Asian Development Policy Review
ISSN(e): 2313-8343
ISSN(p): 2518-2544
DOI: 10.18488/journal.107.2021.91.1.23
Vol. 9, No. 1, 1-23.

URL: www.aessweb.com

ADDRESSING THE MISSING LINK FOR SUSTAINABLE AFRICAN CONTINENTAL FREE TRADE: LESSONS FROM GHANA'S MANUFACTURING INDUSTRY

Jonathan D. Quartey

Department of Economics Kwame Nkrumah University of Science and Technology Kumasi, Ghana.
Email: jdquartey@yahoo.com Tel: +233-244206280

Article History
Received: 5 November 2020
Revised: 8 December 2020
Accepted: 12 January 2021
Published: 1 February 2021

Keywords
Adjustment cost
African continental free trade
Environmental damage
Ghana
Race-to-the-bottom
Manufacturing sector
Pollution haven.

JEL Classification:
F13; F18; L60; P33; Q53.

ABSTRACT

Expected benefits from the African Continental Free Trade Area (AfCFTA) hang on the production of sufficient real output within the region. Real investment will secure sufficient capital stock to drive sustained economic growth from AfCFTA. This can however be curtailed by high adjustment costs for investment, characteristic of Africa. The study examined how local manufacturing firms could increase their contribution to the African economy. As a starting point, it assessed the investment behavior of domestically incorporated manufacturing companies listed on the Ghana Stock Exchange (GSE), Ghana being the AfCFTA secretariat. Panel data was analyzed to estimate adjustment costs subject to the environmental consequences of manufacturing and trade, for Africa's capital stock. The study found a positive and highly significant relationship between the value of capital and investment at the 5% significance level. It also found a 77% erosion of initial manufacturing sector capital stock due to environmental damage. The evidence of pollution haven and race to the bottom phenomena were strongly demonstrated. The net benefit of AfCFTA, based on current arrangements was found to be negative. The findings have offsetting effects on both the rate and magnitude of private local investment in Ghana's manufacturing sector, with consequences for human welfare and AfCFTA. The study recommends a halt of all plans to start AfCFTA trading till a fully functional environmental policy has been put in place, to avert a further deterioration of the African environment and welfare of its people.

Contribution/ Originality: This paper's primary contribution is that the development trade-off through AfCFTA would far outweigh the growth to be derived by Africa, if trade does not occur under very strict and standard environmental policy. Apart from environmental degradation, externalities from resulting pollution havens and race to the bottom will exacerbate poverty and deprivation on the continent.

1. INTRODUCTION

The African Continental Free Trade Area (AfCFTA) agreement is expected to result in the most extensive free trade geographical area in the world. It brings together about 1.3 billion people from 55 countries and a sum of US$3.4 trillion worth of annual output (Ministry of Finance (MOF), 2019; World Bank, 2020a). This is dependent on removing tariffs and non-tariff hindrances between African countries to increase intra-regional trade from the current 16 percent to over 60 percent by 2022, as well as enhance Africa's global trade. The Economic Commission of Africa (ECA) asserts that this move could be the best antidote to the chronic poverty created by severe joblessness on the African continent.

A successful AfCFTA could reduce the manufacturing gap in Africa. Currently, manufacturing contributes on average just 10% of Africa's total GDP. An expanded manufacturing sector could help Small and Medium Scale Enterprises (SMEs) create jobs for the large unemployed youth, to alleviate poverty, since these firms make up about 80% of Africa's firms (Akeyewale, 2018).

With manufacturing as its bedrock, it is easy to recognize the feedbacks that are bound to emerge. Some of these could potentially offset the benefits of AfCFTA. Africa's greatest endowment has been and will to a large extent remain its natural resources. These resources will serve as inputs for the required investments to generate the goods and services expected while creating incomes for labor and returns for capital.

At the same time, the process would have a toll on natural resource stocks accompanied by waste generation, compounding the undesirable environmental outcomes that have plagued the continent for some time now. Also, a depletion of the non-renewable resource stock is certain to occur, leading to higher marginal costs for extraction and manufacturing firms. Thus to make Africa's growth inclusive, where all forms of capital receive gains, it is imperative to ascertain the true drivers of Africa's manufacturing investment, to inform policy in a direction toward sustainable firm value addition and job creation through AfCFTA.

Adjustment processes due to trade reform have raised several issues for discussion globally (IMF World Bank & WTO, 2017). This phenomenon leads to costs for investors generally called adjustment costs, which would have to be identified and correctly quantified to inform policy for a sustainable AfCFTA.

Costs regarding sale, purchase and productive use of capital goods beyond their price are referred to as adjustment costs (Bigsten et al., 1999). Such costs arise as a result of the search and decision processes for acquiring appropriate equipment, discarding obsolete machinery, capital stock installation as well as workers' training and reorganization (Bigsten et al., 2005). Determining any investment model would be flawed if the adjustment cost component is not correctly specified. This also implies that the nature of adjustment costs could provide very essential details about how investment should be carried out for optimal benefits.

In Africa, due to the extent of climate change and environmental vulnerabilities, such costs have tended to escalate. This has been as a result of recent climate related disasters and risks, deep rooted degradation of the natural environment and their attendant catastrophes for businesses and households. Thus, instead of simply searching for the right equipment, firms must now search for the right equipment that are resilient to Africa's climatic and erratic environmental vulnerabilities. In addition, due to the fact that most equipment have to be obtained from abroad, the waiting period and exchange rate fluctuations add to adjustment costs in Africa.

While Hamermesh and Pfann (1996) assert that the greatest component of adjustment costs is the output lost during the adjustment period, this study argues that for manufacturing in Africa, it may rather be environmental damage costs. It argues that AfCFTA would tend to promote environmental effects which will exacerbate adjustment costs of African manufacturing and industry, becoming a drag on sustainable outcomes if not correctly addressed.

1.1. Background of Study

The facilitation of foreign direct investment is a prime target of AfCFTA. It is expected that lifting restrictions on foreign investments, would attract investors to Africa. The addition of foreign capital could lead to expansion in local industries and boosting of domestic businesses through banking systems stimulation, resulting in more investment and consumer lending. The envisaged gains also include allowing partnerships among local firms and multinationals for raw materials processing, training and technology transfer programs.

While it is desirable to be optimistic over an African course which expects great gains, some concerns have been raised regarding AfCFTA. To the Nigeria Labour Congress (NLC), the AfCFTA agreement means more jobs will be outsourced to foreign companies. Already, many jobs, especially in the construction and mining industries, were being outsourced to foreigners. Multinationals they noted, try to reduce expenses on recruitment and training

wherever they are. The NLC feared implementing these agreements would also come with cutting cost on public local subsidies. To the Manufacturers Association of Nigeria, reduced tax on importation was bad for local industry. They feared the AfCFTA agreement would affect most of Nigeria's local industries, further widening the national budget deficit and curtailing the opportunity for more diversification of the Nigerian economy (Costantinos, 2019).

Akeyewale (2018) sees harmonization of the big differences in the levels of development of Africa's heterogeneous economies under one agreement as a major challenge. Currently, about 50% of Africa's total GDP comes from Egypt, Nigeria and South Africa, with the 6 sovereign island nations together contributing only around 1%. This makes AfCFTA the trade agreement among economies with the greatest levels of income inequality, more than double what pertains in some other blocs globally.

While the fears and concerns may be well-founded, all issues, especially those bothering on Africa's environmental difficulties need to be carefully analyzed based on sound theoretical and empirical considerations for efficient decision making.

1.2. The Missing Link

Economic welfare improvements due to trade liberalization can be measured by comparing levels of welfare prior to and after liberalizing trade. However, there has to be some adjustment for loses between the two measures, since some factors of production will be adversely affected by the expanded trade, till a long-run stability is established. Thus, correct welfare computations for AfCFTA must include social adjustment costs (Francois, Jansen, & Peters, 2011).

There has been a general consensus regarding trade liberalization and reduction of trade costs increasing consumer welfare. However, most theoretical and empirical work on export responses have been based on long-run positive effects of these policies disregarding the negative and transitional dynamics involved (Liu, 2018) especially those that pertain to the degradation of the natural environment. This study departs from the existing trend to provide insight on environmental and transitional dynamics towards achieving the expected goals of AfCFTA.

Existing literature on the quantified effects of the African Continental Free Trade Area (AfCFTA) is limited and dwells primarily on tariff reduction, nontariff barriers (NTBs) and trade facilitation assessments (World Bank, 2020a).

The African Development Bank (ADB) employed a Computable general equilibrium (CGE) model to simulate benefits from AfCFTA in 2019. While confirming the efficacy of removing tariff and non-tariff hindrances within African states, the study found benefits would be optimal if trade barriers with other developing countries were also removed to a large extent (African Development Bank (ADB), 2019).

The study of Chauvin, Nicolas, Ramos, and Porto (2016) applied microsimulations to determine the household welfare effects of changes in prices and wages based on selected countries in Africa by means of the MIRAGE-e CGE model. The changes were derived trough a systematic application of selected shocks to their model. Similarly, Vanzetti, Peters, and Knebel (2018) determined numerical effects of the AfCFTA using 3 main shocks in their standard Global Trade Analysis Project model.

These studies found that African trade would experience annual growth of up to US$3.6 billion if all tariffs were removed. The results showed general increases for some countries while others suffered welfare reductions in the medium to long term (Chauvin et al., 2016).

While the AfCFTA risked losing 60% of its gains in the event of allowing a 5% exemption for some selected goods (Abrego, Amado, Gursoy, Nicholls, & Perez-Saiz, 2019; Chauvin et al., 2016) found the extent of openness of economies, the degree of trade barriers as well as existing trade links among the countries as the most important determinants of the gains.

The latest and most important analysis on the AfCFTA so far has been the World Bank (2020a) study, which sought to estimate impacts of the AfCFTA on poverty, unskilled workers and women. The study used the global

dynamic CGE model and the global microsimulation framework, called Global Income Distribution Dynamics (GIDD). The study found that up to 30 million people could be freed from extreme poverty through the AfCFTA, if significant policy reforms and trade facilitation measures are put in place (World Bank, 2020a).

