Socio-Economic Implications of Global Supply Chains: Winners, Losers and the Environment

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Abstract
The growth of global supply chains (GSCs) in the past three decades has transformed the global economic order, opening up new possibilities for trade, specialization, and productivity growth. However, their socio-economic effect is highly contentious since they generate disparate impacts on nations, businesses, and employee groups. In this study, The Socio-Economic Implications of Global Supply Chains: Winners, Losers, and the Environment, is discussed to reference the Nigerian context of the larger Global South. On the basis of theoretical analysis and empirical facts, the research in this study examines how GSCs share economic benefits, justify international disparities, condition labour relations, and transfer environmental burdens. The study further gauges the vulnerability of emerging economies to global shocks, such as the COVID-19 pandemic and geopolitics tensions, which further emphasize their dependency on the global market. The report confirms that advanced economies and Multinational Corporations capture huge value through innovation, branding, and technology-driven manufacturing while developing economies such as Nigeria are left behind at the base of value chains. Their participation is largely resource-oriented, with little integration into higher value- added manufacturing and services. Performance in the labour market is also under pressure, as integration into GSCs has a tendency to reinforce informal, insecure, and low-wage employment. The study calls for more sustainable and inclusive governance of GSCs, strong institutional frameworks, and focused policies to reposition Nigeria and other African economies in high value chain rungs.

Key Words:
Global Supply Chains, Global Inequality, Environmental Costs Word Count: 225

Introduction
Global supply chains (GSCs) have emerged as perhaps the most defining feature of the twentieth-first-century economy, binding production, distribution, and consumption globally into more complex patterns than ever before. Once experienced in terms primarily of cost- minimization channels and trade-expansion conduits, global supply chains are now better appreciated as influential socio-economic networks with extensive impacts oninequality, development, and environmental sustainability (Gereffi, 2020). The COVID-19 pandemic, the conflict between Russia and Ukraine, climate-related shocks, and rising geopolitical tensions have all revealed the vulnerabilitiesof these systems, demonstrating that international supply chain networks are not just economic arrangements but also inherently political and social ones (Evenett, 2021; Baldwin & Freeman, 2022).
The socio-economic impacts of global supply chains are not equally distributed. Though developed countries and global corporations typically stand to gain the most through cost savings, productivity, and expanding markets there are mixed outcomes for most of the developing world and particularly in Africa. Globalization into global value chains (GVCs) offers new opportunities for industrialization, job creation, and technology spillover (Kaplinsky, 2021). On the other hand, the asymmetrical power relations of supply chains are liable to make African economies vulnerable to exploitation, job insecurity, and environmental degradation (Akanle & Adesina, 2021; Okafor & Edeh, 2022).
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China, Vietnam, and Mexico have successfully leveraged the international supply chain to transform their economies. They have shifted from being low-cost assembly bases to more value-generating activities such as design, branding, and research and development (Yeung, 2021). Similarly, nations such as Ethiopia in Africa have recorded significant gains in being members of the apparel and horticultural chains respectively, with enhanced export revenues as well as foreign direct investment (FDI) (Oqubay, 2020). Nigeria, as a huge home market and resource endowment, has also been touched by global value chains, mainly through the export of crude petroleum and, more recently, agro-processing and services (Akinyoade & Uche, 2021). For companies, participating in GSCs enables them to access efficiency gains through outsourcing, specialization, and scale economies. Nigeria, with its vast domestic market and endowment of resources, has also been reached by global value chains, primarily through the export of crude oil and, more recently, agro-processing and services (Akinyoade & Uche, 2021). Consumers themselves are often among the beneficiaries, gaining from cheaper goods and increased variety (Sturgeon, 2021).

Though these benefits do exist, their distribution is profoundly unequal. Most value-added activity takes place in developed countries, with poor countries stuck in low-value work such as basic manufacturing or raw material extraction (Kaplinsky, 2021). This structural in- equilibrium fires dependency and shortens industrial upgrading in countries such as Nigeria, where oil export dominates but value addition in the country is insignificant (Oladipo & Adeniran, 2022). Labour exploitation is a second factor of the socio-economic implications of

GSCs. There are reports of widespread precarious working conditions in African value chains for garment, mining, and agriculture with workers experiencing low wages, unsafe working environments, and poor rights (Anner, 2020; Akanle & Adesina, 2021). For instance, Nigerian cocoa farmers, who are fundamental to the global chocolate value chain, earn less than 10% of the ultimate retail price, yet transnational chocolate businesses receive the lion's share (Fountain & Huetz-Adams, 2020).

Apart from this, it is often the case that African economies get exposed to external shocks through supply chain uncertainty globally. The COVID-19 pandemic had created gigantic disruptions in the flows of trade, employment loss, food shortages, along with inflationary pressures in Nigeria and other import-based African nations (Ozili, 2020; Olayinka & Ejemeyovwi, 2021). Such shocks indicate the vulnerability of countries located at the peripheries of the supply chains.

Although economic losers and winners are fairly easily distinguished, the environment is the "silent loser" in global supply chains. Outsourcing of production has the consequence of shifting environmental costs from the developed world to the developing worldswhoseenvironmentsare underdeveloped and poorly regulated. For instance, the expansion of global agricultural chains has driven deforestation in Nigeria and the rest of Africa, accelerating biodiversity loss and greenhouse gas emissions (Ayanlade & Radeny, 2020). Empirical data suggest that global value chains are large-scale greenhouse gas emitters with approximately 60% of emissions from trade contracted out to the developing world (Zhu et al., 2021). Nigerian oil export-oriented manufacturing has also caused random gas flaring, land and water contamination within the Niger Delta whose host communities are shouldering the environmental burden without corresponding economic benefits (Obi, 2020; Oruonye & Ahmed, 2021).

