

THE COMPETITIVENESS OF GHANA'S ALUMINIUM INDUSTRY

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ABSTRACT

“Competitiveness” and “competitive advantage” became global phenomena in the last two decades of the 20th century. Individual firms, industries and nations began to assess their global competitiveness as a strategy for survival and growth. Competitiveness at the level of the firm may be defined as the ability of a firm to survive and grow, in the light of competition from other firms. Companies all over the world seek to gain advantage over their competitors because of pressure and challenge. The presence of strong domestic rivals, aggressive local suppliers and demanding customers foster competitive advantage on those companies that meet the challenges through innovation. In this paper, the emphasis is on the competitiveness of national industries with the aluminium industry in Ghana as the focus. Using the “diamond of national advantage” established by Porter (1990), it is found that Ghana’s aluminium industry has a competitive advantage in the aluminium processing sector but has only limited competitive advantage in the bauxite mining and primary aluminium sectors of the industry. It is recommended that the full integration of the aluminium industry through the construction of an alumina refinery be made. The aluminium industry in Ghana holds a considerable potential in contributing to the transformation of the basically agrarian economy into an industrial one. This will enhance the achievement of Ghana’s goal of becoming a middle income country by the year 2015.

Key words: competitiveness, competitive advantage, strategy, national competitiveness

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1. Introduction

The terms “competitiveness” and “competitive advantage” appeared as the cliché of the business world in the last two decades of the 20th century. Since then, individual firms, industries and nations have shown considerable interest in assessing their global competitiveness as a strategy for survival and growth. This paper focuses on the competitiveness of national industries with the aluminium industry in Ghana as the case study. A review of the theoretical approach to competitiveness is made which explains why some industries in a nation attain competitive advantage over others. Porter’s (1990a) “Diamond of National Advantage” framework is employed to assess the competitiveness of the aluminium industry in Ghana.

2. Definition of the concept

The concept of *competitiveness* is defined in various ways in the context of individual firms, industries and nations. According to Porter (1990b), “national prosperity is created, not inherited. It does not grow out of a nation’s natural endowments, its labour pool, its interest rates, or its currency’s value, as classical economics insists. A nation’s competitiveness depends on the capacity of its industry to innovate and upgrade.”

Competitiveness at the level of the firm can be defined as the ability of a firm to survive and grow, in the light of competition from other firms. Companies all over the world gain advantage over their competitors because of pressure and challenge. The presence of strong domestic rivals, aggressive local suppliers and demanding customers foster competitive advantage on those companies that meet the challenges through innovation. Porter (1985, 1996) defines *competitive advantage* as the ability of a company to make products that provide more value to the consumer than rival products. This leads to higher sales and increased profits for that company. But the possession of quality products with higher profit margins is not sufficient for a firm to maintain competitive advantage. Almost any advantage can be imitated by rival firms over time. Competitive advantage can only be sustained through relentless improvements and, ultimately, through upgrading to more sophisticated versions.

In this research, an industry is defined as a set of companies, regardless of ownership, that are located in a country and which produce goods and services that are regarded as close substitutes by consumers. Firms in an industry in a country do not only compete among themselves but also, on the aggregate, they compete against similar industries in other countries. The effect of industrial clustering or networking (which promotes vertical and horizontal relationships among the firms and their suppliers) is to mutually reinforce the process of competitiveness through external economies of scale. A nation's industry has a competitive advantage where it possesses the ability to consistently create products and services of higher value than that of rival industries in other countries.

At the national level, the concept of national competitiveness is more difficult to define since the nation is not in the same class as a firm or an industry. The argument has been that nations do not compete by themselves. Rather, the competition is among the firms and industries in the country. It is argued further that competitive enterprises are the main engines of a country's competitiveness. However, since the 1980s, the economic responsibilities of governments have increased tremendously and it is simply impossible to discount the influence of nations on modern economics. The OECD (1996a) recognizes the role of nations in shaping the environment in which enterprises operate and which influences their competitiveness. Much of the competitive advantage of the newly industrialized nations today can be attributed to the very aggressive incentive policies they have pursued such as granting tax holidays, subsidies, etc. which are designed to attract foreign investment.

The OECD (1996b) defines national competitiveness as "the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term." In other words, national competitiveness refers to a nation's ability to sustain higher productivity with higher standards of living for its citizens. Gassmann (1995), on the other hand, defines national competitiveness as the quality of a nation's business environment, or its attractiveness as a location for production. In the last decade, many countries have increasingly been concerned about

their competitiveness on the global markets. For example, Ireland (1997), Greece (2003), Croatia (2004), Bahrain (2005), and the Philippines (2006) have established advisory bodies or special government agencies to handle issues on both industry and national competitiveness.

It is important to distinguish the economic concept of **comparative advantage** from the concept of **competitive advantage**. The main difference between the two concepts is the idea of a one-time advantage versus a sustainable advantage in a dynamic competitive environment. A nation's comparative advantage in a particular product occurs at a specific point in time and can be eroded by the strategic actions of other competing nations over time. The competitive advantage of a nation, however, is embedded in its ability to create more value with its scarce resources than its rivals and sustain this high performance over time (Porter, 1990b). Whereas the concept of comparative advantage rests largely on 'historic' factor advantages, that of competitive advantage places emphasis on continuous efforts, learning and innovation in the dynamic environment of business (Caves *et. al.*, 1990).