The most important policy reforms for the poor in Africa have to do with securing their sources of livelihood, which has been and will continue to be the natural environment. Most poor people in Africa depend mainly on resources of the environment. Any degradation of the natural environment thus worsens poverty on the continent. AfCFTA in its current form is a recipe for serious environmental degradation, which is surely going to worsen the welfare of the poor in Africa, since it has not put in place the necessary policy reforms that would mitigate environmental degradation (World Bank, 2020a).

The current state of the literature leaves a huge gap, which has the tendency to derail the entire AfCFTA potential. While about 70% of the African population depends on resources of the environment for their sustenance, no concrete analysis has been forthcoming regarding the environmental implications of the AfCFTA, particularly for Africa's manufacturing industry. As a matter of fact, current evidence reveal that the AfCFTA has not factored the natural environment into its considerations (World Bank, 2020a). This probably constitutes the greatest omission of the entire process of the AfCFTA. This study therefore seeks to provide some initial steps towards bridging this gap.

The following section examines the policy relevance of assessing the environmental cost of AfCFTA. This is followed by a discussion of the theoretical determinants of private investment, leading to an empirical validation of the flow version of an investment function for manufacturing firms listed on the Ghana Stock Exchange. The results and discussion then follow. The study concludes with implications of the findings for AfCFTA policy.

1.3. Policy Relevance

1.3.1. Irregular Trade Policies

National economic policy initiatives to mitigate environmental damage mostly ensure that externalities are internalized. However, such policies may not be applied at the international level due to uncertainty regarding the bearer of the burden of the externality. In addition, no global institution has the mandate to ensure such externalities are internalized. Thus many irregularities exist when it comes to transnational trade externalities. The fact about most international trade agreements is that they simply ignore the effects of environmental externalities (Harris & Roach, 2018).

While some environmental taxes and levies could be applied internationally, not all countries will have the capacity to apply them to ensure trade becomes beneficial to all (Harris, 2004). In Africa, such policies have largely been non-existent and unimplemented.

Polluting substances easily get traded among countries even though some may be banned in their countries of origin. In most cases African countries become the losers since they lack the necessary gadgets and many times expertise to determine the true environmental effects of some imported chemicals. For instance, the GATT Article XX, which allows countries to apply trade restrictions to protect some natural resources has often been controversial in application due to objections from affected trade partners (Paarlberg, 2000).

1.3.2. The Deception of a Polluting Development Policy

Some arguments in favor of the idea that countries can go through a polluting development path, which will get cleaner once they attain a high income status have been advanced for trade. This Environmental Kuznets Curve (EKC) principle encourages more open trade, since it will help hasten the growth process and hence a cleaner environment. However, this assertion has mostly failed in all relevant validation tests particularly for Africa.

While the EKC principle was supported by empirical data for just few air and water pollutants, it was not applicable for all other environmental pollutants especially the most important greenhouse gases. It was also not

applicable in municipal waste control, ecosystem and soil degradation (Harris, 2004). Thus the EKC does not address the most significant pollutants posing severe challenges to Africa's progress.

The World Bank found that carbon dioxide emissions and municipal wastes increased as countries attained higher economic growth. Even with respect to the conforming pollutants the "turning points" on the EKC ranged from income levels of $2000 to $12,000, to trigger any noticeable improvement in most developing economies. One EKC study estimated the global "turning point" for sulfur dioxide to be reached by 2085 and nitrogen oxides by 2079, making room for over 200% increase in emissions (Selden & Song, 1994) contrary to current estimations from climate change models.

Based on the application of different indicators and additional independent variables in different models, another review of EKC found the results were generally not reproduced. Thus there is no basis to assume economic growth can resolve environmental pollution challenges (Rothman & De Bruyn, 1998).

Economic growth from trade can have significant environmental impacts. While growth may increase the abilities of economies to protect their environments, the way out of unacceptable levels of environmental damage will be carefully designed policies to mitigate environmental degradation. It is worth noting that the AfCFTA has not even thought of these measures much more their implementation. Thus without scientifically addressing the issues of environmental policies for trade, any move to proceed with trade under AfCFTA will be compromising the welfare of Africa and its resources.

2. THEORETICAL FRAMEWORK

2.1. Determining Private Investment

In all economies, the rate at which physical capital is accumulated is determined by investment, accounting for productive capacity growth. Accumulation of physical capital tends to be more associated with growth in capacity in developing economies than in developed ones (Agenor & Montiel, 2015). The following section examines the "conventional" determinants of private investment in a developing economy.

2.1.1. Determinants of Private Investment Behavior

Developed country empirical functions on investment normally depend on a "stock" or a "flow" procedure (Abel, 1990). By this procedure, which has also been referred to as the neoclassical or "flexible accelerator" approach, installed capital is assumed to be available at price p_k. With ρ rate of discount and δ depreciation rate, the rental price of capital is given by

$\sigma = (\rho + \delta)p_k$. From an Agenor and Montiel (2015) derivation,

Let $\pi(k)$ denote the flow profit function, given by Equation 1,

$$\pi(k) = py[k, n(w/p, k)] - wn(w/p, k), \quad (1)$$

With p as the output price, nominal wage w, and employment level $n(\cdot)$, derived from profit maximization based on the existing capital stock. Then the capital stock k^* at the optimum will satisfy the relation in Equation 2,

$$\pi'(k^*) = \sigma. \quad (2)$$

Suppose k_0 is the initial stock of capital, then the net investment would lead to adjusting this initial stock to the eventual capital stock desirable. The gross investment can be obtained if replacement investments proportional to k_0 are added to the net investment. The flow model, by contrast, postulates the existence of a convex function $h(I)$ that measures the total cost (in units of output) associated with obtaining gross investment I. If maximizing $V(k)$ the present value of the firm's profits $\pi(k)$ less investment costs $ph(I)$, is the objective of the firm, then the investment rate based on a discount rate ρ at each time must meet the condition in Equation 3,

$$h'(I*) = q/p, \quad (3)$$

where $q = dV(k)/dk$ is the current period's installed capital's marginal value, with q/p being the marginal value of "Tobin's q," representing the ratio of the value of installed capital to the cost of replacing it. Thus the expression linking investment to the value of capital based on Tobin (1969) becomes Equation 4, stated as:

$$\frac{I_{it}}{K_{it}} = \gamma + \frac{1}{\beta}\left[q_{it} - 1\right] + u_{it} \qquad (4)$$

Where, I_{it} = Investment expenditures for firm i in year t, K_{it} = Capital Stock per firm in year t, q_{it} = Value of Capital per firm in year t not adjusted for tax, γ = Constant Parameter, $\frac{1}{\beta}$ = Slope Parameter and u_{it} = error term.

The determinants of investment in these specifications include, in the stock version, expected future values of aggregate demand, the user cost of capital, and the wage rate, as well as the initial capital stock. These interact in nonlinear forms suggested by the model. In the flow version, what matters is the marginal value of Tobin's q and the parameters of the adjustment cost function (Agenor & Montiel, 2015). When environmental costs are included, the real effect of the marginal value component will continue to deteriorate creating uncertain outcomes for the rate of investment.

If q exceeds 1, firms would increase their physical capital since for every dollar value of new capital, firm stocks can be sold for q dollars, yielding $q - 1$ worth of profit. The implication is that there would be a big increase in firm investment for the $q > 1$ condition. However, the existence of adjustment costs create inefficiencies for big increases in investment, making them increase rather moderately (Agenor & Montiel, 2015).

Determining investment this way provides many advantages above investment theories which are considered to be more conventional. The q theory has a supply orientation. This approach reveals a critical response towards investment stimuli, since firms' decisions are made simultaneously on output and capital intensity. The incentive to firms is towards increasing supply due to a fall in the cost of capital. Since most theories on investment assume a predetermined output level, they are not able to capture this important response of firms (Clark, 1979; Summers, 1981). Thus while the potential to invest and create jobs exist, this cannot happen anyhow, since adjustment costs would have to be taken into account.

Many of Africa's impediments to investment stem from adjustment costs which are mainly driven by environmental and natural resource constraints. To circumvent this limitation, AfCFTA has elected to broaden international trade. However, this route out has its own constraints which may even worsen Africa's plight. The following section discusses the influence of expanded trade on Africa's welfare.

2.1.2. Some Empirical Issues

Academic literature on adjustment costs is rather meagre, generating some interest only in recent times. The claims of some early research that adjustment costs were insignificant relative to long term economic macroeconomic benefit was probably responsible for the little interest. The fact however remains that standard trade models could not estimate these costs correctly due to the complexities they presented, making it difficult to obtain necessary data for adjustment effect estimates (Francois et al., 2011) and particularly for environmental costs.

The relative absence of empirically significant analysis on trade adjustment costs has become a challenge for policy makers seeking crucial responses to issues on trade adjustment costs as well as direction on trade adjustment processes.

While in reality trade adjustment costs can be very high for some groups, it may not be significant for others (World Bank, 2020a). This makes it imperative for policy makers to identify the losers in expanded trade policy systems for assistance. It is a fact that if expanded trade policies are not correctly designed or implemented,

adjustment costs will be high enough to worsen economic welfare in the economy, since the ultimate losers will be the deprived.

The scarcity of empirical evidence is particularly serious for developing countries, since most of the existing analysis dwells on developed economies. Due to the significantly differing economic conditions, institutional and societal dynamics, the magnitude and nature of trade adjustment costs are not substitutable between developed and developing economies (Francois et al., 2011). Rodrik (2004) argues against extrapolating findings from developed economy adjustment costs to developing economies. The largely informal nature of developing economies as well as the lack of diversity (Francois et al., 2011) and substantial role of the natural environment in economic activities make the extrapolation unjustified.