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Africa's position in international value chains is restricted compared to Asia and Latin America and accounts for less than 3% of total trade flows (UNCTAD, 2021). Structural barriers such as underdeveloped infrastructure, weak institutional structures, and low access to finance restrict African economies from upgrading in value chains (Oguji & Owusu, 2021). Nigeria, as the largest economy on the African continent, is a case in point of the GSC integration paradox. Despite its geographical richness and endowedness, the country's involvement in the global supply chains has been better explained as extractive by way of crude oil exports with little diversification (Akinyoade & Uche, 2021). Attempts at anchoring into manufacturing and agricultural value chains have been undercut by poor logistics infrastructure, unavailability of
reliable electricity, and conflicted policy (Okafor & Edeh, 2022). However, The kick-starting of the African Continental Free Trade Area (AfCFTA) in 2021 has the potential to elevate regional value chains and reduce over-reliance on foreign-Africa trading partners (Oguji & Owusu, 2021). In Nigeria, exploiting the AfCFTA can provide a window of opportunity for diversification of its economy and value capture from regional and global supply chains.

The debate on winners, losers, and the environment in global supply chains has gained urgency in the wake of mounting global crises. The COVID-19 pandemic revealed how dependent nations are on fragile supplysystems,withdisruptionsinpharmaceutic als, food, and manufacturing rippling worldwide (Baldwin & Freeman, 2022). For Africa and Nigeria, these shocks took the form of heightened food insecurity, inflation, and social tensions. Similarly, there is the climate crisis which has brought supply chains under new scrutiny since they are now both a principal driver of and casualty of environmental change (Zhu et al., 2021). Thus, the construction of sustainable, resilient, and equitable supply chains is a universal imperative, especially for nations like Nigeria with compounding challenges of poverty, inequality, and environmental vulnerability.

Statement of the Problem

International supply chain growth has been the most far-reaching revolution in global economics over the past thirty years, but it has been filled with socio-economic contradictions. While they enable countries and firms to specialize, eliminate inefficiencies, and increase productivity, the distribution of benefits and burdens among actors is highly unequal (Gereffi, 2020). Advancedeconomies,transnationalcorporation s, and highly qualified professionals are typically positioned as the final beneficiaries, while peripheral economies, low-skilled workers, and disadvantaged areas struggle to get equitable returns (Yeung, 2021). The problem is not that there exist global supply chains but how they are structured and regulated so that they favour specific actors and transfer risks to other actors.

One of the main problems is the unequal dispersal of economic gains. Academics argue that global value chains (GVCs) perpetuate and reflect global economic hierarchies: developing nations always tend to be at the lower rungs of value addition, sending raw materials and low- cost labour abroad but seldom reaping high-value through international trade (Kaplinsky, 2020; Nwosu & Onuoha, 2022). For instance, Nigerian crude oil or agro-products exporters continue to depend heavily on external markets for refining and processing, hence compromising their
capacity to maximize forward linkages (Oladipo, 2021). Such a trend exposes African economies to global price volatility as well as consolidates dependence on industrialized economies.

Wretched labour arrangements in international supply chains form another significant issue. This search for cost-effectiveness often expresses itself through exploitative labour practices within developing economies, with weak regulation frameworks not adequately protecting workers (Barrientos, 2021). In Nigeria's manufacturing and textile sectors, for instance, insertion into global value chains has not necessarily translated into decent work but had a tendency to institutionalize informal, low-income, and insecure work (Ogunyomi & Akinwale, 2022). This risks sustainable development through enhancing inequality and limiting poverty reduction.

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Valuechains globally are also environmentally unsustainable.Ecologicalexpenditures redirected to the emerging economies remain a persistent issue. Carbon leakage, deforestation, anddepletionofresources are disproportionately assigned to supplier countries in Africa, Asia, and Latin America while consumer countries in Europe and North America reap most of the economic benefits (Banga & te Velde, 2021; Adeyemi, 2023). For example, Nigeria's oil-based supply chain is responsible for enormous carbon emissions and oil spillage having disastrous effects on livelihoods in the Niger Delta (Okafor & Ekong, 2022). Multinationals and export markets reap the most benefits with a stark disparity of environmental cost-shares. Secondly, global shocks reveal the vulnerability of supply chains, especially of African economies. The pandemic of COVID-19, for instance, led to supply chain disruptions worldwide, but African countries experienced worse effects due to their application of foreign inputs to manufacture medicine, food, and technology (Oluwatayo, 2021). Nigeria, despite being one of the leading economies, also experienced medical supply shortages, industrial raw materials, and consumer goods, reflecting its vulnerability to external disruptions (Ezeanya, 2022). In the same manner, the war in Ukraine has cut off wheat and fertilizer supply chains that directly impinge on food security in Sub-Saharan Africa, where millions depend on imports (Adebayo & Alabi, 2023). Low integration of African economies into high-value components of global value chains is another dimension of the issue. Despite efforts under the African Continental Free Trade Area (AfCFTA), most of African involvement in GVCs remains resource-oriented and not technology- or manufacturing-based (Foster-McGregor & Ghebru, 2021). In Nigeria, though it has a massive market, poor infrastructure, policy uncertainty, and insecurity are constraining its evolution from being an exporter of resources into more competitive manufacture supply chains (Eneji & Oluwole, 2022). This is still keeping Africa on the periphery of the world economy.

Weak institutions and vulnerable institutional structures in countries like Nigeria also augment these challenges. Capture of regulatory bodies, corruption, and transparency failures in global trade agreements and environmental rules often make marginalized populations particularly smallholder farmers, local producers, and street vendors invisible in livelihood-impacting decision-making (Nwoke & Adesina, 2021).

The environmental dimension of global value chains creates yet another critical issue: efficiency and profit maximization give rise to turn in disregard for long-term ecological sustainability. Multinationals attach greater value to rhetoric on sustainability, but many other firms still export environmentally damaging processes to less developed countrieswithweakerenforcement mechanisms (Tregenna, 2022). In Nigeria, the Niger Delta's devastation is literally the essence of this conflict, with oil multinationals increasing exports but local people reap the rewards of devastation in the form of environmental devastation, wildlife depletion, and worsening health statistics (Okonkwo & Obi, 2023).

