from non-governmental organizations but also, on occasion, from state agencies – because of 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 coordinated the bulk purchase of inputs. The cluster assisted with procurements, which reduced the individual cost incurred by member firms. This helps the firms to purchase inputs at lower prices as purchases are made on a wholesale basis. A participant 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 a higher price but some time 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...”
Participant in FGD with hardware dealers.

To complement the above findings, the firms were asked, through the quantitative survey, to provide the average values of their sales and revenues from 2012 to 2016 (Table 8). 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 are presented in Table 10. 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 show a declining trend in average sales since 2012 but an increase in 2015 for wood sellers, and in 2016 average sales increased for all firms. Based on the average annual sales data, it appears that 2012 was the best year for all the actors in the cluster.

However, when their average profits were calculated – by subtracting the average cost of production from average sales revenue – a different picture emerges. The general trend was a decline in average profits for the entire period. In fact, the figures show negative profits for lumber sellers in 2012 and 2016 and for wood sellers in 2016 (see Table 9).

Interestingly, most of the respondents were of the view that the cluster had had positive impacts on profitability and sales (Table 10 and 11 respectively). For wood sellers, 81%

believed that their profitability was affected either to a large extent or very large extent by the cluster. These figures are 76% and 58% for carpenters and lumber sellers respectively. (Table 10).

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

Table 8: Average sales and production costs (in GHC)

Year	Average Sales			Average Cost of Production		
	Lumber	Wood	Carpenters	Lumber	Wood	Carpenters
2012	6,454.80	8,507.70	5,363.30	6,766.20	6,509.90	3,820.40
2013	4,535.60	5,990.10	3,787.00	4,087.80	4,490.00	2,684.10
2014	3,741.40	5,184.50	3,180.90	3,439.60	3,867.70	2,246.90
2015	3,526.80	5,480.10	3,126.80	3,335.90	4,197.40	2,186.60
2016	3,772.50	7,120.20	3,863.80	3,801.20	7,161.500	2,732.60

Source: Sokoban Wood Village Survey, 2017

Table 9: Distribution of average profits (in GHC)

Year	Average Profits		
	Lumber	Wood	Carpenters
2012	- 311.40	1,997.80	1,542.80
2013	447.80	1,500.10	1,102.90
2014	301.80	1,316.70	934.00
2015	190.90	1,282.70	940.10
2016	- 28.70	- 41.30	1,131.20

Source: Sokoban Wood Village Survey, 2017

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

	Lumber	Wood	Carpenter	Total
Very large extent	21.2	30.4	42.1	37.2
Large extent	36.4	50.7	33.7	37.9
No extent	42.4	18.8	24.2	24.9

Source: Sokoban Wood Village Survey, 2017

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

	Lumber	Wood	Carpenter	Total
Very large Extent	24.2	24.6	39.8	33.9
Large extent	60.6	58.0	36.8	45.2
No extent	15.1	17.4	23.7	20.9

Source: Sokoban Wood Village Survey, 2017

Local inter-organizational collaboration

The focus of this section is to understand the extent and areas of collaboration among firms in the cluster. Overall, discussions from the FGDs suggest that firms in the SWV collaborated for joint procurements, contract executions and business referrals. For contract executions, firms admitted instances where customer demands were either overwhelming or exceeded their stock at the time of request. In those instances, the firms who received the contracts collaborated with other firms to meet customer demands. The following quote provides evidence of such collaborations:

“... 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...”
Participant in FGD with lumber dealers.

Though rare, business referrals were a form of both vertical and horizontal collaboration between firms in the 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...”
Participant in the 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...”
Participant in FGD for hardware sellers.

There were a few instances where some firms claimed that the cluster tended to undermine effective inter-firm collaboration. Some firm owners admitted losing customers to other firms within the cluster. These respondents had a negative view of the competition between similar firms in the same cluster.

Another factor that seems to impede effective collaboration – particularly in the carpentry sector – was the lack of specialized skills required for joint collaborations. It needs to be emphasized that the lack of specialized skills and collaborations among the carpenters were not too different from those that occur when they were operating from Anloga. The basic difference is that, previously, it was more difficult for private and public organisations to approach the firms to offer training programs to improve on their skills.