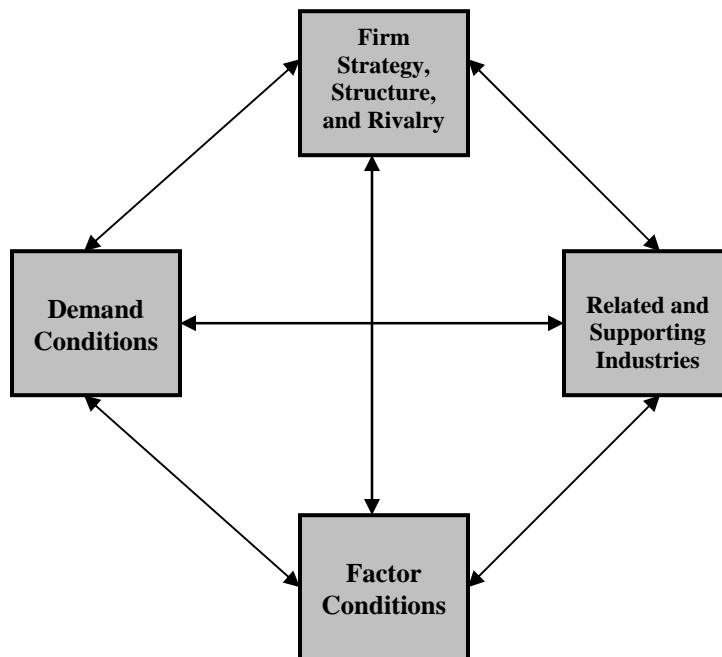
3. Review of Literature and Theoretical Approach

3.1 The Diamond of National Advantage

To understand why some nations have more successful industries than others, Michael Porter undertook a four-year study that encompassed ten nations. He published his findings in his book, "Competitive Advantage of Nations" in 1990. He held the view that the ability of a nation to create higher living standards for its citizens depends on the productivity of its enterprises and industries. He postulated that the industries in a country become globally competitive as a result of very specific national attributes. One or more of these national attributes or conditions enable industries to build a competitive advantage. These attributes were grouped into four broad categories which Porter called the "*Diamond of National Advantage*." Individually and collectively as a system, they constitute an enabling micro-economic environment, "the playing field that each nation establishes and operates for its industries." These four attributes, as shown in Fig. 1, are:

- 1) *Factor Conditions*, i.e. the nation's stock of factors of production such as skilled labour and infrastructure;
- 2) *Demand Conditions*, i.e. the nature of domestic demand for industry's products and services;
- 3) *Firm Strategy, Structure and Rivalry*, i.e. the conditions that govern how companies are created, organized, and managed, as well as the nature of domestic rivalry;
- 4) *Related and Supporting Industries*, i.e. the presence or absence in the nation of supplier industries and other related industries that are internationally competitive.

Fig.1: The Diamond of National Advantage



Source: Adapted from Porter (1990b), p. 77

3.1.1 Factor Conditions

In classical economic theory as popularized by Adam Smith and David Ricardo, factors of production such as land, labour, capital, and natural resources determine the flow of

trade. Nations therefore trade in goods and services which utilize the factors with which they are relatively well endowed. However, the stock of factors that a nation is endowed with is not as important as 'the rate and efficiency with which it creates, upgrades, and deploys them in particular industries.' Porter (1990b:78) further argues that the most important factors of production today are those that are specialized and involve sustained investment. These include specialized scientific institutions such as research centres and specialized hospitals. Since they are specialized and are difficult to imitate, they bestow competitive advantages which are not easily eroded by rivals.

3.1.2 Demand Conditions

Domestic demand conditions usually foster the creation of competitive advantage when a particular industry effectively perceives, interprets and responds to local customer needs. It is not the size of the home market that matter but the characteristics of the domestic demand. Very often, stringent needs arise in view of local values and circumstances. In an effort to meet the needs of demanding domestic buyers, the local firms may come under pressurize to innovate faster which, eventually, results in the achievement of competitive advantage over their foreign competitors. Thus, the demand conditions prevailing at any point in time 'provide advantages by forcing companies to respond to tough challenges' (Porter, 1990b:79).

3.1.3 Firm Strategy, Structure, and Rivalry

National values and circumstances tend to affect how firms are created, organized and managed. They also affect the nature of competition among local firms. For example, while Italian firms tend to be privately-owned and operated like extended families, German firms tend to be hierarchical in organization and management. No one managerial style or system is therefore universally appropriate (Porter, 1990b). The presence of strong domestic rivals stimulates the creation of competitive advantage. A firm with any form of competitive advantage must constantly innovate and upgrade in order to stay on top. Local rivalry tend to push firms to lower costs, improve quality and service, and create new products and processes or significantly improve on existing ones.

3.1.4 Related and Supporting Industries

The presence of related and supporting industries such as very competitive home-based suppliers facilitates the creation of competitive advantages. For example, “they deliver the most cost-effective inputs in an efficient, early, rapid, and sometimes preferential way,” (Porter, 1990b:80). These related and supporting industries also create advantages in innovation and upgrading of products and processes through their close working relationships and constant flow of relevant information. They may even serve as test sites for the R&D efforts of the domestic companies and thereby hasten the pace of innovation in the industry. A good Ghanaian example is the clustering of firms in the auto industry at Suame in Kumasi, in close proximity to the Neoplan assembly plant. A group of auto spares suppliers and parts fabricating firms interact regularly with the various auto repairs and maintenance firms such as mechanics, welders, electricians, sprayers, seat cover producers, etc. This clustering promotes the exchange of ideas and engenders innovation.