While there have been arguments that environmental disruptions are a minimal insignificant cost in business, the recent events of climate change show the contrary. The lack of appropriate measures and/or the reluctance to acknowledge environmental damage has created the impression that its effects are minimal. For the British Insurance and Banking industry, climate risks are now a major source of decision making. The Bank of England admits that climate and environmental considerations must be a requirement in business risk assessments just as changes in interest rates or the introduction of driverless cars (Bank of England, 2019). Certainly, current environmental damage in Africa cannot be trivial cost as some earlier writers have alleged.

With respect to developing countries, the effect has not surfaced because most of the environmental damage being suffered had not been quantified correctly. The most recent Africa SDG report notes the gaps which prevail in data, where only about 50% of the 169 targets have no data and just 40% of indicators have data. In some cases, it has not been possible to collect data while some methodologies still remain incomplete. African countries have had the most egregious gaps in data with the incidence of wide statistical capacity disparities throughout the continent (SDG Center for Africa and Sustainable Development Solutions Network, 2019). However, local data on environmental degradation in Africa is an everyday occurrence, with effects showing everywhere in individual African communities.

3. FREE TRADE AND THE ENVIRONMENT IN AFRICA

Exports thrive on energy, pesticides and other throughput which are ecologically destructive and only exacerbate the global ecological crisis. According to Starkey (2006) Mankiw is reported to have advocated for better jobs in future through shipment of all the dirty, dull manufacturing, call-center, and programming jobs abroad to create more interesting, creative and better paid jobs in the USA.

Daly (1993) argues that with existing world trade dynamics, capital will migrate to countries where production costs are absolutely lower due to lower labor, resource and regulation costs. For instance, countries with corrupt governments which sell their resources cheaply to their trading partners in exchange for arms and other needs to suppress local labor unions and allow loose environmental conditions become an ideal location for capital. Thus the dependence on trade to grow economies will only exacerbate the problems of pollution, putting the regenerative and assimilative capacities of the biosphere at extreme risk. Capital and technology now seeks the areas where wages are low and governments are compliant to offer low taxes, lax environmental regulations, anti-union labor policies, etc. The most suitable place with such conditions happens to be Africa.

Generally, free trade has been advocated as a means spurring international competition to lower the cost of goods by ensuring all markets are open to the most efficient producers, that is, those with a comparative advantage. While this might seem reasonable on its face value, free trade produces "pollution havens" and a "race to the bottom" in Africa, creating more difficulties than what free trade was meant to address, as discussed in the following subsections.

3.1. Pollution Havens and the Race to the Bottom

Daly (1993) argues that under free trade, competing profit- maximizers try to externalize every cost they can, as long as they can escape being held responsible. Without a carefully crafted free trade agreement, therefore, costs, particularly social costs, could be externalized to developing countries from developed countries.

When developing countries fail to deal with pollution externalities, international trade creates a channel for environmental degradation in these economies referred to as "pollution havens". The hypothesis suggests that if producers in one country face stricter environmental requirements than what pertains in another country, they would relocate their dirtiest production systems to the countries with less stringent requirements, which are mainly lower-income countries, or become less profitable. Residents of the country with the strict requirements can then benefit from the cheaper goods produced in the pollution havens.

When a country weakens or fails to strengthen its environmental standards to attract foreign firms or to keep existing firms from relocating elsewhere to protect against job losses, the country is engaging in a race to the bottom. As a result, the country would become a pollution haven by attracting high-polluting firms because of the low environmental standards or the lack of official incentive to act to ensure environmental quality is maintained (Harris & Roach, 2018).

Free trade creates competing incentives compelling poorer countries to settle for weak environmental standards in order to attract jobs, with some jobs moving to countries where weak environmental standards guarantee lower production costs resulting from lower standards. Thus in a world of highly mobile capital, it appears cheap labor and willingness to exploit nature are the only remaining sources of competitive advantage (Starkey, 2006).

3.2. Environmental Effect of Free Trade on Output

Without adjustment costs, expectations for output from trade reform would easily follow the long–run equilibrium Y_L moving from the level Y_1 before trade liberalization (Figure 1). However, adjustment costs could consign output after trade reforms to the trend along Y(t), where there could be an initial fall in output depending on the magnitude of adjustment costs and a later recovery back to the level Y_1 and much later above Y_1. The failure to take into account the true adjustment costs could lead to a realization that the initial expected long-run output (Y_L) was unachievable and thus may really be Y_A, the achievable level. Hence all projections made without taking into account adjustment costs would be illusive. If adjustment costs would have to be recovered, then the output performance beyond T_1 in Figure 1 must produce a net gain from trade liberalization over and above adjustment costs.

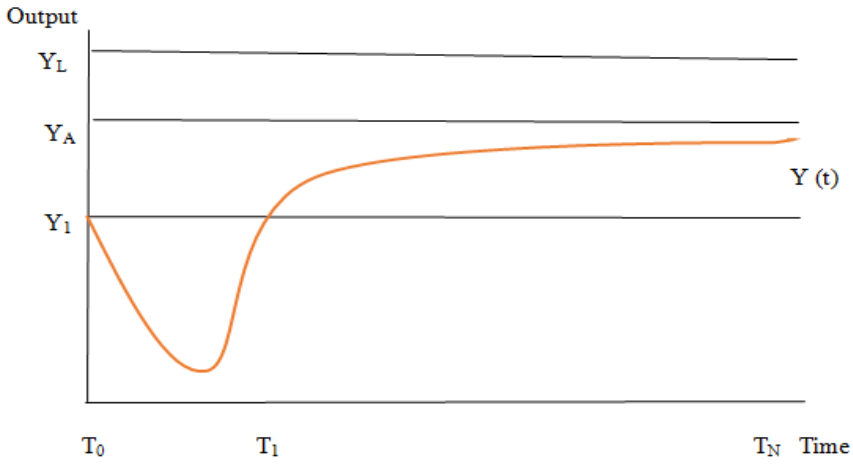

Figure-1. Expanded free trade output and adjustment costs.
Source: Based on Francois et al. (2011).

Francois et al. (2011) report that some theoretical studies found negative effects on trade liberalization long-run output due to adjustment costs as shown in Figure 1. By means of a Heckscher-Ohlin framework, Mussa (1978) established that the expected expanded trade equilibrium will not be attainable due to adjustment costs, following trade liberalization.

Thus a net loss of welfare can occur in the presence of large adjustment costs, making the total discounted yearly net gains beyond T_1 less than the total discounted yearly net losses between T_0 and T_1 (Francois et al., 2011). The largeness of environmental adjustment costs have been amply demonstrated when whole communities as well as civilizations have been devastated irreversibly by abuse of the environment. The recent toll of climate change on economies in Africa and COVID-19 provide hard lessons for taking the environment for granted.

3.3. Relevance for AFCFTA

3.3.1. Effect of Large Manufactured Imports with Pollution Potential

While expanded trade generally promotes income growth among countries which trade, it also causes environmental damage, which in many cases goes unaccounted for, particularly in Africa. Trading partners can benefit from trade if they specialize in commodities they produce most efficiently. However, the comparative advantage theory ignores environmental externalities occurring through the production and consumption of commodities (Harris & Roach, 2018). An imported good's welfare effects in the AfCFTA is demonstrated in Figure 2 for trade in cars, one of the surest sources of environmental externalities.

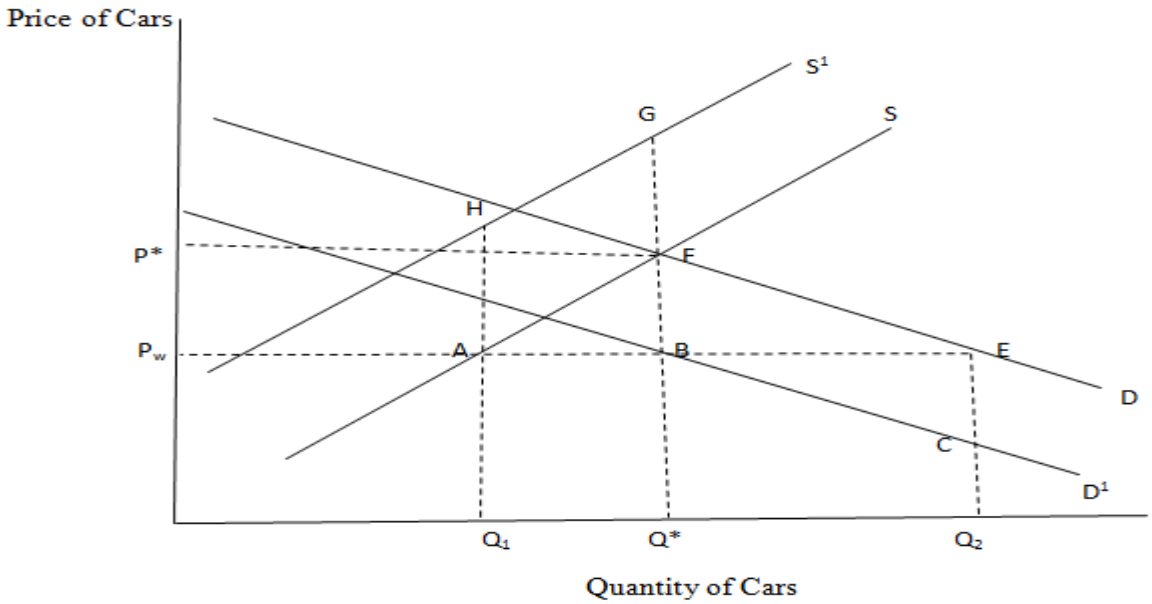

Figure-2. Effects of trade in Cars on AfCFTA due to environmental costs.

Source: Harris (2004).

Assume the African equilibrium for domestic cars production and consumption in the absence of AfCFTA is Q* for output and P* for price, where D and S represent the demand and supply curves respectively. AfCFTA trade would alter this equilibrium due to cheaper car price P_W from developed countries.