To further our understanding of the types of interactions and how they translate into positive and negative outcomes, these qualitative responses were complemented by data from the quantitative survey. Firm managers were asked to indicate the main

Table 12: Training organized by NGOs

	Lumber	Wood	Carpenter
Yes	18.18	27.54	41.05
No	81.82	72.46	58.95
Total	33	69	190

Source: Sokoban Wood Village Survey, 2017

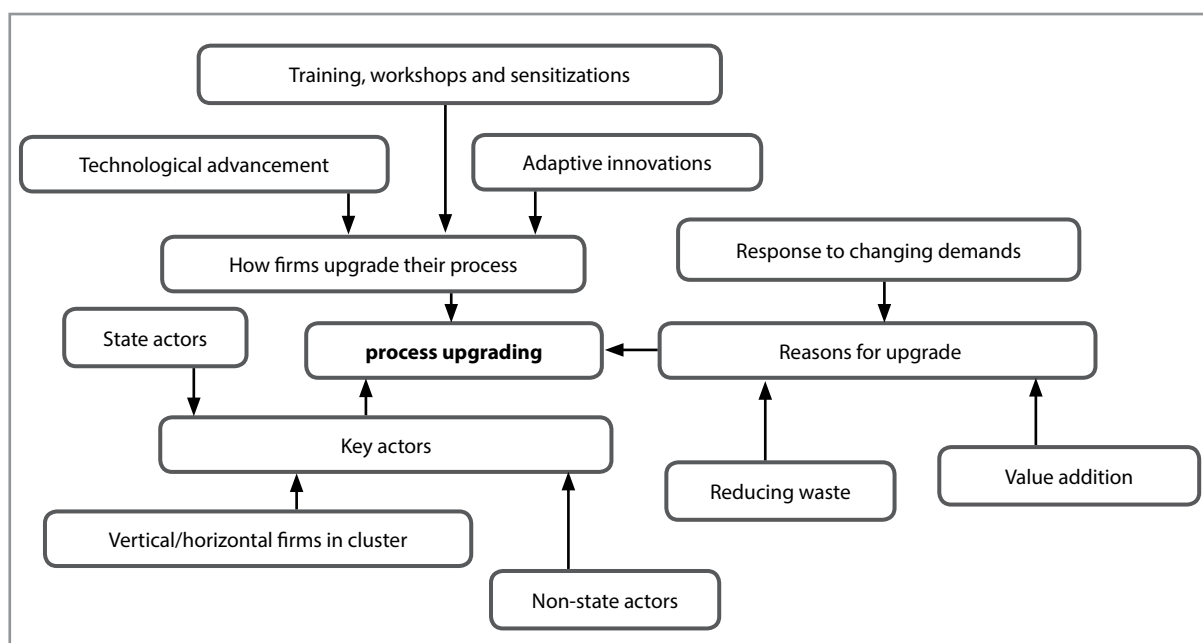
medium through which firms interact with each other. The dominant response is through training programs organized by agencies such as NGOs. However, Table 12 indicates that it was only in the carpentry sector that a high proportion of members benefited (41%). Fewer lumber sellers (18%) and wood sellers (27%) were involved in these types of interactions.

How firms in the cluster upgrade their processes 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 FGDs, it emerged that most of them had introduced new processes rather than products. This finding was probed further to establish the reasons why firms decided to upgrade their processes, how they upgraded their operations and to identify the key actors involved. Discussions centered on the experiences of firms during process upgrades and what firm managers thought were the appropriate channels for upgrading. Figure 5 summarizes the emerging themes from the discussions; this is discussed further under the three themes in the subsequent sub-sections.

Figure 5: Thematic network for firm-level process upgrades within the cluster



Source: Sokoban Wood Village Study, 2017

Reasons for process upgrades

Firms were asked to explain why they preferred to upgrade their processes rather than their products. It was found that firms upgraded their processes mainly in response to changing demands in the wood market. Product upgrades were rare because of the inadequacy of known timber species in Ghana's forest zones. Participants shared instances where they had adopted better methods of production to meet customer specifications. Examples of such instances are provided below:

"...when Dahmoa (local name for 'Piptadenia Africana') started becoming scarce we began introducing Essia ('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 medicines² to stop the smell..."
Participant in FGD with lumber dealers.

Firms also changed their means of production to increase the value of their products. Some innovative ways of production resulted in improved finishing, which increased the market price of the final product. Firms provided examples of adding value through process upgrades:

"...that time we were using the chainsaw to cut the woods. The woods were rough, and the finishing was not smooth but now with a 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.

