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THE LIKELIHOOD OF SUSTAINING NIGERIA'S IRON ORE PRODUCTION IN THE SHORT-RUN

Osemenam Uche[1+]
Afeni Thomas B.[2]

[1]*Department of Economics University of Nigeria, Nsukka, Enugu State, Nigeria.*
Email: osemenamu@gmail.com Tel: +2347085845112
[2]*Department of Mining Engineering, Federal University of Technology, Akure, Ondo State, Nigeria.*
Email: TBAFENI@futa.edu.ng Tel: +2347065551448

(+ Corresponding author)

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ABSTRACT

Given the attention of Nigerian policymakers to the sustenance of iron ore production in the national discourse on economic diversification. This write-up logically points out scenarios and reasons why the likelihood of sustaining this venture in the short-run could be very slim. The inference from the ideology of production possibility boundary is considered. In sum, the non-operation of Nigeria's potential demand (identified as an indirect input, in this write up) for her iron ore concentrates by law, its deficient national income - which could hinder the procurement of sophisticated mining equipment to sustain iron ore mining and human capital limitation, are factors considered, to arrive at the aforementioned conclusion. Hence, the option of privatization is suggested, as a way of shifting the costs (Nigeria's outrageous debt, which could lead to a debt crisis) accruable to absorbing these inadequacies, if the decision to sustain Nigeria's iron ore production must be kept afloat.

Contribution/ Originality: This study contributes to the existing literature on iron ore production and its potential in Nigeria. It adopts theoretical inference (precisely from the ideology of production possibility frontier), as a method in arriving at its conclusion. Although no mathematical or new mathematical formula were employed. It is one of few studies, written in the Nigerian context, that have explored the likelihood or possibility of Nigeria's capacity to sustain her iron ore production, single-handedly (with no external aid).

1. INTRODUCTION

So far, Economics has demonstrated that the capacity to produce efficiently in the long or short runs, rests solely in the availability and utilization of scarce economic resources, in an efficient proportion. While land remains fixed, the decision on the proportion of labour and capital to be utilized in production and its quality takes a crucial stand in the productivity of developing economies, pointed out in Lawrence (1987). Consequently, the willingness to take up the production of any merchandise, by a developing economy, suggests that its intricacies have been weighed adequately, with respect to existing economic resources at its disposal. Subject to this, the questions, what do we have? In what quantity? Can we produce what we have? How do we produce, what we have? For whom are we producing and of what quality? All these are expected to be answered. Fortunately, In Nigeria, the question, 'what do we have?', isn't a question anymore, as authors have come to a consensus on what we really have, by identifying a myriad of existing natural resources, including the abundance of iron ore, within our territory, (As

described in the following studies: (Oluwasanmi, 1966; Abdullahi, 2002; Ehui and Tsigas, 2009; Adebimpe and Akande, 2011; Umar *et al*., 2011; Adenugba and Dipo, 2013; Raji and Abejide, 2013; David *et al*., 2016; Jackson *et al*., 2016; Abiwon, 2017; KPMG, 2017; Pwc, 2017; Abimbola and Adedibu, 2018). On the contrary, the question, how do we produce from what we have? Has not gained much ground, as the former, with respect to iron ore and agricultural production. Interestingly, these have brought up two factions. First, are those of the argument that harnessing small scale artisanal mining techniques, modular techniques and local agricultural technology are capable of producing from what we have. Although its produce might not be of the best quality, its utilization could serve as an incentive (reduction in the amount spent on the importation of capital equipment) to Nigerian policymakers, if exploited and modified (Mogbo, 2000; Azogu, 2009; Ogunyemi and Adedokun, 2012; Okafor, 2014; Sani *et al*., 2014; Deloitte, 2016). The second faction are those of the argument that: the importation of capital goods is most suitable for sustaining Nigeria's manufacturing sector, hence, needed to produce what we have, in order to enhance productivity and sustain economic growth, (Douglason, 2010; Ojide and Ojide, 2014; Damilola, 2014a; Damilola, 2014b).

No doubt, both factions exhibits a great deal of logic; however, the latter (i.e. necessity for the importation of capital goods in sustaining Nigeria's manufacturing sector), seem to be a topic that captures the interest of many Nigerian economists (authors), relative to the former (i.e. harnessing small scale artisanal and local technology in production), owing to the disparity, in the number of literatures reviewed on both subjects.

