economies

*Article*

# Pathways to Progress: Unveiling Structural Change in Africa Through Economic Transformation, Technology, Talent, and Tourism

**Hugo Pinto [1,2,3,*], Evans Odoi [1], Carla Nogueira [1,2] and Luiz Fernando Câmara Viana [4]**

[1] Faculty of Economics, University of Algarve, 8005-139 Faro, Portugal; a78584@ualg.pt (E.O.); cfnogueira@ualg.pt (C.N.)
[2] CinTurs—Research Centre for Tourism, Sustainability and Well-Being, University of Algarve, 8005-139 Faro, Portugal
[3] CES—Centre for Social Studies, Colégio de S. Jerónimo, 3000-995 Coimbra, Portugal
[4] Federal Institute of Brasília, Brasília 70830-450, DF, Brazil; luiz.viana@ifb.edu.br
* Correspondence: hpinto@ualg.pt

**Abstract:** African economies are undergoing significant structural transformation, transitioning from agriculture to manufacturing, services, and technology-driven industries. Driven by urbanization, technological innovation, and global trade, this shift offers opportunities for sustainable growth but faces challenges such as infrastructure gaps and institutional hurdles. This paper examines the dynamics of structural change in 54 African countries, focusing on the roles of technology, talent, and tourism. Using World Bank data, factor and cluster analyses reveal five latent components: structural conditions, public sector capacities, dynamic conditions, urbanization, and growth. The analysis categorizes countries into six clusters, from Developing Economies to African Powerhouses. The findings emphasize the critical role of technology in boosting productivity, the importance of talent development through education and workforce integration, and the potential of sustainable tourism to drive transformation. This research provides a comprehensive framework for understanding Africa's structural transformation, offering actionable insights to address disparities and promote equitable development across the continent.

**Keywords:** Africa; structural change; economic transformation; technology; talent development; tourism

check for updates

Academic Editor: Bedassa Tadesse

Received: 23 November 2024
Revised: 8 January 2025
Accepted: 9 January 2025
Published: 15 January 2025

**Citation:** Pinto, H., Odoi, E., Nogueira, C., & Viana, L. F. C. (2025). Pathways to Progress: Unveiling Structural Change in Africa Through Economic Transformation, Technology, Talent, and Tourism. *Economies*, *13*(1), 21. https://doi.org/10.3390/economies13010021

**Copyright:** © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

## 1. Introduction

Structural change is a central theme for economic development, crucial for fostering a sustainable transition and addressing global inequalities (Rodrik, 2013). Over the last two decades, globalization has accelerated structural transformation, offering unprecedented opportunities for economic expansion while introducing challenges such as social tensions, environmental concerns, and resource misallocation (Karimu, 2019). Structural change, defined as the reallocation of resources across sectors, enhances productivity, generates employment, and drives sustainable development (Islam & Iversen, 2018). This process is particularly significant for Africa, where the transition from agrarian economies to manufacturing, services, and technology-driven sectors has gained momentum (Grabowski & Self, 2024; Nguimkeu & Zeufack, 2024).

The literature highlights the multifaceted nature of structural transformation (Sen, 2023). Key drivers include urbanization, technological innovation, and global trade (Ketels, 2017). However, scholars debate its implications, especially concerning inequality and institutional

barriers (McMillan et al., 2016; Gabardo & Pereima, 2017). Africa's unique economic and cultural context adds complexity, as its structural change is shaped by diverse conditions, from demographic shifts to technological adoption and resource management (Nayyar, 2019; World Bank, 2019). Structural change was growth-enhancing in Africa after 2000, as labor productivity increased in several countries, including Nigeria, Zambia, and Ghana, but African countries may be bypassing the industrialization stage that was so important to other countries such as Brazil or Vietnam that underwent rapid growth (McMillan et al., 2016). The African experience is particularly noteworthy, as growth-enhancing structural change often came at the cost of declining labor productivity growth in the more modern sectors of the economy. This apparent anomaly can be explained by the demand-driven nature of structural change in Africa, which was fueled by factors such as external financial transfers or increases in agricultural incomes (Diao et al., 2019).