Process upgrades also helped to minimize waste and the cost of production. Firms

identified ways of reducing waste by upgrading the processes involved in producing lumber and other wood products. As a result, firms were able to maximize the harvest of lumber and explore alternative uses for the waste products, which had previously been discarded. Waste reduction was part of the process upgrade for carpenters and lumber sellers.

How firms upgraded their processes

Firms shared their experience of how they had upgraded their processes and provided recommendations for ways to further upgrade within the cluster. The discussions revealed that most firms acquired their own skills through various personal experiences gathered over time, and that innovative tools and business insights that were used to upgrade their processes. Some other firms upgraded their processes through training, workshops and sensitization platforms, new technologies and adaptive innovations. Training, workshops and sensitization engagements were tried and tested platforms for upgrading processes and are therefore the recommended way in which firms can upgrade their processes in future. In sharing their experiences, firm managers revealed key insights about the training workshops and how they lead to process upgrades, as evident in the quote below:

"...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 training others, others too don't mind..."
Participant in FGD with carpenters.

2. A chemical compound used by firms to treat the wood in order to minimize the foul odour.

Raising awareness of alternative types of wood that could meet customer demand was also mentioned, and recommended as a way 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... we organize meetings with the carpenters whenever we are about to bring up a new variety...”

Participant in FGD with lumber dealers.

Firms also upgraded their processes by adopting new technologies in their areas of production. These include improvements in devices and equipment, along with better knowledge on how to operate them.

Adaptive technologies were also used to change the process of production to align with customer demands. Adaptations were knowledge-based rather than device-based and with the innovation largely driven informally by demands of the consumer and market knowledge.

Key actors in process upgrades

The firms were asked to identify the key actors that spearheaded innovation within the cluster. It was discovered that most process upgrades were initiated by non-governmental organizations, government agencies and firms within the cluster. The Forestry Commission, the 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 such as Bosch, GIZ and DANIDA initiated both knowledge and

device-based process upgrades. Knowledge-based process upgrades also came from actors within the cluster. These were either vertically or horizontally related firms. The following quotes reveal the role of NGOs and research organizations 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...”

Participant in FGD with lumber dealers.

Results from quantitative survey on process and product innovation

Generally, the responses from the quantitative survey support those obtained from the FGDs. Most carpenters did better in terms of product and process innovations (39% and 42%, respectively). There was no clear pattern as to whether firms are becoming more or less innovative; except for carpentry where innovation has been increasing throughout (Table 13).

For instance, the trend in product innovation remained unchanged for lumber sellers throughout the period, while process innovation increased in 2014 and 2015. For wood sellers, the trend in product and process innovation fluctuated; more so for product innovation.

The modes of developing product and process innovation vary among the different actors (see Table 14). While most lumber sellers developed new products by adopting and modifying innovations developed by other enterprises (33%), the majority of them innovate their processes

Table 13: Product and process innovation (%)

Year	Product Innovation			Process Innovation		
	Lumber	Wood	Carpenters	Lumber	Wood	Carpenters
2012	9.1	5.8	30.0	9.1	31.8	34.21
2013	9.1	2.9	31.6	9.1	33.33	36.32
2014	9.1	2.9	40.5	12.1	31.88	43.68
2015	9.1	7.2	44.7	12.1	33.33	45.79
2016	9.1	15.9	48.9	9.1	36.23	49.47
Average	9.1	7.0	39.2	10.3	33.33	41.894

Source: Sokoban Wood Village Survey, 2017

Table 14: Who developed the innovations (%)

	Product innovation			Process innovation		
	Lumber	Wood	Carpenters	Lumber	Wood	Carpenters
Enterprise by itself	7	25	35	6	21	24
Collaborate with other firms	27	67	15	35	77	27
Adopting and modifying goods developed by other firms	33	8	43	29	2	45
Other enterprises innovations	33	0	7	29	0	4

Source: Sokoban Wood Village Survey, 2017

in collaboration with other enterprises within the cluster (35%). For wood sellers, most developed their product and process innovations in collaboration with other enterprises within the cluster (67% and 77%, respectively). With carpenters, the development of new processes and products is predominantly through the adoption and modification of original goods developed by enterprises located with the cluster (43% and 45%, respectively).

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

Unfortunately, not many of the respondents receive training on innovations: 18% for lumber sellers, 29% for wood sellers and 37% for carpenters (Table 16).