3.1.5 Other Determinants

In addition to the four main attributes, Porter also recognized that governments can influence the national attributes by upgrading them in order to create an environment in which firms can become successful. But governments cannot create sustainable competitive advantage for industries. This role is played by chance, in the form of inventions, political decisions by foreign governments, and even wars. These two additional factors, government and chance, cannot bring about competitive advantage by themselves. They rather enhance and strengthen the conditions for the attainment of competitive advantage.

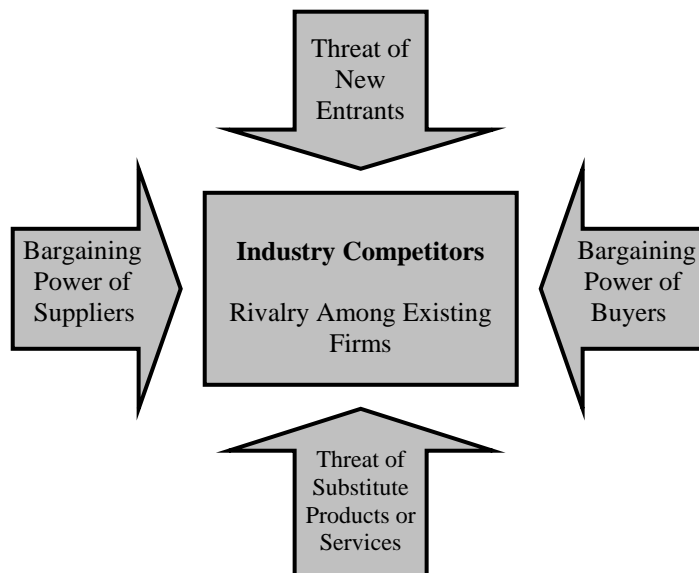
The creation and sustenance of competitive advantage require that a firm stays ahead of competition. According to Porter (1996), “a company can outperform rivals only if it can establish a difference that it can preserve.” This is possible only if the company embarks on continuous improvements and upgrading of its products and processes. Hence, Porter makes innovation central to his theory of competitive advantage since in the modern free trade era, almost every advantage a company possesses can be imitated in the long run.

3.2 Competitive Strategy

Prior to his work on the ‘Competitive Advantage of Nations,’ Porter had published two earlier works: the “Competitive Strategy” in 1980 and the “Competitive Advantage” in 1985. These earlier studies culminated in the publication of the third work, the Competitive Advantage of Nations in 1990. The objective of these works was to provide a basis for understanding industry structure and company strategy.

In the ‘Competitive Structure,’ Porter outlined five forces that determine the performance of an industry. These are: the bargaining power of buyers and sellers, the threat of new entrants, the threat of substitute products and services, and the rivalry among existing firms in the industry (see Fig. 2).

Fig. 2: Factors Determining Industry Profitability



Source: Adapted from Porter (1985) Figure 1.1, p. 5

According to Porter (1985), a firm’s strategy must take into account the rules of competition in the industry since they determine the extent of competitive advantage that the firm can achieve. Porter’s competitive strategy model was fashioned along the lines of industrial organization theory as postulated by Carlton and Perloff (1994). The rules of

competition are seen as embodied in the industry structure which determines the profitability of the industry. The five factors listed in the model above have become the traditional strategy framework for analysing industry profitability (Coyne and Subramanian, 1996).

3.3 Competitive Advantage

The focus of Porter's second work, 'Competitive Advantage,' was on the internal activities of a firm that are regarded as prerequisites for achieving a sustainable competitive advantage. The competitive advantage of a firm comes in two forms: lower costs and differentiation. When these are combined with the competitive scope of the firm (which may be broad or narrow), they create four basic strategies for achieving above average performance in an industry. A firm must make a choice as to which strategy to adopt. The strategy may be variety-based (i.e. producing only one product at a very low cost), need-based (i.e. providing a complete set of activities to serve a specific group of customers), and access-based (i.e. segmenting by access) (Porter, 1996). Competitive advantage is achieved when a firm effectively aligns the management of primary internal activities (e.g. operations, marketing and sales) and supporting activities (e.g. human resources management, R&D) with the strategy it has chosen to follow (Porter, 1985; Chandler, 1992).

3.4 A Critical Appraisal of Porter's Competitive Advantage of Nations

Porter's works were premised on Schumpeterian and evolutionary economic theory rather than neo-classical economics (Porter, 1990a; Nelson and Winter, 1982). According to Porter, the competitive advantage of an industry depends on its capacity to innovate and upgrade. An industry's capacity for innovation is a function of the 'Diamond of National Advantage' (Porter, 1990b) while the external environment plays an important role in a firm's performance. Porter (1985) established that a firm creates competitive advantage by building up skills and know-how in managing its value chain, and this sets the basis for innovation-driven competitive advantage. A firm's strategy is another factor in the creation of competitive advantage and the strategy must fall within the structure of the industry in which the firm operates.

Porter's works criticize the neoclassical economics in several respects. For example, Porter (1990a) saw the theory of comparative advantage as being insufficient because (1) the theory is unable to explain current trade patterns and national developments; (2) the underlying assumptions of no economies of scale, identical technology, undifferentiated products and fixed pool of factors are unrealistic; and (3) the theory takes for granted the role of firm strategy and managerial decisions (Porter, 1990a; Stern, 1989). In addition, while factor advantages may explain trade in the natural resources-based industries, the same cannot explain trade in goods that involve high technology and highly skilled employees.

The main criticism against Porter's model is that it was not subjected to any rigorous econometric testing. Instead, his work was highly qualitative, and based on stories and anecdotes, which makes it difficult to assess the effects of the 'national diamond' on industry competitiveness (Dunning, 1991). Again, the model gives specific reasons for the success of individual industries but cannot be generalized for all industries in a country. Thus, Porter's model can neither be employed to sufficiently explain a country's economic structure nor can it predict which industries will be most successful in future. It has also been pointed out that the model "has been more practically driven than theoretically driven" (Foss, 1995).