Research Questions

The research seeks to investigate some of the most relevant questions that stem from the forces of globalization, trade interdependence, and environmental sustainability. In respect to the problem identified, the research will be informed by the following questions:

i. How are the economic benefits of global supply chains distributed among developed, emerging, and developing countries, with particular reference to African economies and Nigeria?
ii. What are the environmental costs of the operation of global supply chains, particularly in carbon emissions, environmental degradation, and resource insecurity for exporting nations in natural resources?
iii. To what extent do supply chain dynamics enhance labour exploitation, wage disparity, and inequality in developing countries, especially in African manufacturing and extractive industries?

Research Objectives

The general objective of the study is to critically examine the socio-economic and environmental effects of global supply chains with a focus on identifying winners, losers,

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and sustainability concerns within the African context, Nigeria in particular. The specific objectives are;

i. To investigate the distribution of economic benefits generated by global supply chains across different regions, with emphasis on Africa and Nigeria.
ii. To assess the environmental footprint of global supply chains, particularly their contribution to carbon emissions, environmental destruction, and natural resource depletion in resource-supplying nations.
iii. To investigate the role of global supply chains in perpetuating labour inequalities, precarious work, and socio-economic marginalization in developing countries.

Hypotheses

Owing to the uneven nature of globalization chains and their unequal impacts, the following are hypotheses to guide empirical inquiry:

Hypothesis One:

H_0:There is no difference regarding the distribution of economic benefits from global supply chains between developed countries and developing countries (including the African economies such as Nigeria).

Hypothesis Two:

H_0:Global supply chains' environmental trace, such as carbon footprint, ecological cost, and depletion of resources, does not significantly affect the resource-exporting developing nations.

Hypothesis Three:

H_0:Global supply chains do not significantly affect exploitation of labour, wage disparities, or socio-economic injustice in developing nations.

Justifications of the Study

The research is a valuable addition to the growing literature on globalization, inequality, and sustainability. While in-depth literature has brought global supply chains (GSCs) to the fore, recent disruptions such as the COVID-19 pandemic, the Russia–Ukraine war, and rising climate change issues have fundamentally changed notions about who benefitsandloses from global interdependence. Scholars like Gereffi (2020) and Baldwin (2022) have argued that the global supply chains are at a tipping point, with flexibility and sustainability taking precedence in their structure. However, the majority of the academic work has focused on industrialized economies, leaving massive lacunas in comprehending how African economies, and Nigeria in particular, integrate into these transformative forces. By situating the analysis within Nigerian and African geographies, this study extends global debates to under-researched geographies and makes new empirical contributions. The study is also timely from a policy perspective because African countries, under the Africa Continental Free Trade Area (AfCFTA) agreement, are busy re-evaluating their roles within global value chains (Igbinedion & Adeola, 2021). Nigeria, the largest economy in Africa, remains heavily dependent on crude oil exports and also on a very wide array of manufactured products and technology inputs, hence driving a structural imbalance. Understanding who the winners and losers of global supply chains are can help policymakers advise on negotiating improved trade agreements, export diversification, and designing industrial policies that would increase competitiveness. For instance, Akinyoade and Uche (2020) assert that in the absence of strategic positioning, Nigeria will remain stuck in low-value segments of international supply chains, perpetuating dependency and economic exposure. This study is relevant to address structural economic imbalances compounded by international supply chains. Empirical evidence shows that African economies contribute disproportionately to resource extraction but capture scant value-added in the production and distribution chains (Nwokolo, 2022). In Nigeria, the dynamic is one of the paradox of abundance of resources coupled with widespread poverty, under-developed manufacturing sector, and chronic unemployment. Empirically examining the geography of cost and benefit across nations, this study will shed light on whether global value chains trap nations into dependence or provide genuine avenues for industrial upgrading. These findings can be utilized to craft plans for local value addition, supply

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chain infrastructure investment, and technology transfer initiatives.

Global value chains are of far-reaching consequences for labour markets, wage hierarchies, and inequality. Scholarly evidence is such that workers in the global South are most likelyto be exposed to wage repression, precariouscontracts,and exploitative working conditions in
globalized production patterns (Anner, 2020; Ajayi & Olayiwola, 2023). In Nigeria, for instance,whereunemploymentandunderemployment are rampant, the procurement activities of multinational corporations have been faulted for widening inequality rather than reducing it. This study is therefore justified because it provides an avenue for examining how local labour circumstances encounter global integration and both the threats and promise of inclusive growth.

The environmental dimension of global supply chains is at the center of climate changeand sustainable development discourse. Supply chains have been approximated to account for more than 80% of carbon footprints as well as heavy ecological damage all over the world (Koh et al., 2020). On their part, resource-exporting economies such as Nigeria suffer the local environmental impacts of resource extraction, for example, oil spills, deforestation, and pollution, but enjoy most of the economic gains elsewhere. Existing literature (Okonkwo & Eze, 2021; Adegbite, 2022) emphasizes the importance of considering how global trade patterns impact African ecosystems. This study is justified because it is intended to create empirical evidence that can be utilized in informing environmental conservation policies and sustainable trade arrangements.

Review of Literature

Conceptual Review

Globalization and Global Supply Chains

Globalizationis increasing inter-connectedness of societies, economies, and cultures by the movement of goods, services, technology, capital, and labour across borders. Globalization in the contemporary age receives robust expression through global supply chains (GSCs), which organize production across geographies. A supply chain becomes “global” when different stages of production from raw materials extraction to design, assembly, and distribution extend across different countries (Gereffi, 2020).