Since African demand for cars have no significant effect on the world price, the supply of cars to Africa will be perfectly elastic at P_W. This reduces the output of domestic cars from Q* to Q_1, with African purchases going up to Q_2 due to cheaper imports. This means African car firms will lose the area P^*P_wAF due to lower sales caused by lower world prices. African buyers will gain area P^*P_wAF and area AEF since due to lower world prices they can now buy more cars. This makes the net benefit from international trade area P^*P_wAF plus area AEF minus area

P^*P_wAF which equals area AEF. The net benefit however does not take into account the environmental externalities caused by the production and use of the cars. In reality, in Africa such externalities are currently valued zero, not because they do not exist but because they are wilfully not accounted for.

The truth is that car supply (S) will be affected negatively by the external costs of production, shifting it to S^1, while the demand (D) will be negatively affected by the external costs of consumption moving it to D^1. Thus the effects on the welfare of Africa will be area AFGH and area BCEF. Since African output of cars will fall, the resulting lower environmental cost of production in Africa will lead to added benefit AFGH. This means external producers' environmental costs will go up, which they will pass on to Africa through car prices, since Africa's demand for car imports is inelastic. The area BCEF is the environmental cost of increased car use in Africa due to relatively lower import price P_W. Because current trade laws do not take environmental externalities into account, Africa will bear the full cost of environmental damage area AFGH and area BCEF which mostly exceed the gain in area AEF, making Africa the ultimate net loser due to trade liberalization. This means current recorded benefits are deceptive since they deliberately exclude the cost of environmental damage.

Africa is thus going to be the net loser from AfCFTA as far as environmental degradation and damage are concerned. This is with respect to imports of large manufactured goods which will be needed to keep the wheels of the continent moving within the trading environment. The next most important trade is that of Africa's natural resources as exports to the rest of the world, which is discussed using Figure 3.

3.3.2. Effect of Natural Resource Exports

Trade in Africa's natural resources will suffer a similar fate as large manufactured goods. Currently, Africa does not recognize the environmental damage of the harvest of its natural resources for export. If AfCFTA continues this way, which is almost certain for now, the net benefit to Africa for trade in its natural resources will be defined by Figure 3. Timber is used as an example of a typical natural resource export from Africa in the diagram. With expanded international trade, the benefit to exporters of timber will be the areas P_wP^*AF and ABF, where Q^* and P^* are the equilibrium quantity and price respectively for African consumers of timber before trade expansion. Free trade secures a higher world price P_W, generating gains of area P_wP^*AF and area ABF. However, because Africans cannot afford the higher world price they lose P_wP^*AF, leaving only a net benefit of ABF for Africa.

The trade in timber comes along with very high external costs in Africa. These environmental externalities are land and watershed degradation, climate and ecological costs with their attendant effects on future generations. These costs cover area ABCE, which has always been far more than area ABF.

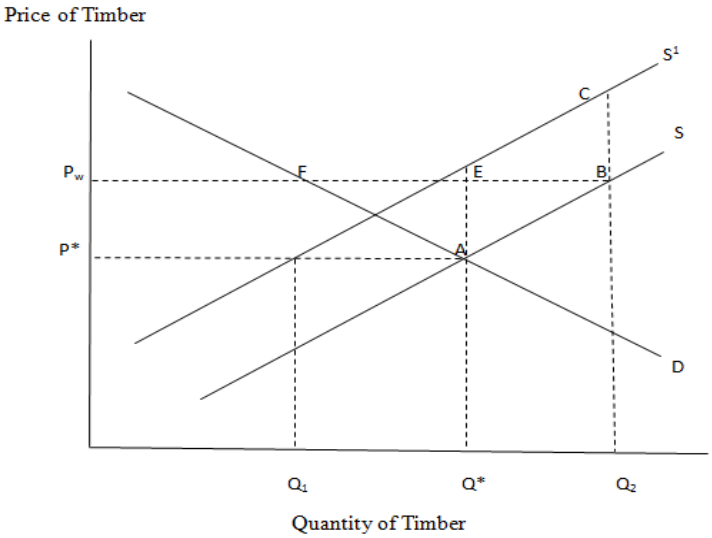

Figure-3. Net benefits for African natural resource exports.
Source: Harris (2004).

Deforestation and environmental degradation lead to a loss of about 15% of Ghana's GDP per annum (World Bank, 2020a). This far exceeds the 7% of GDP per annum which expanded trade can bring (World Bank, 2020b) making Africa a double loser at both the export and import ends of AfCFTA, except Africa puts in the needed measures to address the deforestation and environmental degradation that is surely coming alongside AfCFTA.

3.3.3. Lessons from the North American Free Trade Agreement (NAFTA)

After one decade of implementing the North American Free Trade Agreement (NAFTA), the agreement became a contested issue in the 2004 presidential election of the United States of America. The growth in the American economy at the time did not seem to have come from NAFTA, neither was it thought to have been a good move for the country by a good section of the American people.

These outcomes included a doubling of trade within NAFTA countries and the replacement of Japan by Mexico as the USA's second largest trading partner after Canada. There was also around US$16 billion of annual trade deficit against the USA, a reverse of what used to be before NAFTA. The agreement was perceived to have been a job creation policy for the USA, expected to create about 200,000 jobs but ended up costing jobs. Estimates from the labor-funded Economic Policy Institute revealed a 394, 000 job losses among manufacturing activity workers (Starkey, 2006). NAFTA had resulted in a shift of some production venues from the USA to Mexico.

On the Mexican side, more than 500,000 manufacturing jobs had been created but its farm sector had been opened up to efficient and mostly subsidized US producers. This resulted in more losses of farm jobs in Mexico than the gains in manufacturing jobs. The productivity growth due to foreign investment in Mexico could not result in higher wage benefits due to population growth and lack of existing high unemployment levels and ineffective labor union organization. While admitting that NAFTA brought gains to both US and Mexican economies, these gains were offset by losses for millions of people on both sides (Starkey, 2006).

In 2016, the United States of America's election campaigns raised serious issues about NAFTA, with the promise of improving it. The new agreement, the U.S.-Mexico-Canada Agreement (USMCA), however, continues to carry much of the undesirable elements of the old agreement, which to a large extend hurt the natural environment.

Through NAFTA, some polluting firms moved to Mexico and other areas with less stringent environmental regulations than the USA, and exported their finished goods back to the USA (Chernichiwan, 2017). The USMCA has been criticized for failing to recognize climate change, despite the proof by the WTO and the United Nations that expanded trade agreements result in higher carbon dioxide emissions, as has been the case in the North American region (WTO-UNEP, 2009).

NAFTA's tolerance of mechanisms to safeguard domestic environmental controls did not go far enough to prevent environmental degradation. Thus the desired integration between trade and the environment never materialized. In addition, NAFTA has resulted in serious unintended breaches of the environment with adverse consequences undermining environmental safety and creating further environmental risks (Allen, 2018). An assessment of NAFTA's environmental concessions concludes that they fell far below their requirements, and recommended their strengthening in the subsequent phase (Polaski et al., 2020).

3.4. The Ghanaian Situation

Ghana hosts the secretariat of the African Continental Free Trade Area (AfCFTA). The country's manufacturing sector can be a major avenue through which output can be generated to secure inclusive firm value growth and jobs necessary to address growing unemployment and deprivation.

The manufacturing sector in Ghana grew by 3.7% in 2017, representing a 1 percentage point increase over the 2016 growth rate, and accounted for 4.5% of GDP, the lowest share in the last 12 years. The sector's low share in

GDP in 2017 was partly due to high expansion in oil and gas production which generally dwarfed most sub-sector shares in GDP (Institute of Statistical Social and Economic Research (ISSER), 2018).

The manufacturing sector has seen a decline in importance, particularly in relation to construction, and mining and quarrying. Trends in growth rates of industrial and manufacturing output seem to suggest that until 2014, manufacturing was a key driver of industrial sector growth, with the two growth rates moving in tandem. However, between 2014 and 2017 the influence of manufacturing on industrial growth dwindled significantly.

The seeming recent rebound in the manufacturing sector could be partly due to overall increasing inflows of foreign direct investment (FDI) to the sector, particularly in the last two years. According to the Ghana Investment Promotion Centre (GIPC), 51 new manufacturing projects were started in 2017, bringing in US$2.7 billion in FDI and representing a 727% increase in value, compared to the 113% rise in 2016 and the negative 89% growth rate realized in 2015. The manufacturing sector in 2017 recorded the highest inflow of FDI since 2010.

If the current trend is anything to go by, then it means indigenous firms are fast losing interest in investing in manufacturing in the Ghanaian economy. Being the driving force of the AfCFTA agreement, trade will be beneficial mostly if a country and by extension the continent has home made goods to trade. Thus a robust local manufacturing sector investment will be a necessity if the citizens of each of the countries should add value to their raw materials to be traded. This means that the benefits of the continental trade agreement could be very illusive, making Ghana and by extension Africa a hub for imported goods from the rest of the world if local private investment continues to fall. The following sections assess data from Ghana's manufacturing sector to inform policy for necessary action.

4. METHOD OF STUDY

4.1. The Sample

The study selected the best period for manufacturing in Ghana, based on contribution to GDP in recent history. This was the period from 2000 to 2014. Within this period, all the manufacturing companies listed on the Ghana Stock Exchange were assessed. There were eleven of such firms incorporated in Ghana. Data was extracted from the published annual audited financial statements of these firms, internet sources and the Ghana Stock Exchange library, compiled by a graduate student under the supervision of the author.

4.2. The Model and Variables

From Equation 4 the variables in the regression model are investment expenditure (I), capital stock (K) and the value of capital (q). The Capital Stock (K) of firms was obtained directly from published annual financial statements of the firms. It stands for the aggregate value of the firms' physical capital, less their depreciation over some time period. The value of capital (q) is the ratio of the market value to the estimated value of installed capital stock of domestically incorporated companies listed on the Ghana Stock Exchange (GSE) (Kim & Nelson, 2003). While the capital referred to is man-made, its value will to a large extent depend on the availability of natural capital in the African setting.

Investment expenditure (I) data for the firms were also obtained from firms' published financial statements. This refers to the value of property, plant and equipment in current Ghana cedis. The ratio of investment to capital (I/K) is the dependent variable of the model.