The respondents gave a mixed response when asked about the extent to which the cluster had promoted both product and process innovation. While the carpenters were quite positive, the same cannot be said for the wood and lumber sellers: 67% of lumber sellers and 64% of wood sellers reported that the cluster has had no effect on their product innovations; compared to 47% of carpenters (Table 17). Similar responses were provided for process innovation: 67% for lumber sellers, 43% for wood sellers and 45% for carpenters (Table 18). However, a considerable proportion of carpenters indicated the cluster had affected their product and process innovations (53% and 55%, respectively).

Table 15: Sources of innovations

	Lumber	Wood	Carpenters
The Internet	5%	4%	10%
From attending conferences	23%	10%	20%
From parent company	0%	5%	7%
From attending trade shows	0%	3%	1%
Through business associations	50%	50%	37%
Others	23%	28%	25%

Source: Sokoban Wood Village Survey, 2017

Table 16: Innovation training (%)

	Lumber	Wood	Carpenters
No	82.3	70.8	62.1
Yes	17.6	29.2	37.9

Source: Sokoban Wood Village Survey, 2017

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

	Lumber	Wood	Carpenter
A very large Extent	9.1	10.1	7.4
Large extent	24.2	26.1	45.8
No extent	66.7	63.8	46.8

Source: Sokoban Wood Village Survey, 2017

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

	Lumber	Wood	Carpenter
A very large Extent	9.1	15.9	13.8
Large extent	24.2	40.6	41.3
No extent	66.7	43.5	45.0

Source: Sokoban Wood Village Survey, 2017

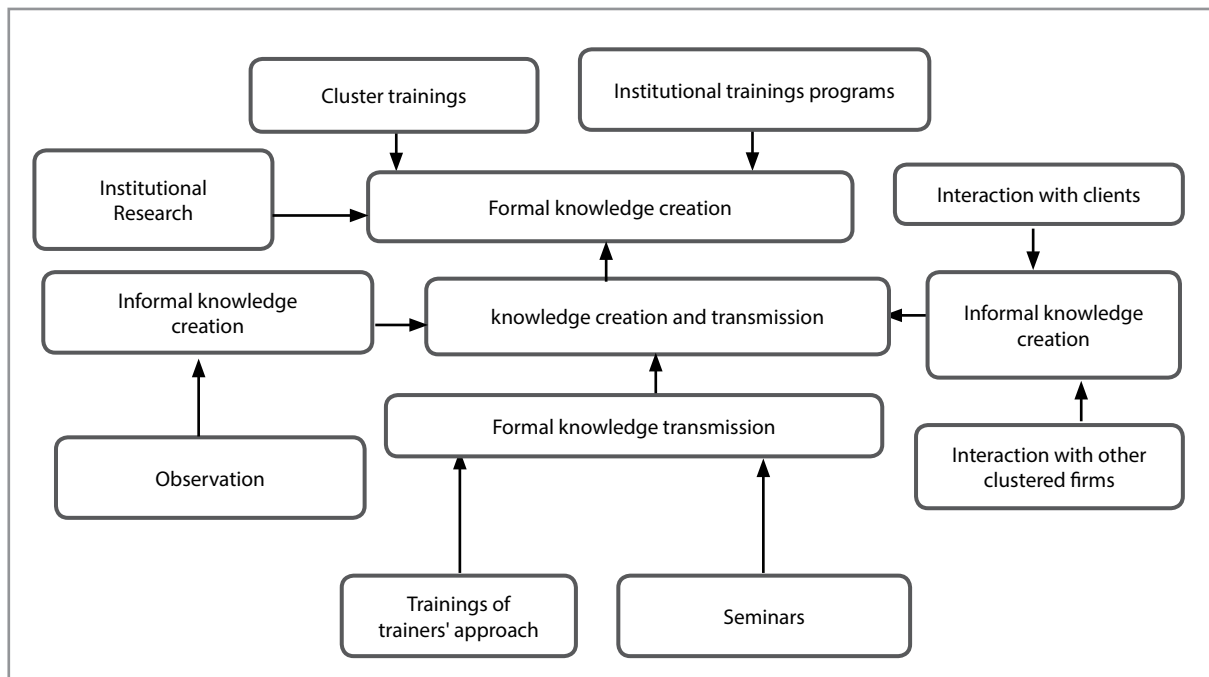
Knowledge creation and knowledge transmission

There are both formal and informal means of knowledge creation and transmission within the cluster. However, the formal means of knowledge creation appear to dominate, and are driven by the activities of both state and non-state actors. Figure 6 summarizes the

emerging themes from the discussions on knowledge creation and transmission.