This article explores the dynamics of structural change in Africa through four key dimensions: technology, talent, tourism, and economic transformation. It identifies patterns of economic development and categorizes 54 African countries into clusters based on their sources of structural transformation. The study employs secondary data from the World Bank, using factor analysis to uncover latent dimensions of structural change and cluster analysis to group countries into typologies reflecting their developmental stages and challenges. This methodological approach provides a comprehensive framework for understanding the interplay between critical sectors and offers actionable insights for policy development.

The article is structured as follows: the next section reviews the relevant literature, highlighting key concepts and debates around structural change. The Methodology section details the data sources, variables, and analytical techniques. This is followed by the Results and Discussion sections, which present the findings and their implications. Finally, the Conclusion summarizes key insights, policy recommendations, and directions for future research.

## 2. Foundations of Structural Transformation

### *2.1. The Role of Structural Change in Economic Development*

Structural change is a defining process in economic development, enabling economies to transition from low-productivity sectors, such as agriculture, to higher-productivity sectors including knowledge intensive business services or technology-driven industries (Lopes & Kararach, 2019). It is a hallmark of modern economic growth and an indicator of an economy's ability to adapt to changing global demands and conditions (Kuznets, 1959). Central to this process is the reallocation of labor, capital, and resources, which contributes to enhanced productivity, diversified economic bases, and long-term resilience (Matthess & Kunkel, 2020).

Africa's economic landscape highlights the importance of structural transformation. For decades, many African economies have depended heavily on agriculture, a sector marked by low productivity and vulnerability to climate shocks. While the sector still employs a significant portion of the labor force, its contribution to gross domestic product (GDP) has declined, underscoring the need for diversification (Islam & Iversen, 2018). Urbanization and globalization have further emphasized the urgency of transformation, as demographic pressures and international competition demand innovative and inclusive growth strategies.

Theoretical models, such as the classical dual-sector model (Lewis, 1954), have provided valuable insights into the process of structural change. The model depicts the migration of surplus labor from traditional agricultural sectors to modern industrial ones, with capital accumulation in urban areas driving growth (Leeson, 1979). However, Africa's context complicates this narrative. Unlike industrializing economies of the 20th century,

African countries often contend with underdeveloped infrastructure, informal economies, and limited access to global markets, inhibiting seamless labor mobility and capital formation (Minami & Ma, 2014).

Africa also faces unique structural challenges, such as the coexistence of traditional and modern economies. Informal employment, which dominates urban areas, limits the impact of structural change on income stability and formal job creation. Additionally, industrialization has been slow, with underinvestment in manufacturing and other high-productivity sectors hindering economic diversification (Gollin, 2014). To address these gaps, policies that support small- and medium-sized enterprises, incentivize formalization, and strengthen infrastructure may play a crucial role in facilitating structural transformation.

Commodity dependence compounds these challenges, as many African economies rely on exporting raw materials subject to volatile global prices. This dependence leaves them vulnerable to external shocks and restricts investments in higher-value sectors. Diversification strategies—promoting value-added production, leveraging regional trade agreements like the African Continental Free Trade Area (AfCFTA), and integrating technology into traditional industries—are essential to reducing this dependence and enhancing economic resilience (McMillan et al., 2016).

Another challenge is the abundance of natural resources, which can lead to the resource curse phenomenon, weakening institutions and hindering the industrialization of some African economies (see Grabowski & Self, 2024; Malah Kuete & Asongu, 2023). This phenomenon often diverts capital away from manufacturing and creates adverse political effects, such as using income from natural resource exports to control the political process and paying less attention to population needs due to reduced reliance on tax revenues. (Grabowski & Self, 2024). Thus, dependence on minerals and other raw materials tends to undermine structural change, highlighting the need for strategic diversification of the economy (Ssozi & Bbaale, 2019).