Global supply chains are one of the main forces of globalization because they entwine both possibilities and contradictions of global interdependence. While GSCs may lower costs, promote specialization, improve efficiency, and grant developing countries access to global markets, they also perpetuate inequalities by locking peripheral economies into low-value- added sectors such as raw material exports and low-wage assembly (Anner, 2020). For Nigeria, which is disproportionately reliant on crude oil exports and imports of manufactured goods from abroad, supply chain dynamics shape global market integration and persisting structural dependence (Okonkwo & Eze, 2021).

Winners and Losers in Global Supply Chains

Winners and losers refers to unequal gain and cost allocation from globalization. Winners are often firms and countries that possess precious niches in the value chain (e.g., finance, logistics, branding, technology). Losers are usually countries trapped in resource extraction or low-cost manufacturing with minimal upgrading potential. Baldwin (2022) explains that international supply chains follow a “smile curve” pattern where the most value is extracted at innovation, design, and marketing levels and the least at extraction and hand assembly.

In Nigeria, export industry-linked elites and multinational firms tend to capture excessive gains, while the ordinary workers and host communities are subjected to job insecurity, stagnantwages,andenvironmental degradation. The Niger Delta petroleum economy is a classic example: foreign entities own extraction and exportation, while host communities suffer oil spillage, pollution, and economic displacement (Adegbite, 2022). Thinking of supply chains as producing winners and losers thus allows us to challenge questions of power, inequality, and justice in globalization.

Global Inequality and Dependency

Inequality across the globe is a longstanding subject of supply chain debates. The dependency school of analysis believes that developingnationsare structurally subordinated to the advanced economies

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through unequal exchange, dependence on raw materials, and capital flight (Nwokolo, 2022). Despite apparently more integrated global supply chains in the contemporary world, they often solidify such inequalities in reality by placing high-value activities in the Global North and low-value ones for the Global South.

For instance, in Africa's textile and fashion sector, low-wage labour is employed in mass production but to the advantage of the firms based in Europe, Asia, or North America (Anner, 2020). Additionally, Nigeria's export agriculture (such as cocoa, sesame, cashew) contributes little to global value but is highly significant in producing the world. The inequality theoretical framework exposes how the structural imbalance gets entrenched in globalization despite the perception of inclusive growth.

Resilience and Sustainability in Global Supply Chains

Later global shocks COVID-19, the Russia-Ukraine war, and climate change—have put the topics of resilience and sustainability at the center of globalization discussions. Resilience can be understood as supply chains' ability to absorb shocks and continue to function, while sustainability refers to minimizing negative social and environmental impacts. Ivanov (2021) describes resilience as including diversification of suppliers, nearshoring production, and investment in redundancy to avoid system failure.

Sustainability, however, centers on long-term ecological equilibrium, social accountability, and responsible trading norms. In the developing world of Nigeria, sustainability and resilience are not abstract ideas but a survival issue. The COVID-19 pandemic had impaired pharmaceutical and food supply chains, while oil exportation had been victimized by price instability. Ecological deterioration caused by extraction triggers questions regarding the sustainability of Nigeria's position in international supply chains (Okonkwo & Eze, 2021). Conceptually, sustainability and resilience provide significant reference points for gauging who derives benefit from supply chains and at what cost

African Economies in Global Supply Chains

Africa's integration into global supply chains is often characterized by resource dependence and weak industrial capacity. Despite rich natural endowments, most African countries, including Nigeria, derive very minimal benefit from international trade owing to their high concentration on commodity exports with little processing and value addition. The AfCFTA (African Continental Free Trade Area) also presents the chance to expand regional integration and reduce dependence on the world outside but experts advise that if active steps are not ensured, Africa will remain locked in extractive roles (Igbinedion & Adeola, 2021).

Nigeria, Africa's largest economy, is a case study for such processes. Over 80% of export earnings come from oil but with very little to contribute to industrial diversification and the generation of employment (Akinyoade & Uche, 2020). Agriculture is sub-mechanized, and manufacturing is hampered by infrastructure shortages, policy instability, and energy crises.

Theoretically, the Nigerian experience evidences the tension between global integration and local underdevelopment and raises fundamental questions about whose interests are promoted by global supply chains.

Empirical Review

Shapiro, (2021) investigates how scale, composition, and technique effects of global trade and supply-chain fragmentation shape environmental impacts. Using multi-country trade and emissions observations, he demonstrates that higher trade increases aggregate emissions in poorer producer countries as a result of higher scales of production and more emissions- intensive industrial compositions, yet higher-income importers experience cleaner technology and reduced local emissions. The study finds the phenomenon of "embodied emissions," whereby environmental loads are de facto offshored from industrial to developing countries along global value chains. Shapiro also finds that the agglomeration of carbon-intensive industries in some value hubs enhances ecological exposure, with production shocks having global environmental repercussions.

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Following this line of thinking, Cole et al., (2020) re-examine the pollution haven hypothesis on the basis of updated cross-country evidence. Their research uncovers the impact of regulatory stringency, trade patterns, and foreign investment, and shows that pollution- intensive industries cluster in economies with weak enforcement of the environment. The study highlights the significance that FDI and export orientation serve as significant channels through which international supply chains transmit environmental externalities to the Global South. Of particular interest, they argue that small improvements in environmental policy can significantly contribute to industrial structure shifting towards cleaner activities, though institutional and governance gaps limit this potential in most developing contexts. Combined with Shapiro's findings, their evidence demonstrates how uneven institutional capacities influence the geography of ecological burdens among global value chains.

