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An examination of linkages in the sawn wood sector of the Nigerian forest industry: Policy implications for natural resource-based development

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ABSTRACT

Proponents of natural resource-based development have argued that backward, forward and lateral linkages around natural resources can bring about structural change. However, there are very few studies on the development potential of natural resources in developing countries, specifically on non-petroleum related industries. This study examines linkages in the sawn wood sector of the Nigerian forest industry, in particular the saw mill and artisanal metal fabrication sectors which represent forward and backward linkages. Using a qualitative approach to obtain a detailed historical perspective, the study reveals that foreign inputs were gradually replaced by local inputs through the spontaneous efforts of artisans using the Doing, Utilising and Interacting (DUI) mode of learning and innovation to fabricate band saws and accoutrements used by the saw millers. Furthermore, problem solving skills have been acquired by the artisans over the years through the fabrication of these machines and interacting with the production activities of the millers. Export of machines by the artisans to regional low technology demanding countries were revealed. In addition, evidence of lateral linkages in form of movement of the fabricators to the manufacturing sector was also reported. While the sector shows promise for structural change, advances in technological competence of the sector is however being curtailed by a lack of access of the artisans to Science, Technology and Innovation (STI) based modes of learning and innovation and a vibrant iron and steel industry. In addition, production activities are being limited by an inadequate supply of timber due to the country's rapidly degrading forests. This in turn has restricted learning and competence building opportunities. For the industry to attain its full development potential, policy recommendations include revitalising the country's iron and steel sector, commencing the award of degrees in wood products engineering, fostering linkages between the artisans and formal knowledge infrastructure, initiating proper sustainable forest management practices and providing relevant physical infrastructure.

1. Introduction

The recent slump in the price of crude oil and its effects on developing countries dependent on petroleum exports has once again prioritised the need to diversify the economies of resource rich developing countries. Structural change, which implies changes in the type and size of industries in an economy, has been linked to job creation, increases in national income and sustained economic growth (Andersen et al., 2015). There are diverse schools of thought among development practitioners on the path developing countries rich in natural resources can thread to achieve structural change. One school of thought argues that natural resources offer little potential for economic development. They propose that resource rich developing countries should establish a manufacturing-based sector without any links to natural resources like the developed albeit resource poor countries in Southeast Asia. They argue that products of manufacturing activities unlike those from natural resources are less susceptible to drastic price changes, permit the

country to be less dependent on natural resources and draw on technological competence and infrastructure which may promote structural change (e.g., Gylfason, 2008; Palma, 2008).

Another school of thought however considers natural resources to be the key to structural change. Proponents of natural resource-based economic development contend that through backward, forward and lateral linkages around natural resources, countries can expand existing industries and establish new ones (Andersen et al., 2015; Ramos, 1998). Authors such as Ramos (1998), Wright and Czelusta (2004) and Andersen et al. (2015) report that production activities based on natural resources are more technologically advanced and have contributed more to the economic growth and technological base of countries than production activities based on manufactures. This literature usually points to countries such as the U.S., Canada, Australia, and New Zealand among others, as countries that have achieved a diversified economic structure and economic development based on natural resources. Thus, proponents of natural resource-based development

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consider the existence of natural resources a considerable opportunity for developing technological competence for structural change and sustainable economic development.

There are a few studies focusing on the process of knowledge accumulation and linkages in natural resource intensive industries in developing countries. According to Andersen et al. (2015) about 6% of the research focusing on learning and innovation are in the domain of natural resource industries. The authors further note that majority of these studies see natural resources from an energy perspective rather than a developmental one. In the light of the above, there is a need to explore the potential of natural resource-based industries in promoting structural change in developing countries.

Two streams of literature have been used to provide theoretical and empirical support for the argument that natural resources do offer opportunities for structural change and economic development. The first is the concept of industrial clusters and the second is the Innovation systems approach. Focusing on these two perspectives, the aim of this study is to examine linkages in the forest industry in Nigeria, specifically an industrial cluster in the sawn wood sector and the industry that provides mechanical inputs. This sector is selected because a review of available literature suggests that this industry has not been given due attention in the African context. In addition, countries such as Finland, Canada and Chile have recorded significant technological spillovers or lateral linkages to other industries from this sector. Therefore, there may be some lessons to be learnt from a study of this sector.