An additional aspect of structural change in Africa relates to access to the sea. In addition to the potential for the development of maritime activities (including tourism), access to the sea facilitates trade openness, which in turn promotes the exchange of knowledge, as well as other resources and products (see Grabowski & Self, 2024; Chabi & Saygılı, 2024). In this respect, the opportunities for landlocked economies are more limited, which is of particular concern for some countries in sub-Saharan Africa (SSA). In addition to the limitations of operating in the maritime sector, when a landlocked economy borders countries with weak institutions, international investment tends to be reduced (Ssozi & Bbaale, 2019).

Structural change allows African economies to achieve inclusive growth and sustainable development. However, success depends on addressing systemic barriers, fostering enabling environments, and implementing comprehensive policies targeting education, governance, and technology (see Adjei et al., 2024; Malah Kuete & Asongu, 2023). These efforts must ensure that the benefits of transformation reach all populations and regions, reducing inequalities while enhancing economic competitiveness (Stiglitz, 2018).

Countries can be classified in different stages of structural transformation: underdeveloped, developing, and developed (Sen, 2023). In this proposal, most African economies fall into the underdeveloped category, where agriculture dominates employment, accounting for 40–60% as of 2018. Employment growth in these economies is concentrated in non-business services rather than business services, diverging from patterns seen in more advanced stages. Additionally, the data showing an apparent positive relationship between trade and manufacturing employment in this group challenges Rodrik's (2016) argument of a premature deindustrialization, the notion that globalization has contributed to limited industrialization and often deindustrialization in low-income countries.

Africa must transition to an internally driven development approach, moving away from externally imposed strategies that have often failed to transform the continent due to their lack of contextual relevance. Effective African development strategies must prioritize structural transformation, with industrialization at their core. These strategies should also integrate critical considerations such as the Sustainable Development Goals (SDGs), climate change, advancements in key enabling technologies, and the complexities of migration, ensuring a comprehensive and forward-thinking framework for progress (Lopes & Kararach, 2019).

### 2.2. Technology as a Catalyst for Change

Among these drivers of transformation, technology has emerged as a potent enabler. With its potential to foster innovation, improve efficiency, and reshape industries, technology can catalyze systemic challenges, and productivity gains across the different sectors. In Africa, technological advancements have reshaped industries such as agriculture, finance, healthcare, and manufacturing. The rise of mobile banking platforms like M-Pesa in Kenya illustrates technology's potential to enhance financial inclusion, particularly in underserved rural areas (Bennett & Bennett, 2003). Similarly, innovations in agriculture, such as mobile advisory services and precision farming, have empowered smallholder farmers to increase yields and adapt to climate variability (Roztocki et al., 2019). Amoako et al. (2022) highlight that technology's impact on sectors like agriculture hinges on tailored approaches, such as energy-efficient production strategies, that address local heterogeneity and ensure equitable outcomes.

The Technological Diffusion Theory (Rogers, 1962) provides a framework for understanding how innovations spread through social systems. In Africa, technology diffusion is influenced by infrastructure quality, institutional capacity, and educational attainment. Countries like Rwanda, prioritizing digital infrastructure and e-governance, have seen significant gains in technology adoption, while others need to catch up due to regulatory barriers and insufficient investment (Vivarelli, 2021). Furthermore, Vivarelli (2021) underscores the interlinkage between technological progress, structural change, and globalization, noting that advancements often depend on international technology transfer and local capability building. These factors enable emerging economies to catch up and achieve sustainable productivity growth.

Despite its transformative potential, technology adoption in Africa is often uneven. Access to digital tools and platforms remains limited in rural areas, where infrastructural deficits and affordability issues persist. Additionally, the introduction of automation and artificial intelligence presents a paradox. While these technologies enhance productivity and competitiveness in global markets, they threaten jobs in traditional sectors, particularly in agriculture and manufacturing (cf. Grabowski & Self, 2024). This is not new as it represents only an updated expression of the Kuznets paradox (Kuznets, 1955).

This underscores the urgent need for retraining and upskilling programs to prepare the workforce for the digital economy's demands. Mensah et al. (2023) highlight how shifts away from agriculture have seen the service sector absorb much of the workforce. However, this has only sometimes resulted in overall productivity gains, reflecting the need for technology-driven strategies that maximize efficiency across sectors.