The missing element in investment expenditure is the investment in natural capital, which gets depleted in the process of generating the firms' physical capital. This creates a gap in models which omit natural capital. While for developed countries this omission will have little or no effect due to the insignificance of natural capital depletion within their economies, for developing countries this is substantial due to the high dependence on natural resources in these economies. In Ghana for instance, about 70% of the population depend on forest resources for livelihood

and cultural purposes (Ghana Forestry Commission, 2012). Thus, just as physical capital was depreciated, investment expenditure should also have been depreciated by the loss in natural capital that made the investment possible. Then, the model formulation requires some modification to become

$$\frac{I_{it}}{K_{it}} - d = \gamma + \frac{1}{\beta}\left[q_{it} - 1\right] + u_{it} \qquad (5)$$

Where d is the rate of depreciation of the natural environment in the economy. To make the results comparable with earlier works, the initial analysis was based on Equation 4. A later application then used the depreciation for further analysis, to capture the role of environmental damage as depicted in Equation 5.

4.3. The Results

Table 1 presents both the random effect and fixed effect panel regression results. The estimated model presents the dependent variable as the ratio of a firm's investment expenditure to its capital stock $\frac{I_{it}}{K_{it}}$, and the independent variable as the value of capital $[q_{it} - 1]$. The table also reports the Hausman specification test which helps to decide between the random effect and the fixed effect models.

Table-1. Random and fixed effect regression results for manufacturing firms in Ghana.

	Coefficients (Std. Error)	
	Random Effect	**Fixed Effect**
Constant	0.128 (0.047)	0.130 (0.024)
q1	0.048 (0.004)	0.047 (0.004)
Sigma_u	0.1334	0.1501
Sigma_e	0.2557	0.2557
rho	0.2142	0.2563
Corr(u_i, Xb)	0.000	0.1274
R-squared:		
Within	0.4579	0.4579
between	0.5459	0.5459
overall	0.4722	0.4722
Hausman	Chi-square(1)	P-value
	0.8	0.3721

The estimated chi-square test statistics was 0.8 with a p-value of 0.3721. The null hypothesis of the Hausman specification test was that the difference in coefficients was not systematic. This means a random effect model procedure is appropriate if the null hypothesis is affected, and fixed effect if the null hypothesis is rejected. Given the p-value of 0.3721 > 0.05, there was insufficient evidence to reject the null hypothesis and hence the random effect model would be the most appropriate panel regression model.

Table 1 also reports the interclass correlation – rho, for the random effect model was 0.2142 It implies that about 21% of the variance is due to the differences across firms in the random effect model. The overall coefficient of determination (R-squared) was 0.4722, indicating that 47.22% of the variation in the dependent variable $\frac{I_{it}}{K_{it}}$, was explained by variations in the independent variable $[q_{it} - 1]$.

From the results, the estimated effect of the independent variable – value of capital on the dependent variable – ratio of investment to capital stock was 0.048 with a standard error of 0.004, making the coefficient statistically

significantly different from zero at 5% level of significance. The coefficient was positive, implying a nonnegative relationship between the dependent and independent variables.

4.4. Discussion of Results

4.4.1. The Value of Capital

Table 1 shows a positive and highly significant relationship between investment and the value of capital (q) at the 5% significance level. Similar findings were obtained by Lichtenberg (1988); Galeotti (1990); Groth and Khan (2009) and Romer (2012). The study thus affirms the fact that investments increase with increases in the value of capital in Ghana's manufacturing industry. Since share prices in firms are prices of claims on firms' capital, managers' response to increasing stock prices would be to produce more new capital, which means increasing investment at high share prices.

4.4.2. Adjustment Costs

Where β is the adjustment cost parameter, the coefficient associated with the marginal adjustment cost for a given investment-capital ratio (I/K), coefficient of q is $1/\beta$. Hence, the marginal cost of adjustment associated with a given value of I/K is given by $\beta(I/K)$ (Romer, 2012; Von Furstenberg, 1977).

The positive significant effect of q on investment found by this study suggests that adjustment costs go up as the rate of investment increases. Since the coefficient of q in the study was 0.048, the adjustment cost parameter β will be equal to $1 \div 0.048 = 20.83$. Shapiro (1986) argued that large estimates of adjustment costs are unavoidable due to the extent of variation in stock prices relative to investment.

Von Furstenberg (1977) obtained an adjustment cost parameter of about 21, Blanchard and Wyplosz (1981) obtained an adjustment cost parameter of 29, while Summers (1981) obtained an adjustment cost parameter of 32. The values obtained in this study for both q and the adjustment cost parameter β suggest that the Ghanaian manufacturing sector incurs adjustment costs by changing their level of capital stock. This result is consistent with the adjustment cost hypothesis which states that the cost to a firm for acquiring fixed capital assets exceeds the purchase price paid to the suppliers of these assets (Lichtenberg, 1988). Therefore, the null hypothesis that adjustment costs of Ghanaian manufacturing firms do not obey the adjustment cost theory is rejected.

It is however worth noting that the firms' data did not include any environmental variable. This means the effect of manufacturing on the environment was assumed to be non-existent. Such an assertion is incorrect for Africa where a very large proportion of investments have a direct bearing on the natural environment.

For the study period, I/K = 0.24548, this makes Ghana's manufacturing sector marginal cost of adjustment without taking the environment into account, equal to 20.83 x 0.24548 = 5.1133. Environmental adjustment costs will make K smaller and therefore the marginal adjustment cost larger.

The required modification is that additional costs will be added to the conventional adjustment costs due to the environmental damage caused by manufacturing. Since consistently Ghana has lost about 14.7% of GDP per annum due to environmental damage (World Bank, 2020b) this will make adjustment costs go up. The initial discounted present value of the marginal adjustment cost 5.1133 over the 13 years covered by the study would be 1.1718. This means the marginal adjustment cost of 1.1718 had deteriorated to 5.1133 after the 13 years. Thus there had been an erosion of about 77% of the value of the initial capital stock due to environmental damage. This being the case, it becomes imperative for environmental adjustment costs to be featured prominently in Africa's trade policies, if the right adjustment costs are desirable to inform resource, investment and capital stock policies appropriately.

4.4.3. Net Benefits

The World Bank (2020a) found that estimated gains from AfCFTA were going to be around US$450 billion by 2035, if the accord was fully implemented. Since the World Bank study did not adjust for environmental damage

from AfCFTA, the projected benefits will not be the real benefits. The following analysis demonstrates that the cost of only three moderate segments of the full environmental damage far exceeds the World Bank's projected AfCFTA gains. These segments are expanded trade generated solid waste, deforestation and climate change adaptation.

Solid waste generation has been increasing rapidly in sub-Saharan Africa. Africa's solid waste generation in 2016 was 165.6kg per person per annum. Through-put economists would argue that the solid waste burden should not be borne by AfCFTA. Such an argument goes to support the failure to recognize that the production of the AfCFTA GDP of US$3.4 trillion dollars, which is a source of pride and inspiration for AfCFTA was what gave rise to the waste. The through-put argument is a denial of the first law of thermodynamics, constituting a scientific fallacy in the way some economists handle waste generated from production of goods and services. So, the output and waste move together because there would have been no waste if there were no output. The solid waste is a necessary byproduct of the goods and services produced and traded to generate the AfCFTA benefits.

Given the 1.3 billion people in AfCFTA, the total solid waste generation would be about 215 million tonnes per annum. Treatment systems for solid waste management cost on average US$75 per tonne in Africa (World Bank, 2020b) making the cost US$16.146 billion per annum. From 2021 to 2035, this cost would be US$226.044 billion based on business-as-usual considerations. The 7% increase in output projected by the World Bank by 2035 will add a corresponding US$15.823 billion to the cost of solid waste management, making a total of US$241.87 billion. This means the management of generated solid waste alone will use up more than 50% of the AfCFTA projected benefits.

With respect to the avoidance of deforestation, the FAO (2012) estimated that it would cost an additional US$8.1- 16.2 billion per year to avoid 75% of total deforestation in Africa. So suppose this 25% deforestation is acceptable, this would cost Africa some US$170 billion on average by 2035.

In terms of climate change adaptation needs, Africa stands to lose a lower average of US$20 billion yearly from 2030-2035 (Pan African Climate Justice Alliance (PACJA), 2009). This amounts to an average of US$280 billion by 2035. Thus for only these three moderate components of environmental damage, the loss to Africa stands at about US$ 691 billion, far more than (about 150%) the AfCFTA projected gains of US$450 billion.

Any attempt to overlook the environmental damage in AfCFTA will constitute a destruction of the seed of Africa's future progress. It is worth noting that to date, the measurement of progress in economic development in Africa has assigned zero value to environmental damage, yet the global annual revenue from environmental resources has been estimated at US$ 125 trillion (Grooten & Almond, 2018). Ignoring the environment is a through-put calamity which ends up impoverishing people whose livelihood depends to a large extent on the natural environment. Outcomes similar to ignoring environmental damage are the issues of undocumented welfare loss from pollution havens and race to the bottom, analyzed in the following sections.

4.5. Africa as a Pollution Haven

The essence of the pollution haven hypothesis is that waste which should be managed by developed country producers ends up in developing countries, irrespective of whether the source of the waste production is moved to developing countries or not. The critical concern is the waste, not necessarily the means of generating the waste. Thus many developed country producers use Africa as their recycling plants, creating the same effect as relocating their dirty production systems there, for the sake of disposing of their waste.

Nearly all the hazardous waste produced in the US and Europe were managed there till around 1985. However, by the beginning of 1990, United States and European firms obtained UWEPA approval, which permitted them to export hazardous waste to developing countries. Systems to regulate shipments have often been circumvented, with exporters sometimes intentionally mislabeling waste to allow its export to Africa and other developing countries, sending huge volumes of hazardous material into these countries (Sthiannopkao & Wong, 2013).

4.5.1. The Extent of Pollution Haven in Africa

Africa's major e-waste dumpsites are the Alaba International Electronic Market and Ikeja computer village in Lagos, Nigeria and Agbogbloshie in Accra, Ghana (Kyere, Greve, & Atiemo, 2016; Terada, 2012).