Notwithstanding the criticisms mentioned above, Porter's work is still very relevant today. The "Competitive Advantage of Nations" has made two important contributions to economic literature. The first contribution is the fact that the model is consistent in explaining why the business environment in a country supports the growth of certain industries. For example, the model explains why the Italian environment supports the fashion and footwear industries, and why different national environments support the automobile and heavy machinery industries in Germany and the computer and electronics industries in Japan. The second contribution of Porter's work is that the model is able to analyze and predict what factors or attributes to change in order to improve the competitiveness of a particular industry and the nation as well.

It is in recognition of the contributions of the Porter's model that it is applied in this study to assess the competitiveness of Ghana's aluminium industry. Essentially, Porter set out to find out why certain nations are the home-base of some internationally competitive industries, and what national attributes promote international competitiveness of such industries. Though the 'national diamond' model favours industrialized countries, it can still be applied to developing nations such as Ghana (Porter, 1990a). For example, Fairbanks and Lindsay (1997) applied the model to the Andean region and Hoefter (2001) to Ghana.

4. Methodology

To determine the competitive advantage of the aluminium industry, the indicators of competitiveness need to be defined. An industry is seen to be competitive when it is able to design, produce and market superior products than that of its competitors. Such superior products engender higher sales and increased market share, as well as higher profitability (Porter, 1985). According to Porter (1990a), the indicators of industry competitiveness include the industry's sales volume in relation to the global sales volume or that of its competitors, or the industry's profitability vis-à-vis that of its competitors. The later appears to be the best indicator of competitiveness, but it is difficult to operationalize as a result of differences in ownership, financial structure, domestic protection distortions, as well as differences in national accounting standards (Porter, 1990a).

A two-phase data collection approach was employed for this study. In the first phase, production and export sales data were collected from secondary sources within the Accra-Tema metropolis where there is a concentration of firms (both foreign and local) in the aluminium industry. The secondary data were collected from publications such as the annual reports and audited financial statements of the 60 participating firms as well as some governmental and regulatory agencies such as the Ministry of Trade and the Ghana Minerals Commission. This set of data was intended to foster understanding of industry characteristics and help ascertain the competitiveness of the aluminium industry.

The second phase involved a firm level survey using a structured questionnaire based on Porter's 'Diamond of National Advantage,' in addition to several interviews. The administration of the questionnaires was supplemented by face-to-face interviews with purposively selected public and industry officials. Some relevant governmental agencies and organizations, selected through the same statistical processes, were also covered for information that helped to clarify or confirm already gathered data. These two approaches ensured that both qualitative and quantitative data were gathered for the study.

However, emphasis on the national attributes is treated differently from Porter's approach since demand and other conditions vary widely between the developed and developing nations. The sophistication of domestic demand which drives innovation in the developed nations, for instance, is less important than factor conditions in the developing world.

5. The Aluminium Industry in Ghana

Bauxite, the raw material for the production of aluminium, was discovered in Ghana in 1921 but it was not until the World War II that mining activities began (Dickson and Benneh, 1995). The occupation of France by German troops meant that Great Britain looked for new sources of aluminium for its aircraft construction industry. Accordingly, mining began at Awaso in 1943. The British Aluminium Company exported the entire ore, and this continued until the late 1950s when poor world market prices for bauxite forced a decrease in mining activities. Production after World War II varied between 70,000 and 150,000 tons per year. In the 1960s, more bauxite deposits were discovered at Mpraeso and Kibi in the Eastern Region of Ghana that brought the total bauxite deposits to over 200 million tons (Bentsi-Enchill, 1983).

Not much attention has been given to the production of bauxite in Ghana, though it has the potential to become the second most important mineral after gold (Addy, 1998). Production witnessed a downturn for twenty years, between 1970 and 1990 (see Table 1). The biggest decline occurred in the early 1980s (between 1982 and 1984) as a result of the decline of the railway transport system. The bauxite industry depends much on railway transport to carry the ore to the port of Takoradi for shipment. Besides, the

discovery of new bauxite deposits in Brazil and Australia where Kaiser had alumina plants made the setting up of a new alumina plant in Ghana an unattractive venture (Saunders, 1983). Thus, Kaiser Aluminium felt it was still economical to import alumina for VALCO from its Kingston, Jamaica plant, despite the 1974 Agreement with the Government of Ghana.

Table 1: Bauxite Production in Ghana, 1955 – 2003

Year	1955	1960	1965	1970	1975	1980	1982	1984	1985	1990	1995	2000	2002	2003
Production ('000tons)	164	191	304	337	315	225	63	49	180	382	513	504	684	495

Sources: International Monetary Fund (1999): Official Statistics; Ghana Minerals Commission and Various Company Reports

With the establishment of the VALCO Smelter at Tema, Ghana had high hopes of developing a vertically integrated aluminium industry (i.e. involving the mining of bauxite, reducing the bauxite into alumina, smelting the alumina into aluminium, and processing the aluminium into intermediate and consumer products). The 1962 Master Agreement between Kaiser Aluminium/Reynolds of USA and the Government of Ghana included a concession for the importation of alumina from Kaiser's plant in the Caribbean for ten years, after which VALCO should work on the alumina plant. VALCO started the production of aluminium ingots using imported alumina from Jamaica in 1967. It was envisaged that by 1977, VALCO would use alumina from its own plant and thus cease the importations. In 1974, the Government of Ghana started negotiations with Kaiser Aluminium for the establishment of the production plant for alumina at Kibi. Nothing concrete came out of the negotiations (Saunders, 1983) and therefore, till now, the bauxite mining and refining remain non-integrated with the rest of the industry.