The multifaceted role of technology in structural transformation extends beyond traditional sectors. It fosters the development of entirely new industries and business models, such as e-commerce, telemedicine, and renewable energy, which have the potential to drive economic diversification and resilience. For example, Eifert et al. (2008) document Nigeria's technology industry's rapid growth, including significant corporations driving innovation in healthcare, agriculture, and finance, alongside smaller enterprises transforming retail and e-commerce. However, challenges like unreliable electricity and limited

funding, particularly for women, highlight the need for inclusive and supportive business environments. Meanwhile, renewable energy technologies address chronic energy deficits while contributing to sustainability goals. Telemedicine platforms are expanding access to healthcare services in remote areas, exemplifying how technology can bridge social and economic infrastructure gaps. As African economies integrate technology into their development strategies, ensuring equitable access and inclusive benefits will be critical for long-term success.

However, technology alone can only drive structural transformation with skilled human capital to sustain and expand its impact (Fabrice et al., 2024). The role of education, skills acquisition, and workforce integration becomes pivotal in aligning human resources with technological advancements.

### *2.3. Talent Development as a Pillar of Transformation*

Human capital is a cornerstone of economic growth and structural transformation. In Africa, the burgeoning youth population presents a demographic dividend that, if harnessed effectively, could drive innovation, productivity, and resilience. Talent development, encompassing education, skills acquisition, and workforce integration, is essential for aligning human capital with the demands of a rapidly changing economy (Laroche et al., 1999). Effective human capital strategies have been recognized as critical for bridging the gap between traditional and modern economies, allowing African nations to maximize their economic potential.

Education systems across Africa face significant challenges, including inadequate infrastructure, outdated curricula, and limited access to quality education in rural areas. These gaps hinder the development of a skilled workforce capable of meeting the demands of industries such as technology, manufacturing, and services. As Mensah (2020) notes, vocational training and technical education have emerged as critical interventions for addressing these issues. Technical and Vocational Education and Training (TVET) programs in countries like South Africa and Kenya have successfully equipped young people with practical skills, fostering entrepreneurship and reducing youth unemployment. These programs have also been instrumental in aligning education with the specific needs of local industries, creating a more seamless transition between education and employment.

However, systemic barriers such as insufficient funding, lack of industry collaboration, and cultural stigmas around vocational education persist. Addressing these barriers requires concerted efforts from governments, private sector actors, and civil society. Public–private partnerships can help mobilize resources for curriculum reform, teacher training and infrastructure development. Additionally, cultural awareness campaigns can help promote vocational training by positioning it as a pathway to economic opportunity.

The global shift toward knowledge-based economies underscores the importance of digital literacy and STEM (science, technology, engineering, and mathematics) education. Programs that promote lifelong learning and advanced technical skills can prepare Africa's workforce for the Fourth Industrial Revolution. For example, initiatives in Rwanda have successfully integrated STEM-focused education at the secondary level, fostering a generation of technologically adept workers capable of meeting the demands of emerging industries (Vivarelli, 2021). Moreover, promoting entrepreneurial skills alongside digital competencies can empower individuals to create innovative solutions tailored to local challenges.

In addition to strengthening domestic education systems, African countries must address the issue of brain drain. The loss of skilled professionals to other regions weakens the local talent pool, exacerbating labor shortages in critical sectors. Initiatives to reverse brain drain and encourage diaspora engagement have proven effective in enhancing the

region's human capital base. Programs like Ethiopia's Diaspora Investment Initiative have shown that targeted policies can attract skilled professionals back to the continent, fostering innovation and competitiveness (Mensah, 2020). Furthermore, diaspora communities can serve as valuable bridges for knowledge transfer and international collaboration, accelerating local development.

Talent development in Africa is about preparing the workforce for existing opportunities and creating an adaptable, innovative, and inclusive labor force capable of driving future economic transformation. By investing in education, fostering industry collaboration, and embracing global best practices, African nations can position their human capital as a critical driver of structural change. The next section examines how key sectors, including tourism, can catalyze this transformation by creating employment opportunities and fostering economic resilience.