In 2012 the ILO stated that as much as 80 % of e-waste produced in developed countries were shipped from developed countries to developing ones, many times illegally (Lundgren, 2012). Due to the increasing demand for electronics in developed countries, this phenomenon is expected to grow in extent in the future.

Several recycling companies that claim to be sustainable and environmentally conscious still choose to send their waste to developing countries instead of processing them in their countries of origin. A Basel Action Network investigation to track e-waste after it was dropped off at various recycling centers through tracking devices placed inside e-waste revealed about 30% of them were sent to developing countries. The guilty recycling centers promoted themselves to be eco-friendly, despite their illegal export of e-waste to developing countries (Electronic Recycles International (ERI), 2017).

The Spanish Civil Guard in 2020 arrested 34 people in Spain, on the islands of Tenerife for illegal export of 2,500 tons of e-waste to 8 African countries including Nigeria. The documents submitted to customs, had falsified certificates claiming the devices were working perfectly. The Civil Guard also found that 138 illegal shipments of hazardous waste had been exported to Senegal, Ghana, Gambia, Togo, Benin, Guinea-Conakry, Sierra Leone and Nigeria between 2018 and 2019 (Ngounou, 2020).

Shipments of used electronic devices have often been used to conceal illegal transport of e-waste from western countries into Ghana's informal sector creating an emerging illegal market thriving in both the EU and West Africa (Europol, 2011). The quantum of these shipments turning up to be unusable goods from the EU shows deliberate shipment of unusable electronics or e-waste to countries lacking strict waste-management to cut costs and to keep waste quotas (Europol, 2011).

A US Environmental Protection Agency (EPA) financed study in 2018 revealed that more than 16,900 tonnes of e-waste were exported to Nigeria in 2015 and 2016. About 77% of the electronic waste had originated from European Union ports. These were made up of 20% from Germany, 19.5% from the United Kingdom, 9.4% from Belgium and 8.2% from the Netherlands (Ngounou, 2020).

4.5.2. Failure of International Law

Pollution from e-waste has become a rapidly worsening pollution problem globally (Kiddee, Naidu, & Wong, 2013). While the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal do not allow the export of hazardous waste, countries which have not ratified the agreement do not comply with it. Major e-waste producers like the United States, Canada, Japan, Australia, New Zealand, South Korea, Russia, India and Brazil have not ratified the convention (Ngounou, 2020).

In addition, the Bamako Convention, The Libreville Declaration and the Durban Declaration (Lundgren, 2012) have various legal weaknesses making the mislabeling of exports easily acceptable (Amoyaw-Osei et al., 2011; Daum, Stoler, & Grant, 2017). This to a large extent promotes the lack of enforcement of environmental regulations on trade (Lundgren, 2012).

4.6. Race to the Bottom

One obvious reason for which the illegal e-waste exports to Africa would not stop is that most African governments lack the incentive to stop them. Daum et al. (2017) found that the lack of incentive for authorities in Ghana to strengthen legislation and enforcement was because the e-waste chain sustained the livelihood of at least 200,000 people. The existing informal e-waste sector served as a cheap way for the city of Accra to manage its waste, which otherwise would have been the responsibility of private companies. It also employs a large portion of unskilled workers and functions as a poverty alleviator in many ways. With the waste sector generating between

$105-$268 million USD per year, there are strong incentives to keep this sector moving (Oteng-Ababio, Amankwaa, & Chama, 2014).

The Government of Ghana's open trade policy completely removed import duties on used computers and accessories. This policy facilitated the importation of about 171,000 MT of e-waste per annum based on 2009 values (Amnesty International, 2011). These e-waste imports were between 10-80% of the imports resulting from scraping of import duties on used computers and accessories (Grant & Oteng-Ababio, 2016).

The combined actions of fraudulent customs officials and import regulators allow e-waste, deceptively labeled through Ghana's Tema port. Ghana's porous and poorly monitored borders also allow shipments of e-waste to pass undetected. There are also cases of under-reporting of direct imports of e-waste into Ghana (Grant. & Oteng-Ababio, 2012). Ghana's new Single Window for trade will likely be an additional line of weakness for the menace e-waste imports.

The Energy Commission of Ghana has not been able to enforce Ghana's ban on second-hand refrigeration appliances due to political interference and unwillingness of political leaders to act. The ban was instituted in 2008 but as at 2019, The Commission has since 2008 been trying to get government's approval to implement the ban. Mr. Huber Nsoh Zan, officer for Energy Efficiency and Renewable Energy for the commission confirmed the unwillingness of every minister of trade to sign the work plan for implementing the policy. The fear has been that its implementation was going to make the ruling government unpopular (Andoh, 2019). Thus, irrespective of the effects of these unwholesome manufactured imports on the health of Ghanaians and the energy sector, political leadership has been prepared to allow a race to the bottom for political expediency. This typically illustrates a race to the bottom common in Africa.

To appear to be attempting a solution, authorities have tried some temporary forced evictions and demolitions undertaken to tackle the expansion of Old Fadama and Agbogbloshie in Ghana (Amnesty International, 2011; Ghana Star, 2018). These types of actions have been accused of being publicity stunts aimed to distract the public from the real issues and provide an image of forcefulness (Myjoyonline, 2015).

4.7. Effect of Pollution Havens and Race to the Bottom on Africa

E-waste carries several chemicals which are toxic in nature (Kiddee et al., 2013). The difficulty of getting information publicized from major e-waste dump sites like the West African region created a situation in which very little was known about the menace of exposures to e-waste in Africa until recently. Efforts are being intensified by the scientific community in Africa to gather and analyze real evidence on the extent to which contamination from e-waste dump sites has affected human health, economic opportunities and the natural environment in Africa (Orisakwe, Frazzoli, Ilo, & Oritsemuelebi, 2019). Africa's air, soils and water bodies have been heavily polluted through these dump sites.

The concern about Africa becoming a bigger pollution haven, with supporting race to the bottom due to expanded trade through AfCFTA is not merely because of waste and pollution. The resulting waste and pollution cause damage to human health, environmental safety and welfare loss for millions of Africans.

Ghana's most popular e-waste dumpsite, Agbogbloshie, is situated right in the capital city, Accra. This site currently ranks among the most toxic sites in the world from high e-waste and poses serious environmental and public health threats to the health and environment of residents of Accra (Caravanos, Clarke, Osei, & Amoyaw-Osei, 2013; Daum et al., 2017). In addition, being along a major river flowing into the Atlantic Ocean, the site contributes significantly to the pollution along the Gulf of Guinea (Karikari, Asante, & Biney, 2006). Its role in the loss of many aquatic species and biodiversity in the Korle Lagoon is also very significant, depriving residents of wholesome fish, aesthetic value and wellbeing (Huang, Nkrumah, Anim, & Mensah, 2014; Karikari et al., 2006).

Also, the growing geographical frontier for e-waste in Ghana goes beyond the capital, Accra. While Agbogbloshie in Accra is internationally acclaimed an e-waste damp, Accra harbors some other e-waste dump sites

yet to receive much recognition. New waste areas are emerging as a result of oversaturation in Agbogbloshie, some of which are Kokompe, Ashaiman and Gallaway (Amoyaw-Osei et al., 2011).

Other parts of Ghana are opening up fast as e-waste dumping sites. The Eastern Regional capital of Ghana, Koforidua has become one of such sites. Tamale, the Northern Regional capital has another fast growing site. Kumasi in the Ashanti Region has some clusters of e-waste dumps, with Suame Magazine, probably being larger than Agbogbloshie (Atiemo, Faabeluon, Manhart, Nyaaba, & Schleicher, 2016).

This means with expanded trade, more clean environments are going to be converted into e-waste dumpsites. This has serious implications for land use and land use change as well as benefits currently derived by local residents from land. The large scale conversion of good land into e-waste dumpsites will be devastating for the African environment as well as the welfare of its people. The ultimate effect will be a limit to development resulting from increasing shortages of land for agriculture and housing and the direct welfare loss from polluted air, soils and water bodies.

Africa does not possess the necessary capacity and facilities to process e-waste. Imports of e-waste have been handled unofficially through mostly open burning, causing extensive pollution of the environment and rendering many locations unsuitable for decent human habitation (Frazzoli, Mantovani, & Orisakwe, 2011; Weber, Aliyeva, & Vijgen, 2013). Africa's heavy rains flood the e-waste dump sites sending contaminated water to farming areas and into fresh water systems.

Sediments sampled from a shallow lagoon within the Agbogbloshie market area in Accra, Ghana contained very high concentrations of metal and organic chemicals due to e-waste burning (Brigden, Labunska, Santillo, & Johnston, 2008). Samples of air from the market contained high levels of Aluminum, Copper, Iron, Lead, and Zinc (Caravanos, Clark, Fuller, & Lambertson, 2011). More than 50% of soil samples collected from the market exceeded the United States Environmental Protection Agency standard for Lead in soil (400 mg/kg or ppm) (Environmental Protection Agency (US), 2001). The least level of Lead in the soil was 134 ppm and the highest 18,125 ppm (Caravanos et al., 2011). Soil and ash samples from various sites at Agbogbloshie revealed extremely high concentrations of Cadmium, Copper, lead, Antimony, and Tin compared to those typically seen in uncontaminated soil (Brigden et al., 2008).

Also, analysis of e-waste samples for heavy metals for Alaba international electronic market and Ikeja computer village in Nigeria showed the presence of Cadmium, Chromium, Nickel, Manganese, Copper, and Lead. Some of the concentrations were more than the limits set by regulatory authorities globally (Alabi et al., 2012).

Following the extent of exposures to e-waste, a study found that the highest non-dioxin-like polychlorinated biphenyls (PCB) level in Accra (32.2 ng/g dw) was higher than the effects range-low level of sediment quality guideline (22.7 ng/g) (Long, Macdonald, Smith, & Calder, 1995) of the US National Oceanic and Atmospheric Administration (NOAA). Most of these chemicals are endocrine disrupters, and most are neuro- and immune-toxic as well. The finding suggested that the likely biological effect of PCBs in Accra, Ghana, could not be ignored, putting the lives of a whole city at risk.