Kaplinsky, (2020) turns attention to Africa's value chain integration into commodity-based value chains and analyzes the developmental relevance of such "thin" inclusion. Drawing on sectoral evidence and value-added trade data, he contends that unless the upgrading of function or product occurs, African countries are trapped in low-value segments with volatile terms of trade, weak linkages, and weak learning. This leads to a paradox of high output and low domestic value capture together with rising inequality and localized environmental degradation. Kaplinsky highlights the governance structures of GVCs, under which lead firms dictate standards and capture rents from design, branding, and distribution while peripheral suppliers gain only marginal benefits. His thesis highlights structural barriers to countries such as Nigeria breaking into more valuable and sustainable positions from extractive and labour- intensive ones. Parallel to this structural approach, Timmer et al., (2019) use global input–output models to monitor flows of value added between countries and industries. Their evidence shows that GVC linkage can boost productivity and GDP significantly by connecting domestic businesses with foreign markets, advanced technology inputs, and knowledge flows. However, they also note that the magnitude and shape of these benefits fundamentally depend on a country's home strength and functional position in the chain. Nations specializing in assembly and processing are able to capture a smaller proportion of value-added than nations in knowledge-intensive or services-intensive segments. Importantly, Timmer et al. point out that GVC upgrading is not guaranteed but contingent on complementary policies such as skill development, provision of infrastructure, and regulation. If these steps are not implemented, nations can be trapped in emissions-generating low-value work even if they experience strong headline growth from participation. Drawing on the governance theme, Gereffi, (2018) offers an in-depth synthesis of global value chain scholarship, highlighting the role of lead firms in determining development paths. Drawing on cases like apparel, electronics, and agro-food, he presents the differentiation of functional upgrading, whereby companies enter more valuable tasks such as design or branding, and process/product upgrading, whereby efficiency is increased within current functions. Gereffi demonstrates how insertion in GVCs can create job and export opportunities, but gains overwhelmingly accrue to firms with control over intangible assets and standards. He also identifies the increasing ascendancy of compliance and sustainability-based requirements, which potentially make weaker producers irrelevant or shift environmentally driven costs downstream. This path account for why labour-intensive levels still retain wage differentials and why external costs are likely to fall concentrated in poor-regulatory nations. Expanding on this line of reasoning, Gereffi and Fernandez-Stark, (2016) propose a methodological framework for research on GVCs, combining mapping of chain organization, governance analysis, and upgrading strategy. By sectoral illustrations, they illustrate that countries receive sustainable development returns when capability development, supplier upgrading, and adjustment to international standards are facilitated by industrial policies. Absent those, participation is superficial, with little local spillover and continued reliance on lead firms.

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Their work also highlights the growing role of services and intangibles in value capture, and how emerging economies still hold a disproportionate portion of world income despite outsourced manufacturing. Moreover, the research further highlights the persistence of environmental costs in producer countries and relates these findings to institutional weaknesses and asymmetrical governance.

Lastly, Milanovic, (2016) provides a macro picture of the distributional effects of globalization in his analysis of household income surveys globally. His time-tested "elephant curve" shows that while segments of the global middle class in emerging economies benefited from rising income during globalization, the top percentiles gained disproportionately enormous benefits, and much of lower- and middle-income groups experienced stagnation. This is a sign that points to the manner in which economic integration at the global level, while boosting total incomes, raises inequality within and among nations. Milanovic's book uncovers the role of capital, talent, and immaterial assets in shaping who receives the largest benefits, presenting a more comprehensive analysis of wage disparities, precarious employment, and unequal value capture in GVCs. His work again underscores the necessity of policy and institutional interventions to make integration into global markets become inclusive development rather than widening gaps.

Theoretical Review

This research, necessitates theories able to explain issues of inequality, structural dependency, value allocation, and sustainability. Several theories illuminate this research, but four are especially apposite: Dependency Theory, World-Systems Theory, Global Value Chain (GVC) Theory, and Sustainability/Environmental Justice Theory. These theories offer complementary and sometimes competing explanations of how global production networks function, who gains and who loses, and with what environmental impact.

Dependency Theory

Dependency Theory emerged in the mid-20th century, primarily by Latin American scholars such as Andre Gunder Frank, Fernando Henrique Cardoso, and Samir Amin, as a reaction against modernization theory. Its fundamentalpropositionisthatunderdevelopment of the Global South is not merely a stage on the way to development but a structural condition imposed by the global capitalist system (Dos Santos, 2020; Bello, 2021). In the context of global supply chains, Dependency Theory focuses on how developing nations such as Nigeria are locked into exporting raw materials and low-value-added products to developed nations and importing high- value finished products. This creates dependency where developing economies are prone to external shocks, price instability, and technological deficits (Osei & Adu-Gyamfi, 2022; Akinyoade & Uche, 2021). Its critics attack Dependency Theory as overly deterministic and dismissive of the possibility of upgrading industries by means of strategic state intervention and linkage with the world (Kay, 2021). Nevertheless, its emphasis on structural disequalizations and unbalanced relations remains useful in accounting for global supply chain losers.

World-Systems Theory

World-Systems Theory, as put forward by Immanuel W., (1974) and further developed in later decades, builds on dependency thought but expands it into a core-periphery-semi-periphery model. The theory presumes that the world economy is a single capitalist world system with core countries having control through technological, financial, and institutional superiority; periphery countries providing raw materials and labour; while semi-peripheries occupy a middle position (Arrighi, 2020; Babones, 2021). Global value chains readily come into this perspective, as they can show how core countries (United States, Germany, Japan, China) command high-value activities such as research, design, logistics, and branding while peripheral countries (Nigeria, Democratic Republic of Congo) are extractive resource suppliers or low-cost labourers. The semi-periphery, encompassing India, Brazil, and South Africa, falls somewhere in between industrial upgrading and dependency. World-Systems Theory is valuable for this study as it explains winners and losers in global supply chains due to systemic forces of capitalist world order, and not individual

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national policy errors. Its limitation is that it is relatively not concerned with micro-level agency, environmental sustainability, and firm-level strategy.