Dr. Kwame Nkrumah, the country's first President, believed that the provision of cheap and reliable electricity was the basis for the industrialization of Ghana. In a statement to the National Assembly (i.e. Parliament), Dr. Nkrumah (1961) stated that the Volta River Project at Akosombo for the production of hydro-electric power, would serve as the catalyst in transforming the agrarian economy of Ghana into an industrial one, for the benefit of not only Ghana but also the industrial development of Africa as a whole. The

Government of Ghana (see Nkrumah, 1961) hoped to realize the following from the Akosombo Hydro-electric Power Project:

- 1) the mining of bauxite should be strengthened and a manufacturing plant for the reduction of bauxite into alumina be established to feed the VALCO plant;
- 2) excess power supply from Akosombo above the needs of VALCO should be utilized by new industrial establishments in and around Tema, Accra and Akosombo;
- 3) increased exports of bauxite and alumina would reduce the country's dependence on cocoa, the income from which is subject to world price fluctuations; and
- 4) in the long run, the aluminium smelter at Tema and the expected industrial development should provide enough employment opportunities for the people of Ghana.

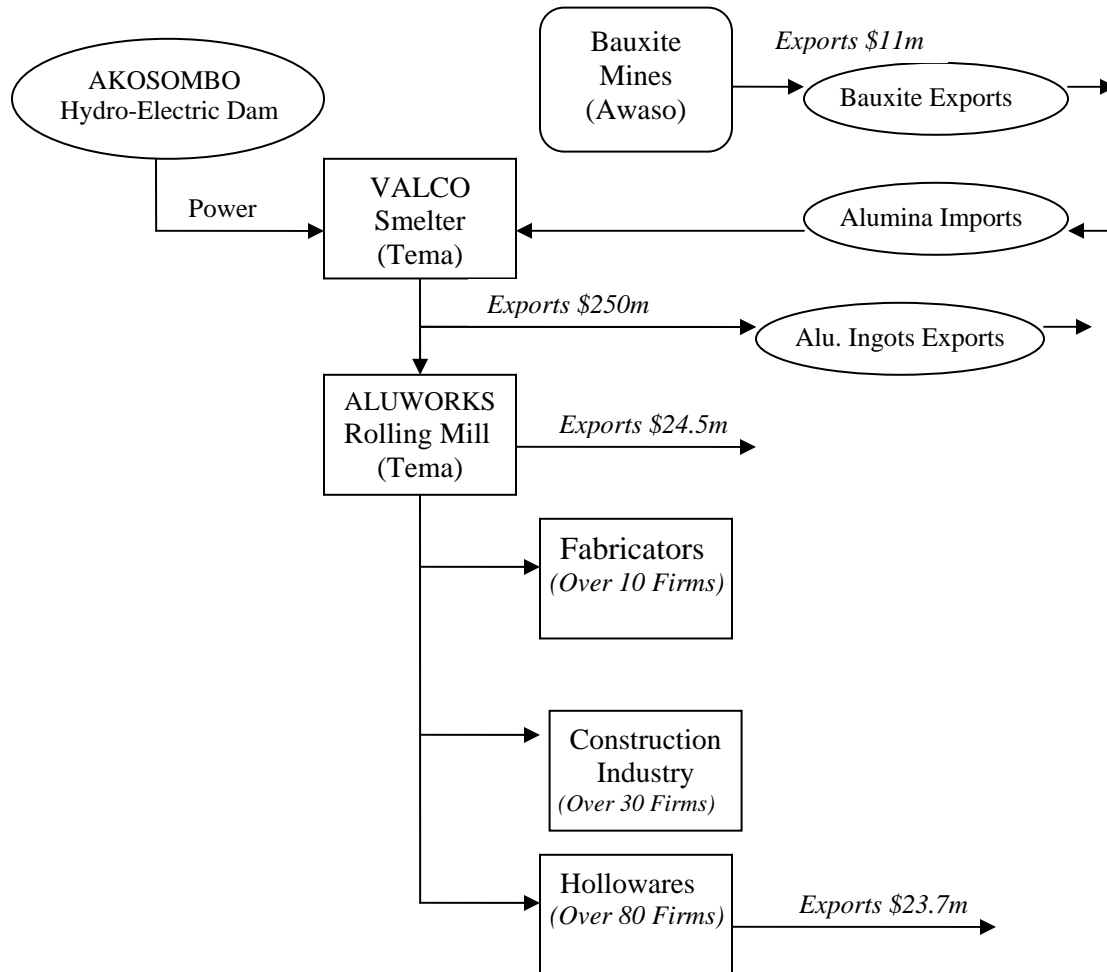
6. Structure of the Aluminium Industry in Ghana

The aluminium industry has four major production or processing phases (see Fig. 3). These are 1) bauxite mining, 2) refining the raw bauxite into alumina, 3) smelting the alumina into raw aluminium ingots and billets, and 4) processing the ingots and billets into intermediate products such as aluminium sheets, coils and profiles, as well as final products such as automotive and aircraft parts, packaging materials, construction inputs and household goods. Low production costs, especially in terms of the refining and smelting processes by way of cheap electricity and raw materials, are the major success factors in the industry. Kaiser Aluminium of the United States of America and Alcan Inc. are two of the world's leading and vertically integrated aluminium companies. These two global companies have been the owners of VALCO at different times.