Since most e-waste dump sites in sub-Saharan Africa are occupied by a large number of support facilities such as housing and eating places, street traders, food and beverage vendors, e-waste exposure affects not only e-waste dealers but whole communities. Such communities, made up of men, women and children, live and work together in these sites every day (Long et al., 1995). Lead exposure alone causes the death of 1200 per annum in Ghana, while ambient air pollution causes about 7,200 premature deaths (World Bank, 2020b).

5. CONCLUSION AND POLICY IMPLICATIONS

While there exists great potential for investment in Africa's manufacturing sector to create benefits for AfCFTA, high adjustment cost remains a challenge. The lack of recognition of environmental adjustment costs by the current AfCFTA agreement constitutes a major missing link for the successful implementation of the

agreement, since it will derail all the potential gains. Without addressing these environmental adjustment costs, pollution havens and race to the bottom will flourish to the detriment of Africa's welfare. The challenges are enormous, cutting across institutions, technical capacity, data collection and processing, and the adoption and application of sustainable development principles.

Expanded African trade has always resulted in the importation of e-waste in Africa, which has caused degradation of the natural environmental, accompanied by adverse ecosystem problems. There will certainly be long years of toxicity, together with the increasing concentrations of toxic chemicals in the air, soils and water bodies due to growth in imports of e-waste at the current rate in Africa (Park, Hoerning, Watry, Burgett, & Matthias, 2017). The onset of expanded trade through AfCFTA has the tendency to exacerbate the situation, creating serious economic, health and destabilizing problems not only for the current generation but also for future ones. This unwarranted compromise of Africa's future prosperity will depend to a large extent on the appropriateness of policies and measures taken in relation to Africa's environment through AfCFTA before any commencement of trading.

While existing international trade rules give no serious consideration to environmental damage, AfCFTA trade should be a means of correcting this anomaly. Making trade rules to address environmental damage is the most essential guarantee of welfare benefits for Africa under any form of expanded international trade, since without such regulation the welfare of about 70% of Africans will be compromised. Thus policy makers will need to proceed with getting these rules and regulations in place before any trade begins under AfCFTA.

Also, AfCFTA will have to concentrate on influencing a speedy transition of global energy systems away from fossil fuels in such a way that will make energy availability and use equitable and socially inclusive. The current leaning on fossil fuels is a disincentive to African trade, since carbon dioxide emissions from energy constitute the greatest externality for African trade through Africa's vulnerability to climate change and environmental degradation, increasing adjustment costs for African manufacturing firms.

In this direction, AfCFTA must prioritize and incentivize clean energy investments and goods and services that prevent, mitigate and help adapt to climate change. AfCFTA should create disincentives for fossil fuel-based trade and significantly discourage trade, investment and technology as well as goods and services that promote climate change. AfCFTA should also use border regulations including environmental taxes, tariffs and denial of entry for goods that are not environmentally friendly (Chernichiwan, 2017).

Thus, AfCFTA must be used by Africa as a tool to harmonize national and international policies aimed at eliminating environmental degradation, since the benefits of any single country implementing strict environmental regulation will be lost where jobs and output can migrate to economies without, or with weak, environmental regulations. This is the only way AfCFTA as designed, can secure the value of Africa's resources and the welfare of its people through expanded international trade, for present and future generations.

Funding: This study received no specific financial support.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

Abel, A. B. (1990). *Consumption and investment. In Friedman, B. and Hahn, F.H. (Eds.), Handbook of Monetary Economics II.* Amsterdam: North Holland.

Abrego, L., Amado, M. A., Gursoy, T., Nicholls, G., & Perez-Saiz, H. (2019). The African continental free trade agreement: Welfare gains estimates from a general equilibrium model. Retrieved from https://www.imf.org/en/Publications/WP/Issues/2019/06/07/The-African-Continental-Free-Trade-Agreement-Welfare-Gains-Estimates-from-a-General-46881.

African Development Bank (ADB). (2019). *African economic outlook 2019.* Abidjan, Cote d'Ivoire: ADB.

Agenor, P. R., & Montiel, P. J. (2015). *Development macroeconomics* (4th ed.). Princeton: Princeton University Press.

Akeyewale, R. (2018). Who are the winners and losers in Africa's Continental free trade area? World Economic Forum. Retrieved from https://www.weforum.org/agenda/2018/10/africa-continental-free-trade-afcfta-sme-business/. [Accessed 20th April, 2019].

Alabi, O. A., Bakare, A. A., Xu, X., Li, B., Zhang, Y., & Huo, X. (2012). Comparative evaluation of environmental contamination and DNA damage induced by electronic-waste in Nigeria and China. *Science of the Total Environment, 423*, 62-72.Available at: https://doi.org/10.1016/j.scitotenv.2012.01.056.

Allen, L. J. (2018). The environment and NAFTA policy debate redux: Separating rhetoric from reality, 42 William. & Mary Environmental Law & Policy Review 965. Retrieved from: https://scholarship.law.wm.edu/wmelpr/vol42/iss3/7. [Accessed 30th May, 2019].

Amnesty International. (2011). *When we sleep, we don't sleep living under threat of forced eviction in Ghana. AFR 28/003/2011*. London: Amnesty International Secretariat.

Amoyaw-Osei, Y., Agyekum, O., Pwamang, J., Mueller, E., Fasko, R., & Schluep, M. (2011). Ghana e-waste country assessment. Accra. Retrieved from: http://ewasteguide.info/files/Amoyaw-Osei_2011_GreenAd-Empa.pdf [Accessed 5th June, 2019].

Andoh, D. (2019). Second-hand fridges still flood markets: Ban not Enforced Since 2008. Retrieved from https://www.graphic.com.gh/news/general-news/second-hand-fridges-still-flood-markets-ban-not-enforced-since-2008.html. [Accessed 10th December, 2019].

Atiemo, S., Faabeluon, L., Manhart, A., Nyaaba, L., & Schleicher, T. (2016). *Baseline assessment on e-waste management in Ghana. Sustainable recycling industries*. St. Gallen: World Resource Forum Association, Freiburg: Oko-Institut e.V Accra: Ghana National Cleaner Production Centre, and Vienna: Sofies.

Bank of England. (2019). *Enhancing banks' and Insurers' approaches to managing the financial risks from climate change. Supervisory Statement SS3/19*. London: Bank of England.

Bigsten, A., Collier, P., Dercon, S., Gauthier, B., Gunning, J. W., Isaksson, A., & Sylvain, M. (1999). Investment in Africa's manufacturing sector: A four country panel data analysis. *Oxford Bulletin of Economics and Statistics, 61*(4), 489-512.

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Willem, G. J., & Teal, F. (2005). Adjustment costs and irreversibility as determinants of investment: Evidence from African manufacturing. *Contributions to Economic Analysis & Policy, 4*(1), 1-30

Blanchard, O. J., & Wyplosz, C. (1981). An empirical structural model of aggregate demand. *Journal of Monetary Economics, 7*(1), 1-28.

Brigden, K., Labunska, I., Santillo, D., & Johnston, P. (2008). Chemical contamination at e-waste recycling and disposal sites in Accra and Korforidua, Ghana (pp. 24). Amsterdam, Netherlands: Greenpeace Research Laboratories.

Caravanos, J., Clark, E., Fuller, R., & Lambertson, C. (2011). Assessing worker and environmental chemical exposure risks at an e-waste recycling and disposal site in Accra, Ghana. *Journal of Health and Pollution, 1*(1), 16-25.

Caravanos, J., Clarke, E. E., Osei, C. S., & Amoyaw-Osei, Y. (2013). Exploratory health assessment of chemical exposures at e-waste recycling and scrap yard facility in Ghana. *Journal of Health and Pollution, 3*(4), 11-22.

Chauvin, D., Nicolas, M., Ramos, P., & Porto, G. (2016). Trade, growth, and welfare impacts of the CFTA in Africa. Working Paper, International Household Survey Network. Retrieved from: http://hesso.tind.io/record/2006/files/Depetris-Chauvin_2017_trade_growth_welfare.pdf. [Accessed 10th July, 2019].

Chernichiwan, J. (2017). Trade liberalization and the environment: Evidence from NAFTA and U.S. manufacturing. *Journal of International Economics, 105*(2017), 130-149.

Clark, P. K. (1979). Investment in the 1970s: Theory, performance and prediction. *Brookings Papers on Economic Activity (BOEA), 10*(1), 73-113.

Costantinos, C. B. (2019). Potential impact & forthcoming imperatives of the AfCFTA. Public Lecture – Respublica Litereria - RL Vol XIII No 448a MMXIX. Retrieved from: https://addisababa.academia.edu/CostyCostantinos. [Accessed 24th October, 2019].

Daly, H. (1993). The perils of free trade. Scientific American. Retrieved from https://www.scientificamerican.com/article/the-perils-of-free-trade/. [Accessed 15th June 2016].

Daum, K., Stoler, J., & Grant, R. (2017). Toward a more sustainable trajectory for E-waste policy: A review of a decade of e-waste research in Accra, Ghana. *International Journal of Environmental Research and Public Health*, *14*(2), 1-18.

Electronic Recycles International (ERI). (2017). Why is E-waste being shipped to developing countries? Retrieved from https://eridirect.com/blog/2017/06/why-is-e-waste-being-shipped-to-developing-countrie/. [Accessed on 10th July, 2020].

Environmental Protection Agency (US). (2001). Lead; identification of dangerous levels of lead. final rule. *Fed Regist*, *66*(4), 1205-1240.

Europol. (2011). OCTA 2011, EU organised crime threat assessment. European Police Office. Retrieved from: www.europol.europa.eu. [Accessed10th July, 2019].Available at: 10.2813/30304.

FAO. (2012). Identifying opportunities for climate-smart agricultural investments in Africa. Retrieved from http://www.fao.org/docrep/015/an112e/an112e00.pdf. [Accessed 10th November, 2020].