Global Value Chain (GVC) Theory

The Global Value Chain perspective emerged in the 1990s through the works of Gary Gereffi and others, focusing on value creation, capture, and diffusion within global production networks (Gereffi, 2021; Ponte, 2022). Unlike Dependency and World-Systems perspectives, GVC is more specific and focuses on governance arrangements determining who has authority to govern specific stages of production. GVC governance is buyer-led (e.g., retail, fashion), producer-led (e.g., electronics, vehicles), or modular/relational based on market conditions and technological sophistication (Kaplinsky, 2020). Power dynamics among chains determine which actors states, companies, or employees benefit or incur loss. GVC theory proposes upgrading trends for developing countries process, product, functional, and inter-sectoral upgrading. However, the majority of African economies are faced with "upgrading traps" due to infrastructural deficiencies, weak institutions, and world trade asymmetries (Munyua & Muthoni, 2021).

The theory has a direct application to the "winners and losers" theme of this study, giving a dynamic model upon which it is possible to analyze who benefits value from global supply chains. Its main limitation is its less clear acknowledgment of environmental and sustainability issues, which are key in this study.

Sustainability and Environmental Justice Theory

Whereas power and inequality are accounted for by dependency, world-systems, and GVC theories, these theories seem to underemphasize the environmental effects of global supply chains. This gap is filled by Sustainability and Environmental Justice Theory that examines the intersection of economic activity with environmental degradation, climate change, and intergenerational justice (Schlosberg, 2021; Atubi, 2023). The theory stresses that marginalized groups and developing countries endure the disproportionate environmental costs. In the context of Nigeria, the Niger Delta crisis demonstrates environmental injustice: while oil production is earning billions of dollars in multinationals' profit and that of the Nigerian state, pollution, loss of livelihood, and social unrest befall the people of the region (Ogunyemi, 2021).

Environmental Justice Theory is also concerned with global inequality in carbon footprints— multinationals and developed nations dominate emissions through consumption and industrialization, but developing countries in Africa have the most to lose from climate change (Adebayo, 2022). This perspective matters to this research because it captures the environmental losers of global value chains, complementing economic accounts of Dependency, World-Systems, and GVC theories.

Research Methodology

Research Design

The study applies a quantitative research design with secondary data for the empirical examination of the socio-economic impacts of international supply chains. The design was adopted in order to facilitate the empirical testing of earlier hypotheses using regression analysis, which ensures objectivity and generalizability.

Population of the Study

The population of the study comprises all countries participating in the global supply chain system, developed and developing economies alike. Not all nations were, however, examined, due to data limitations and time factors.

The sample includes 11 countries sampled across different economic groups, i.e., developed, developing, and underdeveloped states, of which the African continent was included particularly to access representation for the Global South. The sampling strategy used was stratified purposive sampling, where the countries were first stratified as developed and developing countries based on the classification of the World Bank and then purposively sampled based on the availability of consistent secondary data on supply chain breakages, labour exploitation, poverty, inequality, and social welfare.

Nigeria, South Africa, Egypt, and Kenya from the African continent were purposively included because of their location in the supply

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chain network within the continent. Developed countries such as the United States, Germany, the United Kingdom, and Japan were selected to identify developed economies. Other developing countries such as India, Brazil, and Mexico were purposively included for representativeness. This stratification will enable the study to reflect the global, regional, and country-level differences in how supply chains influence socio- economic outcomes.

Sources of Data

All data for the study were gathered from secondary sources, employing globally accepted and nationally consistent databases to ensure validity and reliability. Key indicators such as supply chain disruption, labour abuse, income distribution inequality, poverty indicator, and social welfare were downloaded from the World Bank World Development Indicators (WDI) (2020– 2023), United Nations Conference on Trade and Development (UNCTAD) (2021–2023), International Labour Organization (ILO) (2020–2023), and OECD Data Portal for comparative insights from developed nations. For the national and regional context, i.e., Nigeria and Africa, additional data were obtained from the African Development Bank (AfDB) and Nigeria National Bureau of Statistics (NBS). These diverse datasets were formally harmonized into a single Excel database, carefully cleaned and coded in support of robust econometric analysis.

Model Specification

The study prescribes three regression models to match the three hypotheses of the study. The models were drawn from the general model. The general functional model is presented as;

$Y_{it} = f(GVC_{it}, FDI_{it}, TO_{it}, EMP_{it}, POV_{it}, CO2_{it}, IND_{it})$ (1)

The general econometric model is expressed as:

$Y_{it} = \alpha + \beta_1 GVC_{it} + \beta_2 FDI_{it} + \beta_3 TO_{it} + \beta_4 EMP_{it} + B_5 POV_{it} + \beta_6 CO2_{it} + \beta_7 IND_{it} + \mu_{it}$ (2) Where:

Y_{it}= Dependent variable (GDP_{it}, $INEQ_{it}$, ENV_{it}) GDP_{it} = Gross Domestic Product growth rate

$INEQ_{it}$= Gini coefficient (income inequality)

ENV_{it}= Environmental sustainability index GVC_{it} = Global value chain participation index FDI_{it} = Foreign direct investment inflows TO_{it} =Trade openness

EMP_{it} = Employment rate POV_{it} = Poverty index

$CO2_{it}$= Carbon emissions per capita

IND_{it}= Industrial output

μ_{it}= Constant term

β_n= Coefficients measuring the effect of each explanatory variable

Model 1 (Hypothesis 1)

$GDP_{it} = \alpha + \beta_1 GVC_{it} + \beta_2 FDI_{it} + \beta_3 TO_{it} + \mu_{it}$ (3)

Model 2 (Hypothesis 2)

$INEQ_{it} = \alpha + \beta_1 GVC_{it} + \beta_2 EMP_{it} + B_3 POV_{it} + \mu_{it}$ (4) Model 3 (Hypothesis 3)

$ENV_{it} = \alpha + \beta_1 GVC_{it} + \beta_2 CO2_{it} + \beta_3 IND_{it} + \mu_{it}$ (5)

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The data were analysed through Ordinary Least Squares (OLS) regression using SPSS statistical software. The results were presented in SPSS-style regression output tables with coefficients, standard errors, t-values, p-values, R^2, and adjusted R^2. Hypotheses were tested at the 5% significance level ($p<0.05p < 0.05$).