There are over 120 formal, small and medium-sized aluminium firms in Ghana today. Besides these, there are also over 1,000 local aluminium enterprises in the informal sector, which are scattered all over the country. Together, they provide employment for over 10,000 people, according to the Ministry of Employment and Social Welfare. The formal sector of the aluminium industry has firms that are concentrated in the four leading industrial cities of Accra, Tema, Kumasi and Takoradi. The major aluminium firms include the Volta Aluminium Company (VALCO), Aluworks Limited, Ghana Aluminium Products Limited, Pioneer Kitchenware Limited (formerly Pioneer

Aluminium Factory Limited), Pasico Ghana Limited, Domod Aluminium Company Limited, Lion Aluminium Company and Ridge Aluminium Products Limited.

Fig. 3: Structure of Ghana's Aluminium Industry



Sources: Aluworks Ltd, Ministry of Trade and Industries (Export values from 2006)

VALCO is Ghana's second largest company and Africa's largest smelter with a turnover of over US\$250 million in 2006. The company has an installed capacity of 200,000 metric tonnes (MT) of primary aluminium production but has since 1997 operated at about 30% capacity. As a result of power supply shortages, the company was forced to close down in 2003 and was re-opened in 2005 after Kaiser Aluminium had sold off its shares to the Ghana Government, which subsequently found Alcan Incorporated a willing investor.

The bulk of VALCO's annual production is exported while only 10% is used by the local aluminium industry. The major competitors for Ghana's aluminium products (e.g. household goods) are the East Asian manufacturers. However, the local industry is in a cost-competitive position as a result of its proximity to input sources and low transport costs. In terms of substitutes, aluminium products have no serious threats in view of their wide range of applications.

7. Findings: Ghana Aluminium's Diamond of National Advantage

The results of the study of the determinants of the competitive advantage of the aluminium industry in Ghana are presented in Table 2. They are based on the methodology employed by Porter (1990a), Fairbanks and Lindsay (1997) and Hoefter (2001).

7.1 Factor Conditions

These represent the mix of production factors that a country possesses. These include basic factor advantages such as the availability of relatively cheap raw materials and labour, and specialized factor advantages such as technology and special skills that are specific to the industry. The factor conditions taken into account in this research are the raw materials, physical infrastructure, availability of capital and human resources.

7.1.1 Raw Materials

The presence of large deposits of high-grade bauxite and relatively cheap electric power supply constitute the basic factor advantages of the aluminium industry in Ghana. These, indeed, were the underlying factors that informed the decision to establish VALCO in Ghana. These two factors still remain the drivers of competitiveness of Ghana's aluminium industry. The quality of Ghana's bauxite (which is of the benchmark chemical grade) continues to be a competitive advantage. However, the advantage of cheap electricity is being eroded as a result of power supply shortages, especially since 1998. This has been occasioned by the perennial drought experienced over the Volta Lake region in the recent past. Power and labour costs account for nearly half of total smelter costs. VALCO was rated Kaiser Aluminium's lowest cost smelter between 1967 and

Table 2: Determinants of Ghana Aluminium's Competitive Advantage

Determinants	Components	Bauxite	Primary Aluminium	Processed Aluminium
Factor Conditions	Raw Materials	2	2	1
	Human Resources	0	1	2
	Specialized Factors	0	1	2
	Capital Availability	0	1	2
	Physical Infrastructure	-1	-1	0
	Technology	0	1	1
	Managerial and Administrative Factors	0	0	1
Demand Conditions	Size of Home Market	0	0	1
	Quality of Demand	0	0	2
Firm Strategy, Structure and Rivalry	Firm Strategy	0	0	2
	Structure and Rivalry	0	0	2
	Investment Climate	1	1	2
Related and Supporting Industries	Related Industries	0	0	2
	Supporting Industries	0	1	2
Role of Government	Microeconomic Environment	1	1	2
	Macroeconomic Stability	1	1	2
Summary	Capacity for Innovation	0	1	1
	Development of Competitive Advantage	-1	1	1

Legend: -2 = very negative; -1 = negative; 0 = not relevant; 1 = important; 2 = very important.
Source: Field Survey (2007).

1998. This was because VALCO paid US 0.2625 cents per kWh of power supplied, the cheapest rate in the world as at then. In 1998, when power rates were raised from US 2.2 cents to 3.9 cents per kWh, VALCO's production costs increased by about US\$ 140 per ton of aluminium produced (Hoeftler, 2001). Currently, at the rate of US 3.0 cents per kWh, power constitutes about 24% of VALCO's total smelter costs (CRU, 2004; Valco, 2006). The government's efforts at sourcing natural gas from Nigeria, the contribution of the new Aboadze thermal plant and additional power production by a number of independent power producers represent attempts at finding a lasting solution to Ghana's power problems (Hoeftler, 2001; Valco, 2006).

The domestic aluminium processing sector enjoys the advantage of the availability of adequate raw materials. The local industry can only absorb about 10% of the production

of Aluworks, leaving a huge part for exports. In terms of price and quality, the local industry does not enjoy any advantage over imported aluminium products.

7.1.2 Physical Infrastructure

Besides the power problems, the state of the country's physical infrastructure, especially the railway transport network, constitutes a major problem. Bauxite is transported from the Awaso mine over a 240-kilometre rail system to the port of Takoradi for shipment. This rail link suffers frequent breakdowns such that it impinges on the mine's ability to build any meaningful competitive advantage. According to Hoefter (2001), transport costs represent 45% of the export price of Ghana's bauxite, which makes it highly non-competitive on the world market. Since the domestic aluminium processing industry is concentrated in the cities of Accra, Tema, Takoradi and Kumasi, production is not hampered by the poor physical infrastructure. The government's attempts to overhaul and modernize the railway network, it is hoped, would improve the competitive advantage of the mines.