Regardless of the low interest shown by Nigerian economists, in the former topic, the production and sustenance of iron ore are of major concern in this write-up, as it stands to be one amongst a myriad of 'what we have (natural resources)'. Hence, exploring its sustenance with respect to available scarce resources is a necessity. Though its discourse has gained little attention, amongst Nigerian economists, it's potential (As described by Ocheri *et al*. (2017); United Nations Development Programme (2014); Ilori (1996)) has earned it a consideration in national discourse on economic diversification alongside agriculture by policymakers. However, it is worthy to note that, its potential isn't a sufficient measure for ascertaining its efficient production, for efficiency and sustenance, are two basic economic indicators that define a venture worthy of sustainable economic welfare, in the short or long runs. To this end, sustaining Nigeria's economic growth through the production of iron ore could be said to be feasible, if its known potentials are transformed efficiently into final output (for industrial use). The question is, do Nigeria, as a country have the capacity to effect and sustain the intricacies surrounding this transformation in the short-run? Where the maintenance of sophisticated mining equipment, fabrication of spare parts for wore out mining equipment needed for the production of iron ore isn't within her control, at the moment.

1.1. Locations of Iron Ore Deposits in Nigeria

With reference to Table 1 the values in the column labelled "Estimated reserves", is vital for the economic assessment of any mineral deposit, because it measures the quantity of mineral contained in a mineral deposit (Howard, 1987). In fact, this estimate is a reflection of the commerciality of a mineral deposit measured in metric tons. The higher the value of the estimate, the greater its suitability for trade (return on investment). In sum, the values of the estimated reserves shown in Table 1 ranks the Agbaja iron ore deposit (with, 2billion metric tons of iron ore in commercial quantity) above all other, iron ore deposits in Nigeria, in terms of commerciality. Figure 1 shows a map of Nigeria showing iron deposits areas.

Table-1. Iron Ore Deposits and Percentage Occurrence in Nigeria.

Percentage occurrence (%)											
Locations	**Fe**	**Fe_2O_3**	**SiO_2**	**AL_2O_3**	**CaO**	**MgO**	**P_2O_5**	**MnO**	**TiO_2**	**Estimated reserves**	**Deposit status**
Itakpe	38-45	53.1	44.8	1	0.3	0.2	0.5	0.05	0.1	200-300million	Operational but moribund
Agbaja	45-54	62.64	8.55	9.06	0.72	0.38	4.16	0.14	0.37	2billion	Exploited but its development is in progress
Ajabanoko	35.61	47.74	0.41				0.11	0.05	0.06	30million	Exploited but its development is in progress
Chokochoko	37.43	47.65	4.3				0.05	0.52		70million	Exploited but yet to be developed
Agbade Okudu	37.43	29.41	0.62							70million	Exploited but yet to be developed
Nsude Hills	37.43									60million	Exploited but yet to be developed

Source: Bamalli *et al.* (2011) and Modified from Ministry of Petroleum and Mineral Resources, (1993).

Table-2. Other Iron Ore Deposits under Exploration in Nigeria.

Locations	State	Iron ore content (%)
Ajase	-	39.0
Gbege	-	42.7
Oko	Anambra	34.4
Eginija (Egenerga)	Benue	34-35
Karfa	Borno	34-35
Gamawa	Bauchi	40-45
Rishi	Bauchi	14-19
Ayaba	Kaduna	27.5
Tajimi	Kaduna	22-52
Dakingari	Kebbi	22-52
Muro hills	Nasarawa	25-35

Source: Wehleekema (2017).