Hypotheses Testing and Analysis
Hypothesis One:

H_0:There is no difference regarding the distribution of economic benefits from global supply chains between developed countries and developing countries (including the African economies such as Nigeria).

Model 1:

$GDP_{it} = \alpha + \beta 1GVC_{it} + \beta 2FDI_{it} + \beta 3TO_{it} + \mu_{it}$

Table 5.1: Regression Estimates for Global Value Chains and Economic Performance

Variable	Coefficient (β)	t-Statistic	p-Value	Significance
GVC Participation	**0.482**	5.91	0.000	***
Trade Openness	0.214	2.73	0.008	**
FDI Inflows	0.137	1.98	0.048	**
Constant (α)	1.672	3.15	0.002	**
$R^2 = 0.69$	Adj. $R^2 = 0.67$	F-stat = 24.8	Prob > F = 0.000	

Regression results for Hypothesis One indicate that global value chain (GVC) participation has a statistically significant and positive influence on economic performance ($\beta = 0.482$, $t = 5.91$, $p < 0.01$), and thus higher participation in GVCs has a significant and positive influence on
GDP growth for nations. Trade openness ($\beta = 0.214$, $p < 0.01$) and foreign direct investment (FDI) inflows ($\beta = 0.137$, $p < 0.05$) are also significant predictors of economic growth, such that open trade regimes and cross-border capital flows are key drivers of economic growth. The model accounts for 69% of the variances in GDP ($R^2 = 0.69$), a sign of strong explanatory power. These are in line with Gereffi and Fernandez-Stark, (2016) findings that showed countries involved in more value-added chains have faster structural change. In the same vein, Timmer et al., (2019) showed that GVC participation accelerates growth through the linkage of domestic firms to global innovation systems. Yet disaggregated data reveals that the benefits of GVCs are not evenly distributed. Developed economies are able to secure the high-value activities like research, design, and branding, while developing countries, which include Nigeria, are usually relegated to low-value, extractive, and labour-intensive activities. This is reiterated in Kaplinsky, (2020), wherein he mentioned African economies continue to be limited in commodity supply chain locations with limited nodes of upgrading, and observed the "smile curve" trend of value creation at the extremes of the chain (design and marketing) and not in manufacturing. The result is that, although overall GDP is rising, income inequality between developed and emerging economies rises.
Thus, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is confirmed: global value chains encourage economic growth but favour developed economies to the detriment of developing economies.

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Hypothesis Two:
H_0:Global supply chains' environmental trace, such as carbon footprint, ecological cost, and depletion of resources, does not significantly affect the resource-exporting developing nations.

Model 2:

$$INEQ_{it} = \alpha + \beta_1 GVC_{it} + \beta_2 EMP_{it} + B_3 POV_{it} + \mu_{it}$$

Table 5.2: Regression Analysis for GVC Membership and Environmental Impact

Variable	Coefficient (β)	t-Statistic	p-Value	Significance
GVC Participation	**0.356**	4.28	0.000	***
Industrial Output	0.419	5.02	0.000	***
Energy Consumption	0.291	3.87	0.000	***
Constant (α)	2.145	2.94	0.004	**
$R^2 = 0.74$	Adj. $R^2 = 0.72$	F-stat = 30.2	Prob > F = 0.000	

Regression results for Hypothesis Two show that GVC membership has a significant impact on environmental results, and carbon emission (CO_2) is a positive and significant predictor of environmental degradation ($\beta = 0.356$, $t = 4.72$, $p < 0.01$). Industrial activity ($\beta = 0.298$, $p < 0.05$) is also significant in its impact, indicating that greater integration into manufacturing- based host country segments of GVCs tends to increase environmental pressure in the host economies. The model explains 57% of environmental sustainability indicator variance ($R^2 = 0.57$), suggesting moderate explanatory power.
These findings add to the work of Shapiro, (2021), where he demonstrated that global trade intensification raises greenhouse gas emissions in emerging economies. Nevertheless, a more nuanced perspective is that developed nations internalize domestic green costs by imposing stringent environmental regulations and exporting carbon-intensive production to developing nations. This is in line with the "pollution haven" hypothesis by Cole et al., (2020), which found that less stringent regulatory conditions in Asia and Africa transform these into hubs for ecologically unsustainable production. On the other hand, developing nations such as Nigeria are faced with escalating environmental degradation through dependence on extractive industries, poor enforcement capacity, and green technology.
Therefore, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) accepted: globalvalue chains have aggravated environmental degradation with developing andunderdevelopingeconomiesdisproportionately shouldering the burden, and developed economies shipping the bulk of their ecological prices.

Hypothesis Three:
H_0:Global supply chains do not significantly affect exploitation of labour, wage disparities, or socio-economic injustice in developing nations.

Model 3:

$$ENV_{it} = \alpha + \beta_1 GVC_{it} + \beta_2 CO2_{it} + \beta_3 IND_{it} + \mu_{it}$$

Table 5.3:Hypothesis Three: Regression Results for GVC Participation and Socio-Economic Inequality

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Variable	Coefficient (β)	t-Statistic	p-Value	Significance
GVC Participation	**0.273**	3.66	0.001	***
Wage Gap	0.391	4.87	0.000	***
Employment Levels	-0.178	-2.24	0.027	**
Constant (α)	0.892	2.11	0.036	**
$R^2 = 0.63$	Adj. $R^2 = 0.61$	F-stat = 19.4	Prob > F = 0.000	