7.1.3 Availability of Capital

This has not been an issue. The bauxite mine is owned 80% by Alcan Inc. and 20% by the Government of Ghana. The major aluminium producers like Aluworks Limited, Ghana Aluminium Products Limited and Domod Aluminium Company Limited are either subsidiaries or joint ventures with foreign parent companies, or listed on the Ghana Stock Exchange. Besides, there is a wide sub-regional market for their products, especially in West Africa. For example, Aluworks exports about 40% of its production to the West Africa sub-region with Nigeria being the largest, single export destination. Thus, the industry enjoys a competitive factor advantage in this area.

7.1.4 Human Resources and Specialized Factors

Human resources and specialized factors show no competitive advantages in the bauxite mining sector. However, they represent competitive advantages in the primary aluminium and processing sectors through staff training. VALCO has pioneered specialized skills acquisition through staff training to the extent that out of the 60 expatriates the smelter started with in 1966, only 13 have remained. A similar situation prevails in Aluworks Ltd

where less than 10 expatriates are retained. The availability of highly-qualified workforce confers competitive advantages, especially in the primary aluminium and processing industry (Hoefter, 2001).

The aluminium processing sector has largely been dominated by Ghanaian technical experts and management professionals. Most of these have either been former employees of the multinational enterprises in the aluminium industry or have benefited from the specialized training programmes of the multinationals.

7.1.5 Technology, Management/Administrative Infrastructure

The technology employed in the aluminium industry is largely given and therefore confers no factor advantages. Besides, there is hardly any government or industry-led research or training institutions that provide technical or managerial support for the industry. Research and development activities are sponsored by the parent companies of the multinational enterprises such as VALCO and Aluworks Ltd. It is also clear that the prevalent administrative bottlenecks as regards company registration and cumbersome export procedures do not support the development of competitive advantage in the aluminium industry in Ghana. The creation of the export processing zones for the processing and manufacturing of goods for export is expected to eliminate administrative bottlenecks and promote exports.

7.2 Demand Conditions

Domestic demand conditions generally determine the presence or otherwise of competitive advantage since they underlie how firms effectively perceive, interpret and respond to local customer needs (Porter, 1990b). The two components of domestic demand are the total market size and the quality of domestic demand. While large markets enable firms to harness economies of scale, the effect of sophisticated demand and high quality standards is to push firms to upgrade their products and innovate in order to stay competitive.

In the bauxite mining and primary aluminium production sectors, domestic demand conditions do not show any advantages. However, in the aluminium products sector such as in the production of hollow-ware, domestic demand conditions are important. For example, middle class consumers demand high quality household products such as cooking utensils with special designs and features like the non-stick surfaces. As the firms upgrade and innovate to meet the high quality domestic demands, they translate this expertise into successful exports into the sub-regional market. This enhances the competitive advantage of such firms.

7.3 Firm Structure, Strategy and Rivalry

Firm rivalry within an industry is an indicator of the nature and intensity of competition within the industry. Such competition forces firms to upgrade their products and innovate. The nature and intensity of competition is determined by the structure of the industry as well as the strategic decisions made by firms within the industry.

The aluminium processing sector has a diverse structure with more intense rivalry. About 120 medium and small-scale firms operate in this sector. This is as a result of the availability of raw materials and accessibility to both equipment and markets. There are virtually no entry barriers for starting new firms in this sector and the evidence supports the fact that many former employees of existing companies have left to establish their own firms (Yankson, 1996). This intense rivalry compels firms to be competitive not only on costs but also to upgrade and innovate in terms of quality and design.

The bauxite mining, smelting and primary aluminium production sectors have one dominant producer in each segment. The Ghana Bauxite Company (owned 80% by Alcan Inc. and 20% by the people of Ghana) is the only producer of raw bauxite. Its entire production is exported to Alcan alumina refineries in Canada and the US. The smelting process in Ghana is entirely undertaken by VALCO while Aluworks Ltd. is the only rolling mill in Ghana (see Fig. 3).

The investment climate and the regulatory environment in Ghana today may be described as ‘investor-friendly.’ The aluminium industry has benefited under this regime such that when Kaiser Aluminium decided to quit in 2003, Alcan Inc. readily took over VALCO and has laid up plans for revamping the smelter’s operations and to integrate the aluminium industry in the near future. Alcan’s projections include building two modern alumina plants at Nyinahin (to refine bauxite from that location) and in Tema (to refine bauxite from Kibi). This means that Alcan will inject capital of between US\$1.5 billion to US\$2.0 billion over the next few years which will create about 3,500 jobs during construction and 600 permanent jobs at the alumina plants (Valco, 2006).

In terms of strategy, the competitive success of VALCO can be attributed to its corporate strategy of maintaining high production efficiency with cost control in the light of rising power prices. Power constitutes about 24% of total smelter costs. In order to stay competitive, VALCO combines the use of “electricity and other fuels in amounts that give economic reasons for the sustainability of the West Africa Gas Pipeline Project,” (Valco, 2006). [This project, completed in 2007, will supply gas from Nigerian oilfields to Benin Republic, Togo and Ghana to supplement the energy requirements of these countries]. The second important thrust of VALCO’s strategy is the maintenance of good relationships with the Government of Ghana. To this end, Alcan Inc. signed a memorandum of understanding with the Government for the creation of a joint venture between Alcan (51%) and the Republic of Ghana (49%) to develop a bauxite mine and an alumina refinery with an initial capacity of 1.5 to 2 million tonnes per year (GBC, 2006). This venture is aimed at the full integration of the aluminium industry in Ghana.