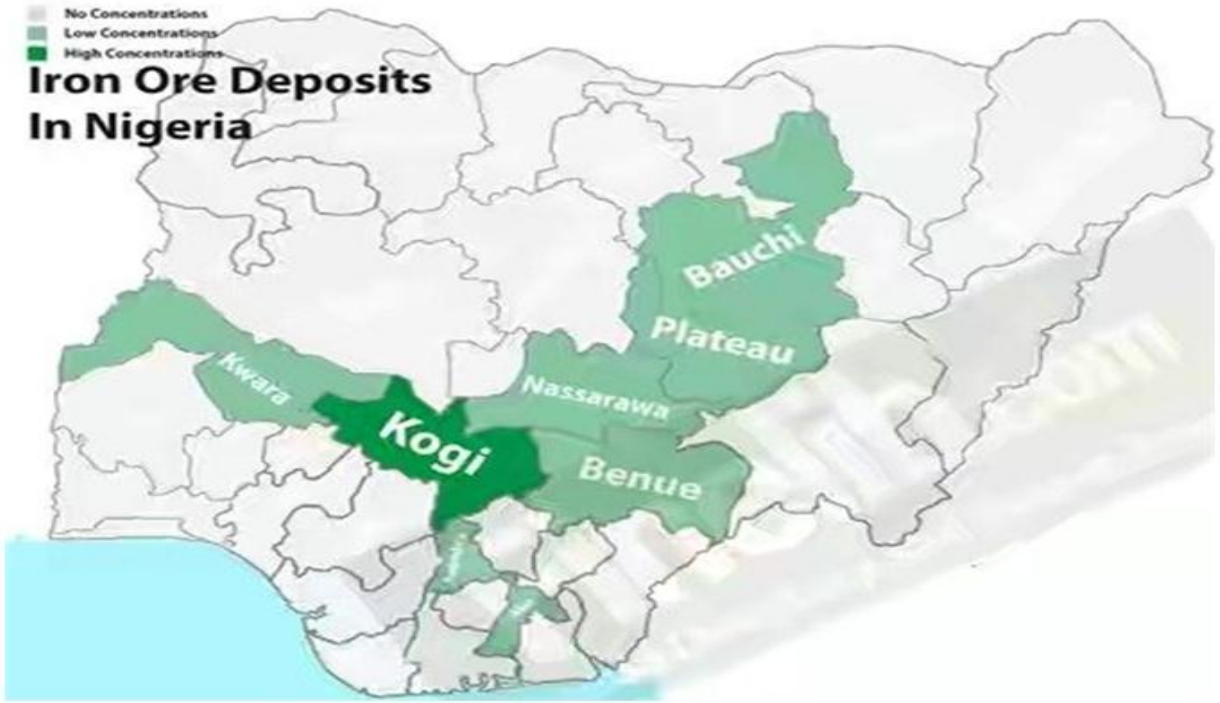

Figure-1. Map of Nigeria showing iron ore deposits.

Source: Finelib.com (2017).

2. THE POSSIBILITY OF SUSTAINING IRON ORE PRODUCTION: NIGERIA IN VIEW

Generally, the factors necessary for the production and sustenance of a proposed commodity has been identified in the economic model, Production Possibility Frontier. It puts forward, advances in technology, human capital development, changes in resources and changes in the labour force, as basic requisite to effect and sustain the production of any commodity. However, the word "sustaining", as used in this write-up implies, Nigeria's capacity to withstand and maintain its plan of producing, 2,150,000 metric tons of iron ore concentrates for Ajaokuta Steel Company and 550,000 metric tons of iron ore concentrates, for Aladja Steel Company, with respect to existing and available technology, its costs and the availability of human capital needed to take off and maintain the production of iron ore in Nigeria. According to United Nations Industrial Development Organization (1985) 'No doubt, it is advantageous for a country to develop her iron and steel industry, but this depends on the availability of resources, needed to effect it'. To this end, in order to sustain the production of iron ore (as a commodity) in Nigeria, policymakers must always place the aforementioned factors at the lead of its plan.

2.1. Available Technology vs Nigeria's Iron Ore Extraction

Attaining efficiency and quality ore concentrates has been characterized by the use of sophisticated earthmoving equipment, such as hydraulic shovel, bulldozers, soil compactors, rotary drill, etc. in the extraction of ore deposits, Howard (1987). Unfortunately, according to Osemenam and Afeni (2018) some of the earthmoving equipment procured for the extraction of iron ore at NIOMCO (National Iron Ore Mining Company), which is Nigeria's iron ore company, have been exposed to a long period of rainfall, since the year, 2011. In fact, the lifespan of some, of the equipment haven't been utilized. Based on this, it is not illogical, to conclude that some of the procured equipment and its component would require replacement, for extraction to take place. In a nutshell, the use of sophisticated equipment and some of its parts, can't be ignored, as Nigeria seek to sustain the production of iron ore concentrates, alongside, economic welfare. The main concern is, as a country, are these equipment within our productive capacity? Do we have any available alternative that is capable of withstanding the production intensity at various stages of iron ore exploitation and production at the moment? Is there a likelihood of a costly economic trade-off, if we choose to utilize the most feasible option at our disposal?