The formal means of knowledge creation are independently led by both state and non-state actors. Occasionally, this occurs through private-public partnerships. These actors organize training programs on a variety of issues relevant to the wood sector. A typical example was the training provided by a

Figure 6: Thematic network for knowledge creation and transmission in the cluster



private institution to share knowledge on new policy developments within the wood sector that required a change in operations from the use of chainsaws (which was popular at the time) to artisanal milling. This is reflected 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 chainsaw operators and we shared the knowledge on artisanal milling with them, we couldn’t meet all of them the first time...” KII3

Another form of formal knowledge creation is the dissemination of research findings. These research activities are primarily funded by private institutions but conducted by state institutions, as expressed below:

“...we [referring to a state forestry research institute] 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 in the SWV requested formal training on specific issues within the wood sector. These requests come primarily from the executives of the sub-clusters. For cases where there was not enough funding to train all the firm managers within a particular sub-cluster, a training of trainers’ approach was adopted. Selected cluster members were trained and later expected to train other firm managers in the village.

The informal means of knowledge creation is essentially through observation. This is particularly common in the cluster where the entire value chain can be found in one particular location. Some firm managers described instances where they acquired knowledge through interactions with firms (both vertically and horizontally).

In other instances, knowledge was informally created through interactions with clients.

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

	Lumber	Wood	Carpenters
Observing	17%	44%	64%
Training from NGOs	27%	26%	13%
Training from association	50%	17%	17%
External sources	6%	13%	7%

Source: Sokoban Wood Village Survey, 2017

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

	Lumber	Wood	Carpenter
Yes	84.8	89.9	96.3
No	15.1	10.1	3.7

Source: Sokoban Wood Village Survey, 2017

Table 21: Skills and financial capacity (%)

	Lumber	Wood	Carpenter
Yes	21.2	31.9	45.3
No	78.8	68.1	54.7

Source: Sokoban Wood Village Survey, 2017

Some clients requested products that require more sophisticated knowledge and skills. A carpenter shares his experience of creating knowledge through working with a client:

“...I have a customer; she travels from abroad to buy most of her things. She wanted some furniture, so I looked at it and 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 the work for her. Some of the customers will make you create new designs because of what they want...”
FGD1

The responses from the quantitative analysis are similar to those obtained from the qualitative analysis. As indicated in

Table 19, five out of ten lumber sellers reported that the most likely means of gaining knowledge was through training provided by their local association (50%), while a sizeable proportion of wood sellers (44%) and a majority of carpenters (64%) attributed it to observations.

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

Institutional support and policy interventions and their effect on cluster competitiveness

Activities in the wood processing sector in Ghana are shaped by a number of institutions, policies and regulations. Key among these institutions is the Ministry of Land and Natural Resources, which is responsible for oversight of the forestry and related sectors in Ghana. The primary agency under the ministry for executing policies and programs is the Forestry Commission. The Commission is responsible for the regulation of issues pertaining to the utilization of forest and wildlife resources, the conservation and management of these resources, and the coordination of policies related to the sector. The Commission, through the Timber Industry Development Division, provides specialized services for promoting efficiency in product quality assurance and value addition in the timber industry and timber trade, in line with best environmental practices.

Since 1996, a number of policy frameworks have been implemented to regulate and coordinate 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 sectoral policies 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 the efficiency, productivity and profitability of wood processing to increase the competitiveness of local processors by setting up support centers and developing 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 24 months prior to data collection. Table 22 profiles the interviewed institutions. The various institutions interviewed are assigned identification (IDs) to aid identify responses of these institutions (see Table 1).

The activities of firms in the SWV cluster are supported by both private and public sector institutions, who provide assistance for infrastructure development and the management of the cluster. Other support service help with formalizing the operations of the cluster, capacity-building and knowledge management training, as well as in empowering the cluster to contribute to policy within the wood sector.