In the household products sector of the aluminium industry in Ghana, the strategy is toward cost control and the development of strong brands through innovative designs and features such as the popular non-stick surfaces. Strong marketing campaigns are essential part of the strategy at this level since there is intense competition in the industry.

7.4 Related and Supporting Industries

The presence of related and supporting industries fosters the development of close, mutually beneficial relationships among firms. This affinity enhances advances in innovation and productivity among the firms in the aluminium industry and those in the related and supporting industries.

The clustering of aluminium processors and their allied industries (such as caustic soda and lime industries) in Accra and Tema ensure the smooth flow of technical information and expertise among the firms. For example, the establishment of the Aluworks rolling mill in close proximity to VALCO ensures that the former takes advantage of the expertise of the latter. Again, Aluworks also offers expert advice to its customers as regards the choice of machinery, inputs and marketing opportunities. Besides, several aluminium processors have benefited from the periodic skills training programmes of both VALCO and Aluworks and the mobility of labour from the large scale aluminium producers to the small and medium-scale aluminium enterprises within the Accra-Tema metropolis and elsewhere in the country.

7.5 The Role of the Government

Government plays a key role in determining the competitiveness of the aluminium industry in Ghana. The government's educational policies and the provision of basic infrastructure such as power, railways and ports, indirectly, influence the factor conditions of the industry while the regulatory environment and other industrial and economic policies reflect in the sophistication of domestic demand as well as in the strategies adopted by various firms. Similarly, the competitiveness of the industry is greatly influenced by direct government interventions (as in the case of VALCO) and by regulation (such as the existing investment promotion and technology transfer protocols). In the light of the foregoing, a national competitiveness advisory body is highly recommended.

8.0 Summary of Findings and Conclusions

8.1 Capacity for Innovation

In the bauxite mining sector of Ghana's aluminium industry, there exists limited capacity for innovation. However, with the new investments of Alcan Inc. which is aimed at expanding bauxite mining into two new locations, there is the potential for productivity improvement and lowering of production costs. There are also advanced plans to establish two new alumina refineries which will in effect integrate the aluminium industry in Ghana. These projects are expected to add value to Ghana's bauxite and enhance the potential of the smelter to operate at full capacity and to achieve an annual revenue target of US\$500 million (Valco, 2006).

The capacity for innovation in the primary aluminium sector is limited to process improvements leading to lower production costs. Plant and machinery constraints do not allow for innovativeness in the short run, but is achievable in the long run through modernization. The highest capacity for innovation is seen in the aluminium processing sector where new product development, product improvements and upgrading are common. This is as a result of the fierce rivalry that exists among firms in the aluminium processing sector as well as the presence of similar products from the East Asian region. The existence of a large and ready domestic market encourages innovation such as the non-stick product feature. Again, the capacity for innovation is enhanced by the existence of a large export market in the West African sub-region.

8.2 The Development of Competitive Advantage

Ghana possesses large deposits of bauxite. Only a little fraction of this mineral is currently being mined. There is also the Akosombo hydro-electric dam for the generation of power, the Tema harbour which offers facilities for deep-sea transport, an aluminium smelter and a rolling mill. All these facilitate the growth of a competitive aluminium industry. The missing link is the lack of alumina refinery in the aluminium production chain. The clustering of the rolling mill and aluminium processors around the smelter and in close proximity to the deep-sea harbour constitute a national competitive advantage. In this way, raw materials are easily accessible since the output of the smelter is the input of the rolling mill, and the output of the rolling mill becomes the input of the aluminium processors. This arrangement also fosters knowledge spillovers through the interactions

of skilled and specialist workers which promote the development of competitive advantage.

Another important factor for the development of competitive advantage in the aluminium processing sector is the low entry barriers. The ease with which new firms enter the industry invariably leads to intense rivalry among such firms which seek to maintain or increase their respective market shares. This they achieve through product and process innovation and upgrading as well as launching into foreign markets.

8.3 Conclusion

Ghana's aluminium industry has substantial potential for investors, but must innovate and upgrade existing products and processes in order to remain competitive. The huge quantities of good quality bauxite at four major locations in the country, namely Awaso, Nyinahin Mpraeso and Kibi constitute a national advantage. The continuous supply of cheap and reliable electricity, which provided the base for the industry in Ghana in the first place, is a national challenge. Without the reliable supply of the basic input of cheap electricity to VALCO, the basic factor advantage is being eroded. Ghana's drive towards becoming a middle income country by 2015 can be supported by an integrated aluminium industry which consists of the mining of bauxite, refining the bauxite into alumina, smelting the alumina into aluminium, and the fabrication of the aluminium into semi-finished and finished products. The VALCO smelter at Tema is not integrated with bauxite mining and still imports alumina from Canada and the United Kingdom while Ghana still exports raw bauxite for processing into alumina. The reasons for the lack of integration are attributed to various causes. While many blamed Kaiser Aluminium for breaching the Master Agreement of 1962 by its failure to establish the alumina plant, the company defended itself by faulting the Government of Ghana for inability to supply the agreed amount of power for full-capacity production. Others hold the opinion that world conditions and the level of Kaiser's operations in Ghana did not make such a venture a profitable one. With Alcan Inc. taking over control, a new lifeline has been given the aluminium industry.

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