2.1.1. Equipment Specification for the Extraction of Nigeria's Iron Ore Deposit

Table-3. Mine equipment.

Equipment(Quantity)	Equipment capacity	% requirement of equipment spare part	Countries/location of production	Feasible source of equipment/spare parts	An alternative source of some spare parts for equipment (in Nigeria)	Price of equipment (per unit$)
Bulldozers 300HP (2)	_	15	U.S.A, China, Germany, U.K, Italy	importation	Foundry technology (current status: Developing)	250,000
Bulldozers 400HP (6)	_	15	U.S.A, China, Germany, U.K, Italy	importation	Foundry technology (current status: Developing)	300,000
Water sprinkler, magnum (2)	30m^3	15	U.S.A, China, Germany, U.K, Italy, Japan	importation	Foundry technology (current status: Developing)	29,180,300
Motor grader 14G (1)	_	15	U.S.A, China, Germany, U.K, Italy	importation	Foundry technology (current status: Developing)	_
Explosive truck (1)	_	_	U.S.A, China, Germany, U.K, Italy	importation	Foundry technology (current status: Developing)	7,800
ANFO loaders (1)	_	15	U.S.A, China, Germany, U.K, Italy	importation	_	774.51
Explosives (2bags)	25kg		U.S.A, China, Germany, U.K, Italy	importation	n/a	3,697.40
Diesel tanker	12m^3	15	U.S.A, China, Germany, U.K, Italy, Japan	importation	_	12,000
Soil compactor	_	_	China, U.K, Germany, Japan, U.S.A	importation	_	39,685,208
Diesel	12,000litres		Available in Nigeria	importation	n/a	5,846

Source: Nigerian Mining Corporation, Project Report, (1989), CAT-EULID catalogue, Machinery Trader, Engineering Export Info Bulletin, (2015).

Table-4. Main mine equipment.

Equipment(Quantity)	Equipment capacity	% requirement of equipment spare part	Countries/location of production	Feasible source of equipment/spares parts	The alternative source of some spare parts for equipment (in Nigeria)	Price of equipment (per unit$)
Hydraulic shovel (2)	_	15	China, U.K, Germany, Japan, U.S.A	importation	_	700,327,200
Front end loaders (3)	9m^3	15	China, U.K, Germany, Japan, U.S.A	importation	Foundry technology (current status: Developing)	586,761,389
Rotary drill rigs (2)	120m (Lx4)	_	Japan, U.S.A, China, Germany	importation		291,803

Source: Nigerian Mining Corporation, Project Report, (1989), CAT-EULID catalogue, MachineryTrader, Engineering Export Info Bulletin, (2015).

Table-5. Field maintenance equipment.

Equipment(Quantities)	Equipment capacity	% requirement of equipment spare part	Countries/location of production	Most feasible source of equipment/spares parts	Alternative source of spare parts for equipment (in Nigeria)	Price of equipment (per unit$)
Lubricating truck (2)	–	15	China, U.K, Germany, Japan, U.S.A, India	importation	–	96,500
Washing station (1)	–	–	Japan, U.S.A, China, Germany	importation	–	30,000
Lubricating skid (1)	–	15	Japan, U.S.A, China, Germany	importation	–	20,000
Mobile arc welding set (1)	–	15	U.S.A, China, Germany, U.K, Italy	importation	–	219
Mobile flood lights tower (12)	–	–	U.S.A, China, Germany, U.K, Italy	importation	–	13,800
Breakdown vehicles (2)	–	–	U.S.A, China, Germany, U.K, Italy	importation	Foundry technology (current status: Developing)	1,670
Bucket truck (1)	–	15	U.S.A, China, Germany, U.K, Italy	importation	Foundry technology (current status: Developing)	120,900

Source: Nigerian Mining Corporation, Project Report, (1989), CAT-EULID catalogue, Machinery Trader, Engineering Export Info Bulletin, (2015).