The institutions were found to be more enthusiastic about working with firms in the cluster than with firms outside because the cluster provides an organized way of dealing with actors in the wood supply chain. The cluster allows easy access to a range of firms,

Table 22: Profile of interviewed respondents

Respondent ID	Name	Type of Institution	Key focus
R1	Tropenbos International Ghana	Private	Policy/infrastructure / formalization
R2	Forestry Research Institute of Ghana	Public	Research/formalization and policy
R3	Bosch Group, Ghana	Private	Training and process upgrading
R4	Kumasi Metropolitan Authority (KMA)	Public	Management
R5	Timber Industry Development Division (TIIDD)	Public	Formalization/certification
R6	Member of Parliament	Public	
R7	Resource Management Support Centre (RMSC)	Public	Formalization/policy/monitoring and evaluation

even with limited resources. Indeed, some of the respondents were explicit in saying that the cluster is more conducive to their ‘training of trainers’ approach. This view is reflected in the quote from 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...”

Site development and management

The management of the cluster has gone through various changes. The cluster was initially managed by a private consultancy firm; however, the local government (KMA) took over the running of the village as a 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 managing the cluster. The

reasons for the changeover are 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.

KMA has set up a management structure to oversee the running of the SWV. The 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 is mandated by the KMA to oversee the running of the village in tandem with the executives of the various sub-clusters. The activities of the management are summarized in the quote below:

“...KMA [Public institution that manages the cluster] is here to ensure revenue generation, proper sanitation and public safety. That is why KMA is here in Sokoban...”

Infrastructure development within the SWV is funded by both private and public

organizations and this decision is based on the interest and mandate of these entities and in certain cases when the essential needs of the cluster are identified. For instance, to enhance the 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. The KMA, a public institution, provided the village with street lightening to address security issues in the village at night, providing the opportunity for firms to increase their working hours. The new infrastructure was the product of interactions between the institutions and the executives of the various associations within the cluster.

Formalizing operations

Firms located within the enclave have upgraded their operations to enhance their competitiveness. They received assistance from both private and public institutions, which have helped to ensure that upgrades adhere to industry standards. Three specific instances cited by respondents describe how their engagements with the SWV have transformed their previously illegal practices into institutionally acceptable standards of operations:

“...The idea was to convert those who were in illegal chainsaw milling into artisanal milling, so the whole production chain was gathered in clusters. So, they had the head porters, the people who actually use the chainsaw to log, and the firm owners who fund the logging, into clusters. They were trained technically in chain operations and business management. On a 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 intention 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 the Forest Research Institute of Ghana shared that new technology will soon be used 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 have started to sell alternative wood species to unsuspecting consumers, as the original species have been depleted.

“...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 two different species altogether. 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 ...”R2

8.5.3 Policy engagements

There are public institutions – Forestry Commission and AMA - 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 then become laws that formalize the activities of firms in the cluster.

Once public institutions have helped to formalize the operations of the cluster, the firms are empowered to engage with higher level regulatory institutions. The formalization of their activities as a group helps to leverage direct negotiations with the 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 to suggest that both public and private institutions have collaborated to provide assistance to the firms in the cluster, and that this has enabled the firms to contribute to the development of the Domestic Lumber Market Policy and the Public Procurement of Local Wood Market Policy. The private institution created interactive platforms that enabled dialog between cluster representatives and policymakers. The quote below describes how an institution was able to empower the cluster in this way:

“...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.

Training/ capacity-building and knowledge management

Some institutions provided training programs on technical operations for firms in the cluster, leading to process and product upgrades. The firms received these training sessions from both private and public organizations. In some cases, the executives of the cluster have employed consultants to develop funding proposals for training programs for their members. A key informant from a public institution shared his experience of training programs that led to process upgrades among the firms in the cluster:

“...that project, which we called TILCAP [Timber Legality Compliance and Advocacy Project], 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 omitted], who is now an MP, showed that at the time when the VPA arrangements were made more than 80 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 have conducted research and disseminated the findings. These have been used to inform the operations of clusters, as described below:

“...through research we have realized that they [wood clusters] do not know the technical properties of 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 34 species and, as I speak today, these are the species making the industries survive...” R.2.

Challenges in implementing interventions and policy engagements

Some of the institutions lamented the divisive attitudes of some of the firms in the cluster, which tended to impede the success of interventions in Sokoban:

“...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 the 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 revealed that national institutional interventions that had been successful in other clusters in the country were unsuccessful in the SWV because of the divisions between the different groups.

“...Interviewer: Then I don't think that DOLTA was successful in terms of Sokoban but maybe nationally?”

Respondent: Yes, nationally; but in Sokoban, it was not successful basically because of their divisions over there; the different groups were too much...” R.1.