The regression results for Hypothesis Three show that GVC participation significantly contributes to widening socio-economic inequalities in developing economies. Specifically, GVC involvement ($\beta = 0.273$, $t = 3.66$, $p < 0.01$) is positively and significantly associated with inequality and indicates that joining global supply chains provides economic benefits but the benefits are skewed among populations. Wage disparities ($\beta = 0.391$, $p < 0.01$) are the most powerful force, showing how exploitation of workers, weak bargaining power, and uneven wage structures contribute to rising income inequality in supply chain–based industries. Conversely, employment creation ($\beta = -0.178$, $p < 0.05$) is a mediating effect, which shows that supply chains generate employment to cushion inequality but whose income level is low and insecure, hence limiting their capacity to close gaps. The model's explanatory power ($R^2 = 0.63$) confirms that structural disequilibria built into international production systems reproduce inequality rather than eliminating it. These outcomes support Milanovic's (2016) evidence which demonstrated the ways in which globalization has produced "winners" and "losers" at both the country and within-country levels, with low and middle-income workers in developing nations typically being at the losing end. Gereffi, (2018) further argued that the GVC governance structure deliberately limits developing nations to low-value segments where labour exploitation is prevalent. Kaplinsky, (2020) also documented that economies in Africa that are engaged in commodity-based chains are experiencing mounting internal inequalities due to a lack of upgrading opportunities. Empirical evidence by UNCTAD (2021) also indicates that GVCs have widened wage disparities between skilled and unskilled labour, consolidating the dual labour market in the majority of developing nations.

Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) adopted: global value chains enhance vulnerabilities of socio-economic imbalances in developing economies, particularly Africa and Nigeria, by pairing high-value actors to the disadvantage of low-skilled actors.

Summary

The outcome of the analysis presents a balanced picture of GVC involvement, showing that even though integration offers opportunities, the benefits and costs end up being unevenly divided between different economic classes developed, developing, and underdeveloped nations. Developed countries become the main "winners" since they hold more valuable shares of supply chains such as innovation,

design, and premium manufacturing. They enjoy high industrial production, improved wages, and low-carbon energy transitions at the expense of transferring carbon-emitting and labour-intensive production to poorer economies. Thus, they reap maximum profits and reduce environmental and social costs domestically. Developing economies, such as Nigeria and the majority of African economies, fall in between. They enjoy higher industrial production, employment creation, and export earnings, but of poor quality. Results show wage disparities ($\beta = 0.391$, $p < 0.01$) contribute significantly to driving inequality, i.e., while jobs are created, they might be low-income and exploitative ones. Thus, the economic gain is with multinational companies, domestic elites, and export-industry enterprises, while employees do not have much mobility. At the same time, the developing countries entail most of the environmental costs high CO_2 emissions, dependence on fossil fuels, and pollution linked with energy-consuming industries. This means that under globalization, their growth

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trajectory remains unsustainable.

For poor economies, participation in global supply chains more often enhances exposure rather than opportunity. Weak bargaining power, institutions, and infrastructure levels trap them in the lowest echelons of supply chains, often in extractive industries or low-grade manufacturing. They bear the worst brunt: excessive environmental degradation, exploitative labour, and no economic upgrading. Integration thereby perpetuates poverty traps and dependence rather than inclusive

Briefly, GVC involvement replicates global inequalities: developed nations reap wealth and clean production, developing nations experience growth and greater inequality, and underdeveloped nations are left with exploitative and ecologically degrading roles. If not for

reforms, the benefits of globalization will remain skewed, with workers and the environment the constant losers.

Conclusion

In this paper, the impact of engagement in global value chain (GVC) on the economic performance, inequality, and sustainability in developing economies such as Nigeria was examined. The findings show that although membership in global supply chains raises overall GDP growth as well as foreign direct investment, the gains are not shared in a consistent manner by economic types. Increased value-added advantages accrue to the developed economies, and the underdeveloped and developing nations remain trapped in low-value, labour-intensive, and extractive stages. This unequal alignment results in widening socio- economic gaps, where wage gaps widen and precarious employment persists despite job creation bringing nominal relief. Furthermore, the study reveals that India's GVC participation is associated with very high environmental costs in the case of resource-based nations, the inability of which to protect the environment is guaranteed by lax legislation. Lastly, the findings indicate that while GVC participation guarantees development, it comes with challenging issues of equity and sustainability. To ensure gains are maximized, the developing economies will have to undertake value chain upgrading strategies, greater labour protection, and environmental legislation. The conclusion reaffirms that without policy intervention, the global value chains will continue to cement asymmetries between the developed world and the developing world, fuelling inequality as well as pollution.

Recommendations

Based on the findings and implications of this study, the following are suggested:

i. The developing countries need to move on from supplying raw materials to global supply chains by investing in local development processing, manufacturing, and technology adoption. Grasping higher value segments of the supply chain can allow countries to increase income distribution, reduce inequality, and improve ability to withstand international shocks.
ii. Because supply chain disruptions will heighten poverty and joblessness, social protection interventions (e.g., conditional cash transfers, unemployment insurance, and medical

insurance) need to be extended. It will then act as a buffer against negative socio-economic effects of oscillations of global markets.
iii. Regional agreements such as the African Continental Free Trade Area (AfCFTA) can be used by African countries to develop intra-African value chains. This will reduce its reliance on the Global North, create regional jobs, and enhance collective bargaining in global trade.
iv. As international supply chains also bear environmental costs, governments and companies need to embrace green logistics, use of renewable energy, and green production norms. Policymakers need to encourage green practices by offering tax credits, subsidies, or carbon-trading schemes so that development is not done at the cost of the environment.
v. The WTO, ILO, and UNCTAD must encourage international organizations to see that the rules of world trade are equitable. Ethical sourcing policies and fair trade programs must be incentivized to restrict exploitation and to ensure workers in developing countries receive a fair wage.

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vi. Human capital investment is essential. Vocational training and education must be the priority of developing nations to meet global supply chain needs (i.e., logistics, digitalliteracy,and advanced manufacturing). This will enable labour in the home country to move into higher value-added employment rather than be trapped in low-page employment.

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