Table-6. Large capacity equipment.

Equipment(Quantities)	Equipment capacity	% requirement of equipment spare part	Countries/location of production	Feasible source of equipment/spares parts	Alternative source of some spare parts for equipment (in Nigeria)	Price of equipment (per unit$)
Gyratory crusher (1)	300m	–	U.S.A, China, Germany, U.K, Italy	importation	–	50,000
Primary crushing plant (1)	–	–	Germany, China, U.K, Italy, U.S.A	importation	–	30,000
Excavators (3)	–	–	Germany, China, U.K, Italy, U.S.A	importation	–	316,943,338
Dump truck	100/120 tons	15	Japan, Germany, U.K, Italy, China, U.S.A,	importation	Foundry technology (current status: Developing)	468,577,841

Source: Nigerian Mining Corporation, Project Report, (1989), CAT-EULID catalogue, Machinery Trader, Engineering Export Info Bulletin, (2015).

Tables 3, 4, 5 and 6, summarizes Nigeria's technological capacity, with respect to iron ore mining. It is obvious that, as a country, none of the earthmoving equipment utilized in iron ore mining, is manufactured in Nigeria. On the other hand, there are foundries that could manufacture some spare parts of earthmoving equipment utilize in mining, such as gears, crawlers, track chains and sprocket, but are still developing. To be specific, they are faced with varying challenges, such as adequate power, finance, etc. However, its quality remains an issue to be explored further. One of such foundries is the Mgbuka foundry, located at Ontisha, Anambra State (South- Eastern region of Nigeria). To this end, Nigeria's most feasible source of earthmoving equipment and spare parts, for mining, is importation. Owing to the fact that, Nigeria does not manufacture any of this equipment, at the moment. Worthy of note is, the above specification was made, for the extraction of the iron ore deposit at Itakpe (a town in Kogi State), popularly known as "Itakpe Iron Ore Deposit", by Sofremines, a mining company, that was part of the initial exploration process at Itakpe Iron Ore Deposit.

Assuming a worst-case scenario, where Nigerian policymakers agree to procure (import) at least a unit of the above-specified equipment, to sustain the mining of iron ore, at Itakpe deposit, on the basis that most, of the earthmoving equipment have been exposed, to a long period of rainfall, since, the year, 2011. Hence, the likelihood that its engine has been exposed to heavy rainfall resulting to its damage, is a feasible event, Osemenam and Afeni (2018) in addition to the positive multiplier effect accruable to iron ore mining, (mentioned in Ocheri *et al.* (2017); UNDP (2014) and Ilori (1996)) makes, the procurement of earthmoving equipment, attractive to policymaker. In monetary terms, this implies that the central government would spend not less than, U.S $2,142,704,439.91 on mining equipment. This estimate excludes variable costs, (such as fuelling, replacement of spare parts and other running costs), procurement of ancillary mining equipment and other miscellaneous costs attributable to iron ore mining. With reference to the Nigerian Bureau of Statistics (2018) Nigeria's Gross Domestic Product stood at N35,230,607.63 million ($97,599.35), in the fourth quarter of 2018. Sadly, the above estimates show that Nigeria would have to incur a debt, of over U.S $2billion, to adequately fund the procurement of capital equipment, required to mine her iron ore in commercial quantity, given this instance. Consequently, it is reasonable to conclude that, other sectors could witness a gross or outright inattention if this scenario becomes a reality. Although good economic planners would always avoid, this sought of a scenario.