A comparison of firms in the SWV with other clusters revealed that these divisive tendencies could be traced back to the activities of the existing associations and the entrenched interests prior to relocation to Sokoban. This points to the fact that the functional relationship among the various associations in the cluster is quite weak. Other respondents believed that the struggle for power among the associations in the cluster also contributes to the divisive tendencies in the SWV.

In relation to both public and private institutions inability to provide adequate support to the enterprises located at SWV, the various institutions cited the lack of funds as a key challenge to institutional interventions. They expressed concern that their activities were constrained by inadequate funding and, as a result, they had to limit the coverage of some of their projects.

Publicly funded training programs and policy interventions

This section reveals both the positive and negative impacts of institutional and public policy interventions on the competitiveness of clusters. Clusters in the SWV received sponsorship for training programs from public institutions. Cluster members who benefited from these publicly funded training programs reported that the new skills they acquired helped their cluster to upgrade its products and operations in ways that made the cluster more competitive:

“...those of us who took the training seriously are benefiting. 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 are good quality. So, most of them will come and buy from you after comparing your work with other works, so the training helps us ...” Participant in FGD with carpenters.

The extent to which publicly funded, cluster-level training enhanced competitiveness depended on the adoption and application of the newly acquired skills by firm managers. An FGD participant highlighted this point during the discussions on the benefits of publicly funded training programs:

“...the cluster will get the training, but some of the firm managers will act like they didn't receive any training. 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...” Participant in FGD with carpenters.

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

In some instances, respondents reported the negative effects of some public policies on cluster performance. For example, government environmental control policies that regulate the exploration of natural resources, restricted their access to wood – a critical natural resource for cluster operations.

In summary, government institutions had more of a positive impact on cluster competitiveness, although there were a few instances where external public policies indirectly had an adverse effect. Furthermore, private institutions also actively provided firms within SWV with various training programs to enhance their skills.

Respondents' views on institutional support and policy interventions

To identify the types of institutional support and policy interventions for the wood cluster, and determine how effective they have been, the respondents were first asked whether they had received any business support within the past twelve months. The majority of lumber sellers (64%) had received some business support, while most wood sellers (64%) and carpenters (57%) had not received any (Table 23). Business support is usually in the form of skills training (94%). Surprisingly, very little attention is given to the development of innovative ideas (5%) and technological diffusion (1%). The skills training support was offered by the government, NGOs and business associations (Table 24). Innovative

Table 23: Business support in the past 12 months

	Lumber	Wood	Carpenter	Total
Yes	63.6	36.2	43.2	43.8%
No	36.4	63.8	56.8	56.2%

Source: Sokoban Wood Village Survey, 2017

Table 24: Types of business support and who offered the support (%)

	Government	NGO/Donor	Business Association	Private Sector	Total
Skills training	96.2	83.3	95.8	100	93.7
Developing innovative ideas	2.5	12.5	4.2	0	4.7
Technology diffusion	1.3	0	0	0	0.8
Others	0	4.2	0	0	0.8
Total Number	79	24	24	1	128

Source: Sokoban Wood Village Survey, 2017

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

	Lumber	Wood	Carpenter
Very supportive	9.1	7.2	14.7
Fairly supportive	12.1	18.8	26.3
Not supportive	78.8	73.9	58.9

Source: Sokoban Wood Village Survey, 2017

Table 26: Infrastructural Improvement (in Percentages)

	Roads	Power/Energy	Telecommunication	Water	Transport
Improved	2.7	48.3	38.7	31.5	27.7
Worsened	91.1	21.6	6.5	19.2	25.3
Not changed	6.2	30.1	54.8	49.3	46.9

Source: Sokoban Wood Village Survey, 2017

Table 27: Biggest obstacles to business (%)

	No obstacle	Minor obstacle	Moderate obstacle	Major obstacle	Very severe obstacle	Does not apply	Do not know
Poor quality of raw materials	13.7	8.6	19.5	33.6	24.3	0.3	0.0
Inadequate/unreliable supply of raw materials	1.4	2.4	4.4	30.5	61.0	0.3	0.0
High cost of raw materials	2.4	2.4	11.3	37.7	45.9	0.3	0.0
Access to finance	5.5	11.0	24.7	33.6	22.9	1.7	0.7
Tax rates	29.4	32.2	25.3	9.9	2.0	0.7	0.3
Tax administration	29.8	25.0	18.5	8.2	2.7	8.9	6.8
Corruption	31.2	12.0	14.0	19.9	12.0	7.9	3.1
Courts	45.5	14.7	7.9	2.4	1.0	20.9	7.5
Political business cycles	22.6	22.3	17.1	18.8	9.6	7.2	2.4
Inadequately educated workforce	53.8	25.7	11.0	4.1	0.3	3.8	1.4

Source: Sokoban Wood Village Survey, 2017

ideas were mainly supported by NGOs/ donors.