Studies on industrial clusters usually emphasise progressive stages in the development of a cluster. That is, from an incipient to a mature cluster. In mature clusters, pioneer industries have led to the creation of new ones (Porter, 2000; Ramos, 1998). The innovation systems approach highlights competence building linkages between innovating units and users of innovations (Lundvall, 1985; Lundvall and Lema, 2014). This study will therefore attempt to; identify the innovating units that provide inputs in a cluster of the sawn wood sector; examine the innovations and learning processes in the innovating and production units in the cluster; determine the stage of development of the identified cluster and if there are lateral linkages to other industries and recommend policy initiatives that may promote structural change. The literature review will be discussed in the subsequent section. This will be followed by the methodology, results, discussion and policy implications for natural resource-based development.

2. Literature review

Clusters can be defined as groups of closely related industries and associated institutions co-located in a region (Delgado et al., 2014; Porter, 2000). Membership of a cluster may consist of one or a limited number of industries; specialised suppliers and service providers who provide inputs such as machinery, engineering services and specialised infrastructure; related firms who provide downstream complementary products and; institutions such as universities, standard agencies and trade associations that provide training, research, information and technical support (Porter, 2000). The interconnectedness of relationships among cluster members has been found to enhance cooperation in innovative activities, competition-induced innovation, productivity, employment generation and the emergence of new industries (Delgado et al., 2014).

Natural resource industries have usually been studied at the level of industrial clusters (Bas and Kunc, 2009). Firms tend to agglomerate near the source of raw materials because of benefits that may be gained in relation to transport costs (Ramos, 1998). However, findings have suggested that the geographic agglomeration of firms may also be due to other factors such as access to skilled labour pools, markets, technical information, knowledge institutions and infrastructure which may facilitate innovation and technological upgrading better than in isolated locations (He and Fallah, 2011; Porter, 2000). The success of production clusters around the world in creating new industries and enhancing

job creation and knowledge-based economic development has encouraged both regional and national governments to search for ways to replicate successful clusters in their localities.

Ramos (1998) argues that sustainable economic development can be achieved by building production clusters around natural resources. In a study of the Finnish forest industry, Ramos (1998) reports that the industry went through four stages to attain the status of a mature production cluster. In the first and incipient stage, the natural resource is exported with minimum local processing using imported inputs such as machinery and engineering services. In the second stage, minimal processing of the natural resource and export of value added products commences using locally produced inputs usually manufactured under license to serve import substitution purposes. In the third stage, all inputs are produced locally and the cluster begins to export such inputs and products to near and less technologically demanding markets. In the fourth stage and when the cluster can be considered mature, inputs, goods and services are exported to technologically demanding markets. In addition, the cluster begins to invest in similar activities in other countries. Ramos (1998) contends that these production clusters will be made up of firms formed through backward, forward and side linkages to the natural resource. Industries formed through backward linkages are those that provide inputs necessary for extracting, processing and transporting the natural resource. Industries formed through forward linkages are those that add value to the natural resource by processing it further in to value added goods. Industries formed by side linkages may be unrelated to the natural resource but will employ the technological competence and/or infrastructure developed by industries connected directly to the natural resource. Ramos (1998) suggests that action to facilitate the development of incipient clusters in to mature clusters may include; a) identifying and promoting activities supplying local inputs b) attracting foreign direct investment capable of generating linkages and technological learning opportunities, c) identifying technologies that can play key roles in upgrading the cluster and initiate activities that can promote the mastery, improvement and adaptation of these technologies and, d) identifying and providing the physical, S&T and human resource infrastructure needs of the cluster.

Another important stream of literature is the concept of national innovation systems which is a network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies (Freeman, 1987). A key strand of this literature proposes an innovation based natural resource intensive development (INRID) system for countries whose industrial structure is dominated by natural resource intensive industries (NRII) (Andersen et al., 2015). INRID proposes providing platforms for the diffusion of technologies and competence building to extend NRIIs. As technologies are diffused, competence building feedback mechanisms occur between innovating units and users of their innovations (Lundvall and Lema, 2014). Innovating units may need to fix glitches users encountered in the use of innovations. Users may also need assistance with solving production problems or require new process innovations for new product lines (Lundvall, 1985). As innovating units search for technical opportunities to address these problems, linkage mechanisms across functional departments within the innovating units and/or with external knowledge institutions may be necessary. These mechanisms may bring about incremental or substantial improvements in process and product innovations and increases in the competence of both innovating units and users (Lundvall, 1985, 2007). Opportunities for competence building may thus occur when innovating units endeavour to provide solutions to the demand by NRIIs for technological products. These products may be inputs needed for the exploration, extraction and transportation of natural resources or for value-adding production activities. In order to provide these technological products, innovating units may need to undergo a process of technological learning, thus enhancing innovative capability in the process. This learning process may involve linkages with not only local knowledge institutions, but also national and global actors in possession of related technological

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