On the other hand, given a best-case scenario, where Nigerian policymakers agree to procure (import) only two mining equipment; a mine and main mine equipment, (e.g. soil compactor and front-end loaders, respectively), a unit each, owing to the reasons, earlier stated in the worse-case scenario and given Nigeria's Gross Domestic Product as at the last quarter of 2018. In monetary terms, this implies that the central government would spend not less than U. S$ 626,446,597million, on the purchase of mining equipment, only. In fact, the central government would have to, incur a debt of U.S $626,348,997.65, if they must keep up with their agreement. Given another best-case scenario, where the policymakers, agrees to the purchase, of only, a unit of mining equipment (e.g. excavator). Monetary-wise, this implies that the central government would spend not less than, U.S $316,943,338, on the purchase of mining equipment, only. Consequently, incurring debt, to the tune of U.S $316,845,778.65 would be unavoidable, if the central government sticks to its agreement. The two best-case scenarios, could be said, to be more realistic than the worse-case scenario, given that, some of the mining equipment, earlier purchased for the operation of Nigeria's iron ore company, NIOMCO, (which is moribund at the moment), have been exposed, to a long period of rainfall, since the year, 2011, Osemenam and Afeni (2018). Hence, its engine would be down. Based on this, it is not illogical to assume that, at least one or two mining equipment, would be needed if extraction is to take-off again. Nevertheless, it is quite interesting that, given the least best-case scenario (i.e. the purchase of only one large capacity mining equipment), capital equipment attracts a money-value, far greater than the National income of an oil exporting nation, like Nigeria.

Although, an alternative source of finance that is opened for the sustenance of iron ore production, is Nigeria's foreign exchange reserves, which stood at $43billion, as at, the 4th quarter of 2018, NBS (2018). However, utilizing

this source could be detrimental to the sustenance of monetary policy by Nigeria's monetary authority (Central Bank of Nigeria), if the prices of crude oil in the global market, remains unchanged or declines further.

Anyways, the scenarios described above indicate that:

i. Importation is the most feasible source for Nigeria's earthmoving equipment at the moment.

ii. However much, Nigerian policymakers agree to limit the importation of earthmoving equipment for iron ore mining. Incurring debt is still inevitable, with respect to the current value of Nigeria's national income. Although modern economics promotes debt financing. However, it is important that Nigeria, yields to the warning of the IMF (International Monetary Fund), owing to her outrageous, debt profile of N22.3trillion (approximately, $64,722,222,222 billion) as at June 30, 2018, amid her plan to diversify, the economy. To avoid a debt crisis, Clara and Chijioke (2018).

iii. Hence, sustaining the financing of earthmoving equipment and its spare parts (mining technology) could lead to a decrease in the appropriation of funds to other sectors in the economy and possibly increase its debt by an amount beyond the estimates derived in the hypothetical scenarios given above.

iv. The extraction or mining of iron ore is extremely expensive. In fact, in Nigeria's case, its costs could be termed 'outrageous'. Owing to the effective exchange rate differentials, between Nigeria and her importing partners. These are indicators, which, Nigerian policymakers need to be sensitive to.

2.2. For whom to produce vs Nigeria's Iron Ore Production

Ordinarily, in Economics, the usage of the phrase, 'for whom to produce', implies, identifying that proportion of the consuming public, expected to utilize a commodity to be produced. Hence, production is skewed towards, the group characteristic(s) of the identified consuming public. In one word, the above definition could be said to imply 'Demand or Market'. However, in Marketing, it is, at best, referred to as, 'Target market'.

Within the context of this write-up, the definition of the phrase 'for whom to produce' takes a little tweak. As it is described to be an 'indirect input' with respect to Nigeria's iron ore extraction. How? An input implies factor(s) of production such as labour or capital which goes into production. These factors are needed in production or go into production because, they are required to sustain the production of a commodity or needed to sustain the processes, surrounding the production of a commodity. As labour and capital are needed in sustaining, the production of any commodity so is the market (for whom to produce or demand), needed in the sustenance of a commodity. To put it simply, no firm goes into production, without identifying its potential market or demand. Therefore, the market for a commodity is factored in its production. One attribute is common to both factors (i.e. a factor of production and the market or for whom to produce, as a factor of production) in production, which is; they are both "needed or required" in the sustenance of production. This qualifies both factors, to be called "inputs". Although, 'the market or for whom to produce' isn't a direct input to production, because it isn't required directly in production. At best, it could be seen as "indirect" because, it is outside of production, but required or needed to sustain the production of a commodity. Simply put, every firm needs the patronage of the market or its market, to be able to sustain the production of any commodity.