Respondents were subsequently asked to indicate how supportive the public sector has been, in relationship to the wood sector over the last three years. The majority of the enterprises reported that government policies have not been supportive of the sector over the last three years. Indeed, 79%, 74% and 59% of lumber sellers, wood sellers and carpenters respectively, reported that policies pursued by government over the last three have not been supportive in terms of growth and development of the wood sector in Ghana (see Table 25).

The respondents were also asked whether, in their view, they thought the infrastructure – roads, power/energy, telecommunications, 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 worsened. However, nearly half of the respondents reported that the power/energy situation had improved.

The study went on to assess the major obstacles to businesses within the cluster (see Table 26). In terms of the wood industry value chain, the study found that inadequate/unreliable supply of raw materials stands out as the major challenge (91%) (Table 27). Furthermore, we found that the high costs of raw materials were a concern for about 84% of respondents, followed by the poor quality of raw materials (58%) and the lack of access to finance (57%).

Conclusion

The purpose of this study is to examine the potential of industrial clusters for promoting industrial development in developing countries. Using the wood processing cluster in Ghana's second largest city, Kumasi, as a case study, this paper seeks to assess the growth potential of industry and firms in clusters.

To examine how the cluster has affected performance, the survey asked respondents to provide the average values of their sales and revenues from 2012 to 2016. From this objective measure of performance, we found that both sales revenues and profitability have been disappointing. Profitability, in particular, has declined over the last five years for almost all the actors in the cluster.

The respondents were then asked to rank the extent to which they thought operating within the cluster had affected their profitability and sales revenue. When we examined the qualitative responses, most of the respondents were of the view that the cluster had had positive impacts on their profitability and sales. This is an interesting finding in that it suggests that the firms may have been worse off if it were not for the cluster. In general, the means through which the cluster exerted positive effects on the firms were: training programs, commercial recognition, cheaper procurement and operational support. Commercial recognition comes from the fact that the cluster offers greater convenience to customers.

The study sought to understand how firms located within the cluster upgraded their products and processes. We found that most of the innovation that took place within the cluster relates to processes, rather than new products. More often than not, firms initiate 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 the 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 point to the fact that the role of the cluster in promoting innovation was minimal. Unfortunately, few respondents received 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, who provide assistance for infrastructure development and the management of the cluster. Other forms of support include help in formalizing the operations of the cluster, capacity-building and knowledge management training, as well as empowering the cluster to contribute to policy within the wood sector.

Despite the availability of institutional support from both public and private actors, issues such as the scarcity, cost and quality of raw materials, and the lack of access to finance, have hindered the growth of the industry.

Since the firms relocated to the Sokoban Wood Village, knowledge transmission and the provision of institutional support seem to have increased. These are characteristics that can be directly attributed to the cluster. However, it is difficult to determine the effects of the cluster on productivity as the entire wood industry has suffered from the depletion of traditional species of timber. Recent institutional support aimed at promoting new species for wood and wood products, along with policy interventions to encourage their use, may go some way to overcoming these challenges.

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Appendix: Supporting transcriptions

A1. Cluster structure and firm performance

i. A carpenter describing how the SWV is 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..." in Participant in FGD with carpenters.

ii. A transporter sharing an experience where his membership in the transport cluster in the 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..." Participant 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..." Participant 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..."

Participant 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..." Participant in FGD for carpenters.

A3. Reasons for process upgrades

i. Carpenters and lumber sellers explained how wastes products became useful after upgrading processes 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..." Participant 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 twos for roofing so we so not waste them anymore..." Participant in FGD with lumber dealers.

A4. How firms upgraded their processes

i. Lumber sellers expressing their views on new technologies:

"...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..."

Participant 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..." Participant 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 [Council for Technical and Vocational Education and Training] 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 (vertically and horizontally):

"...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 infrastructure developments are brought to the 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 the SWV transformed their operations from illegal practices to 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 gives the firms leverage to negotiate directly with the 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 we 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 in 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 programs

A participant'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..."Participant in FGD for carpenters.

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