Francois, J., Jansen, M., & Peters, R. (2011). *Trade adjustment costs and assistance: The labour market dynamics. In Jansen, M., Peters, R. and Salazar Xirinachs, J.M. (Eds.). Trade and Employment: From Myths to Facts.* Geneva: International Labour Office (ILO).

Frazzoli, C., Mantovani, A., & Orisakwe, O. E. (2011). In: Nriagu, J.O. (Ed.), Electronic waste and human health. Encyclopedia of environmental health (pp. 269-281). Amsterdam, Netherlands: Elsevier.

Galeotti, M. (1990). Specification of the technology for neoclassical investment theory: Testing the adjustment costs approach. *The Review of Economics and Statistics*, *72*(3), 471-480.Available at: https://doi.org/10.2307/2109355.

Ghana Forestry Commission. (2012). *Ghana forestry and wildlife policy.* Accra: Ministry of Lands and Natural Resources.

Ghana Star. (2018). Move from unauthorised spaces In 48-Hrs Else- AMA boss to agbogbloshie traders. Retrieved from https://www.ghanastar.com/news/move-from-unauthorised-spaces-in-48-hrs-else-ama-boss-to-agbogbloshie-traders/. [Accessed 14-Apr. 2018].

Grant, R. J., & Oteng-Ababio, M. (2016). The global transformation of materials and the emergence of informal urban mining in Accra, Ghana. *Africa Today*, *62*(4), 3-20.Available at: https://doi.org/10.2979/africatoday.62.4.01.

Grant, R., & Oteng-Ababio, M. (2012). Mapping the invisible and real" African" economy: Urban e-waste circuitry. *Urban Geography*, *33*(1), 1-21.Available at: https://doi.org/10.2747/0272-3638.33.1.1.

Grooten, M., & Almond, R. E. A. (2018). *WWF living planet report-2018: Aiming higher.* Gland, Switzerland: WWF.

Groth, C., & Khan, H. (2009). *Investment adjustment costs: An empirical assessment.* New York: McGraw-Hills Companies.

Hamermesh, D. S., & Pfann, G. A. (1996). Adjustment costs in factor demand. *Journal of Economic literature*, *34*(3), 1264-1292.

Harris, J. M., & Roach, B. (2018). *Environmental and natural resource economics: A contemporary approach.* New York: Taylor and Francis.

Harris, J. M. (2004). *Trade and environment. Global development and environment institute.* Medford: Tufts University.

Huang, J., Nkrumah, P. N., Anim, D. O., & Mensah, E. (2014). E-waste disposal effects on the aquatic environment: Accra, Ghana. *Reviews of Environmental Contamination and Toxicology*, *229*(2014), 13-34.Available at: 10.1007/978-3-319-03777-6_2.

IMF World Bank & WTO. (2017). Making trade an engine of growth for all. Document prepared for discussion at meeting of G20 Sherpas, March, 2017. Frankfurt: IMF, World Bank and WTO. Retrieved from: https://www.imf.org/en/publications/Policy-Papers/Issues/2017/04/08/making-trade-an-engine-of-growth-for-all. [Accessed 19th October, 2019].

Institute of Statistical Social and Economic Research (ISSER). (2018). *State of the Ghanaian economy in 2017*. Legon - Accra: University of Ghana.

Karikari, A., Asante, K. A., & Biney, C. A. (2006). Water quality characteristics at the estuary of Korle Lagoon in Ghana. *West African Journal of Applied Ecology*, *10*(1), 2006.Available at: 10.4314/wajae.v10i1.45700.

Kiddee, P., Naidu, R., & Wong, M. H. (2013). Electronic waste management approaches: An overview. *Waste Manag*, *33*(5), 1237-1250.Available at: https://doi.org/10.1016/j.wasman.2013.01.006.

Kim, C. J., & Nelson, C. R. (2003). *Models with regime switching*. Cambridge: MIT Press.

Kyere, V. N., Greve, K., & Atiemo, S. M. (2016). Spatial assessment of soil contamination by heavy metals from informal electronic waste recycling in Agbogbloshie, Ghana. *Environ Health Toxico l*, 10.Available at: https://doi.org/10.5620/eht.e2016006.

Lichtenberg, F. R. (1988). Estimation of the internal adjustment costs model using longitudinal establishment data. *The Review of Economics and Statistics*, *70*(3), 421-430.Available at: https://doi.org/10.2307/1926780.

Liu, Y. (2018). Capital adjustment costs: Implications for domestic and export sales dynamics. University of Mannheim, Department of Economics Working Paper No. 18-04.

Long, E. R., Macdonald, D. D., Smith, S. L., & Calder, F. D. (1995). Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environ Manag*, *19*(1), 81-97.Available at: https://doi.org/10.1007/BF02472006.

Lundgren, K. (2012). *The global impact of e-waste: Addressing the challenge. Programme on Safety and Health at Work and Environment*. Geneva: International Labour Office (ILO).

Ministry of Finance (MOF). (2019). *The 2019 mid-year fiscal policy review of the budget statement and economic policy and supplementary estimates*. Accra: Government of Ghana.

Mussa, M. (1978). Dynamic adjustment in the Heckscher-Ohlin-Samuelson model. *Journal of Political Economy*, *86*(5), 775-791.Available at: https://doi.org/10.1086/260711.

Myjoyonline. (2015). Blaming June 3 floods on Old Fadama residents reckless, irresponsible – Pratt. Retrieved from: https://www.myjoyonline.com/news/2015/June-27th/blaming-june-3-floods-on-old-fadama-residents-reckless-irresponsible-pratt.php. [Accessed 20th May, 2019].

Ngounou, B. (2020). Africa: 34 traffickers arrested for importing electronic waste. Retrieved from https://www.afrik21.africa/en/africa-34-traffickers-arrested-for-importing-electronic-waste/. [Accessed 10th September, 2020].

Orisakwe, O. E., Frazzoli, C., Ilo, C. E., & Oritsemuelebi, B. (2019). Public health burden of E-waste in Africa. *Journal of Health & Pollution*, *9*(22), 1-12.Available at: https://doi.org/10.5696/2156-9614-9.22.190610.

Oteng-Ababio, M., Amankwaa, E., & Chama, M. (2014). The local contours of scavenging for e-waste and higher-valued constituent parts in Accra, Ghana. *Habitat International*, *43*, 163-171.Available at: https://doi.org/10.1016/j.habitatint.2014.03.003.

Paarlberg, R. (2000). *Political power and environmental sustainability in agriculture. In Harris, J. (Ed.), Rethinking sustainability: Power, knowledge, and institutions*. Ann Arbor, Michigan: The University of Michigan Press.

Pan African Climate Justice Alliance (PACJA). (2009). The economic cost of climate change in Africa. Retrieved from 1530-AfricanClimateReport_online.pdf. [Accessed 7th November, 2012].

Park, J., Hoerning, L., Watry, S., Burgett, T., & Matthias, S. (2017). Effects of electronic waste on developing countries. *Advances in Recycling & Waste Management*, *2*(2), 1-6.Available at: https://doi.org/10.4172/2475-7675.1000128.

Polaski, S., Anderson, S., Cavanagh, J., Gallagher, K., Pérez-Rocha, M., & Ray, R. (2020). *How trade policy failed U.S. workers and how to fix it*. Boston: Institute for Policy Studies, Boston University Global Development Policy Center, and Groundwork Collaborative.

Rodrik, D. (2004). Getting institutions right. CESifo DICE Report 2/2004.

Romer, D. (2012). *Advanced macroeconomics*. USA: McGraw-Hill Companies, Inc.

Rothman, D., & De Bruyn, S. (1998). Probing into the environmental Kuznets curve hypothesis" (Introduction to Special Issue on the Environmental Kuznets Curve). *Ecological Economics*, *25*(2), 143-145.

SDG Center for Africa and Sustainable Development Solutions Network. (2019). *Africa SDG index and dashboards report 2019*. Kigali and New York: SDG Center for Africa and Sustainable Development Solutions Network.

Selden, T. M., & Song, D. (1994). Environmental quality and development: Is there a Kuznets curve for air pollution emissions? *Journal of Environmental Economics and management*, *27*(2), 147-162.Available at: https://doi.org/10.1006/jeem.1994.1031.

Shapiro, M. D. (1986). The dynamic demand for capital and labor. *The Quarterly Journal of Economics*, *101*(3), 513-542.Available at: https://doi.org/10.2307/1885695.

Starkey, J. L. (2006). *Introduction to microeconomics: An ecological perspective*. Redding: Horizon Textbook Publishing, LLC.

Sthiannopkao, S., & Wong, M. H. (2013). Handling e-waste in developed and developing countries: Initiatives, practices, and consequences. *Science of the Total Environment*, *463-464*(2013), 1147-1153.Available at: 10.1016/j.scitotenv.2012.06.088.

Summers, L. H. (1981). Taxation and corporate investment: A q-theory approach. *Brookings Papers on Economic Activity*, *12*(1), 67-140.

Terada, C. (2012). Recycling electronic wastes in Nigeria: Putting environmental and human rights at risk. *Northwest Territories Human Rights Commission*, *10*(3), 154-172.

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, *1*(1), 15-29.

Vanzetti, D., Peters, R., & Knebel, C. (2018). *Non-Tariff Measures: Lifting CFTA and ACP trade to the next level*. Paper presented at the UNCTAD Research Paper No. 14, United Nations Conference on Trade and Development, Geneva.

Von Furstenberg, G. M. (1977). Corporate investment: Does market valuation matter in the aggregate? *Brookings Papers on Economic Activity*, *8*(2), 347-397.

Weber, R., Aliyeva, G., & Vijgen, J. (2013). The need for an integrated approach to the global challenge of POPs management. *Environmental Science and Pollution Research*, *20*(4), 1901-1906.

World Bank. (2020a). *African continental free trade area: Economic and distributional effects*. Washington, DC: World Bank.

World Bank. (2020b). *Ghana country environmental analysis*. Washington D. C: The World Bank.

WTO-UNEP. (2009). *Trade and climate change. WTO-UNEP Report*. Geneva: World Trade Organization.