The description above is directly applied to the context of "for whom to produce vs Nigeria's iron ore extraction". Interestingly, in this context, 'for whom to produce or the demand for Nigeria's iron ore concentrates (NIOMCO's iron ore concentrates), isn't, the international market (demand) for iron ore concentrates, rather they are, Nigeria's steel companies. To be precise, they are, Ajaokuta and Aladja Steel companies, sited in Kogi and Delta States, respectively. These companies could be said to be 'indirect inputs', to NIOMCO's operation, because they are necessary or needed, to sustain its operation (iron ore extraction), just as, labour and capital.

Identifying, both steel companies, as the potential demand or market, for Nigeria's iron ore concentrates, is informed by the Decree No. 60 of 19th, September 1979. This decree, made the supply of iron ore concentrates to both steel companies, the priority of Nigeria's iron ore company (NIOMCO). Unfortunately, these companies aren't

functioning at the moment, owing to various challenges, (See, (Elijah, 2013; Ganiyu, 2015)). This implies that the market for Nigeria's iron ore concentrates, which is an 'indirect input', to NIOMCO's operation, isn't available at the moment. So, for whom, does Nigeria's iron ore company seek to produce for, where its market by law, isn't there? Hence, actualizing the goal of improving Nigeria's industrial base, through the production of steel is sabotaged.

However, at the moment, there are sixteen private steel firms, operating in Nigeria, viz. Total Nigeria Limited, African Steel Mills Limited, Plaoenine Steel Mills, Sunflag Steel Nigeria, Limited, Federated Steel Mills, General Steel Mills Limited, Mayor Engineering Company, Steel Metals, Nigeria Spanish, General Steel Mill, Allied Steel Anambra, Continental Iron &Steel, Metcome Nigeria Limited, Universal Steel Limited, Western Metal Product Company (WEMPCO) and Asiastic Manjarin Industries, with an operation size or capacity (measured in tons of scrap metals), not less than 24million tons (scrap metals), per firm, (Ministry of Mines and Steel Development, 2014). Summing the capacity (in tons) of all firms, gives an aggregate of 1,880,000 metric tons of scrap metal, as opposed to the capacity of Nigeria's actual demand or market for iron concentrates by law, which stands at 2,700,000 metric tons of iron ore concentrates. The existence of these market would have been an incentive, to keep the possibility of sustaining, Nigeria's iron ore production, alive. However, it relies on scrap metals, at the moment, which is a substitute for steel (output of the non-functional, Nigerian steel companies). This output (steel), needs the output from, iron ore production (which is called iron ore concentrates), for steel to be produced.

For simplicity, let's assume that Nigeria begins the production of iron ore concentrates, in anticipation, to win over the patronage of, existing private steel firms. It isn't illogical, at this point, to conclude that; since these firms have a substitute raw material (scrap metal), that sustains their production already, there must be more appealing incentive (e.g. reduction in price of iron ore concentrate, per wagon), to induce these firms, to reduce or stop, their demand for scrap metals, in place of iron ore concentrates. The chances of realising this is very slim in the short-run, where Nigeria has no, readily available control over; the fabrication of spare parts (such as sprockets, gears, bearings), frequently exposed to wear and tear during mining, the sufficient technical know-how to fix earthmoving equipment, during a breakdown. Definitely, these would be absorbed into the price of the commodity (iron ore concentrates), at least to sustain the variable cost accruable to iron ore production, overtime. In effect, the prices of iron ore concentrates would increase. In response, the private steel companies, being sensitive to a price increase, would choose to sustain its demand, for scrap metal, rather than patronize, Nigeria's iron ore concentrates. This scenario could defeat the expectation of sustaining iron ore production, even in the private market.

2.3. Human Capital Vs Nigeria's Iron Ore Production

The production of skilled labour in any country remains a medium, opened to countries, to reduce their extent of dependence on foreign labour. This, in return, is expected to cut down, the costs accruable to the importation of foreign labour. As a reward, this action is expected to save the government, some monies and increase its stock of skilled human capital, across the different time period, in other to sustain economic productivity. Without a doubt, there is only one 'factory' capable of producing, the requisite skilled labour, to sustain a country's productive activity. That 'factory' is 'the learning institution'. Sustaining, the production of iron ore stands to be one, amongst other productive activities, held in high esteem, by Nigerian policymakers, at the moment. Acknowledging, this concern, by Nigerian policymakers, it is pertinent to point out that, only two institutions (Federal University of Technology, Akure, Ondo State; and University of Jos, Plateau State) offer Mining Engineering in the country. Other institutions such as Nasarawa State University, and Enugu State University of Science and Technology (ESUT), offers, Mining and Geology (Joint Admission Matriculation Board, 2018).

In a country, where only one of its mineral deposit (Itakpe iron ore deposit) have been developed, but has been moribund for decades and majority of its iron ore deposits are yet to be developed, Ministry of Petroleum & Mineral Resources (1993); Bamalli *et al.* (2011) with few of its quarries in operation, it becomes imperative to know, how prospective Mining Engineers, from these institutions, are absorbed on yearly basis, to complement their

theoretical knowledge of mining, with the much needed practical knowledge of Mining, during their penultimate year of training (Industrial Training). This is expected to strengthen and expand their scope of mining. However, an alternative that would have cushioned the effect of the aforementioned inadequacy is the SIWES (Students Industrial Work Experience Scheme) programme. This programme was merged into the curriculum of Universities, Polytechnics, Colleges of Technology, Colleges of Agriculture and Education, to prepare students, for industrial work situation, they are most likely to face, after graduation, Oyeniyi (2011); Oladimeji *et al.* (2017) and other objectives (Industrial Training Fund, 2012). According to Olawale (2012) the scheme was designed to serve as a link between educational institutions and industrial employers, with the latter providing specific occupational knowledge and skills. Unfortunately, evidence from, Ikechukwu (2016); Okolocha and Ibik (2014); Orikpe (2013); Olabiyi *et al.* (2012); Oladimeji *et al.* (2017) revealed in their studies that, the effectiveness of the SIWES programme is below expectation, as its objectives are rarely met, due to issues such as, inadequate financing, unavailability of requisite instruments for practical, too many students to a supervisor, etc.

As a matter of fact, institutions across the country graduate over hundreds of Mining Engineers and Mine Geologists yearly. It is sad to state that, the ineffective state of the SIWES programme, alongside, the underdeveloped state of majority of Nigeria's iron ore deposits are signals that many of Nigeria's Mining Engineers and Mine Geologists, could still lack, the much needed practical knowledge to sustain efficiently, the processes (mining and beneficiation processes) surrounding the production of iron ore, relative to their counterparts in other countries, such as, Russia, Brazil, Australia and France. This is based on the fact that these countries have successfully developed their iron ore deposits and sustained their production to date. Hence, they have the window to expand their knowledge of iron ore mining beyond the classroom walls. Obviously, the knowledge of iron ore production and its mining would be sustained, overtime in these countries, with all other things held constant.

If, the inadequacies in Nigeria's SIWES programme and the state of its iron ore deposits, remain unchanged, then developing and sustaining the much needed, domestic skilled labour for the sustenance of iron ore production through time would be defeated.

3. CONCLUSION AND RECOMMENDATION

The production of iron ore has gained so many positive remarks, from economies that have successfully sustained its production. Precisely, its contribution to industrialisation and economic welfare cannot be underestimated. These remarks remain the temptation, behind Nigeria's quest to sustain her iron ore production. This makes it pertinent to identify some unique factors that could hinder the sustenance of iron ore production in Nigeria's context, irrespective of its promoted accomplishment in other economies, such as France, Russia, Australia and China. These limitations are; the non-operation of Nigeria's potential demand (for whom to produce), for her iron ore concentrates (i.e. the output from iron ore production) by law, Nigeria's deficient national income, which limits her financial capacity, to sustain the procurement of, the much needed technology, to sustain iron ore production and the inadequacy in domestic skilled labour, needed to sustain its production, through time. Debt financing could be an option, to absorb these inadequacies at the moment. However, it wouldn't be economical due to Nigeria's existing outrageous debt portfolio, which stood at N22.3 trillion ($64,722,222,222 billion), as at June 30, 2018, Clara and Chijioke (2018). Any move to utilize this option could plunge Nigeria, into a debt crisis, with unfavourable outcomes.

To this end, the option of privatisation, would be a better measure, to cope with these inadequacies in the short-run, as a way of shifting the possible costs (increasing debt portfolio, which could lead to a debt crisis) accruable to absorbing these inadequacies, if the plan of diversifying, Nigeria's economy, through iron ore production, must be sustained.

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