### 2.4. Sectoral Transformations in Tourism and Other Key Industries

Structural transformation in Africa is deeply connected to the development of key sectors such as tourism, manufacturing, and services. These sectors not only drive economic growth but also generate synergies that magnify the transformation across the broader economy. Their interdependence highlights the interconnected nature of Africa's progress and the need for an integrated approach to sustainable development.

Tourism, in particular, has emerged as a crucial catalyst for economic diversification and resilience. Africa's rich natural and cultural heritage forms the foundation for tourism-led development, creating opportunities for job generation, infrastructure improvement, foreign exchange earnings, and cultural preservation. Sustainable tourism initiatives have also emphasized environmental conservation and local community involvement (Henseler et al., 2022). Technological advancements, such as online booking platforms, virtual reality tours, and mobile travel applications, have further expanded tourism's reach, integrating traditional economic activities into modern value chains. As a cornerstone of structural transformation, tourism can bridge the gap between local economies and global markets. Marsiglio's (2018) study on tourism specialization reinforces this potential, showing that strategic interventions can spur economic rejuvenation and attract increased tourist activity, though challenges like stagnation or decline must be managed carefully.

Despite its transformative potential, tourism faces persistent barriers in Africa, including insufficient infrastructure, political instability, and environmental concerns (Nyasha et al., 2021). Drawing from Zuo and Huang's (2020) analysis of tourism in China, tourism-related industrialization fosters productivity and integration with other sectors. Applying such strategies in Africa necessitates policies that enhance regional connectivity, prioritize safety, and promote community engagement to fully unlock the sector's potential while mitigating its challenges.

Nevertheless, tourism's growth can result in adverse consequences. Issues such as inflated local prices, gentrification, commodification of cultural values, increased crime, overcrowding, and environmental degradation underscore the need to address tourism's negative externalities. It remains essential, however, to recognize its role in reducing social inequalities, driving economic development, and enhancing the quality of life for local communities (Alcalá-Ordóñez & Segarra, 2023). Recommendations for the sector include improving visa processes to facilitate international travel, extending credit and consultancy support to small businesses, and leveraging ICT to enhance competitiveness (van der Schyff et al., 2019; Ssozi & Bbaale, 2019). Furthermore, Ofori et al. (2022) demonstrated that tourism's potential to reduce income inequality is significantly amplified by good governance.

Beyond tourism, the manufacturing sector is a critical driver of industrialization and economic diversification. Initiatives like the African Continental Free Trade Area (AfCFTA) aim to increase intra-African trade and attract investments in value-added production (Page, 2016). Emerging industries such as textiles, automotive, and food processing illustrate manufacturing's capacity to generate employment and stimulate innovation. While premature deindustrialization is not a pervasive issue in most sub-Saharan African economies (Nguimkeu & Zeufack, 2024), the sector grapples with high production costs, unreliable energy supplies, and regulatory inefficiencies, which must be overcome to realize its transformative potential.

The services sector, particularly telecommunications and finance, has also emerged as a powerful growth engine. Driven by mobile technology and digital platforms, innovations like mobile banking, e-commerce, and fintech have revolutionized financial inclusion, broadening access to credit and markets in remote areas (Mintsa & Ndongfack, 2017). Such advancements create ripple effects across sectors, fostering progress in agriculture, education, and healthcare.

In conclusion, Africa's structural transformation relies on the interplay of these sectors, each amplifying opportunities in others. By integrating tourism, manufacturing, and services, African economies can align traditional practices with modern systems, driving inclusive growth. Strategic policies, regional cooperation, and innovation adoption will be key to unlocking their collective potential for sustainable development.

## 3. Methodology

As explored in the literature, structural transformation is a multifaceted process shaped by the interplay of technology, sectoral changes, talent, and emerging industries like tourism. Understanding this process requires a methodological framework that captures these dimensions' complexity and interconnectedness, particularly in Africa's unique challenges and opportunities.

This section outlines the research plan, data collection processes, and analytical techniques employed to investigate the dynamics of African structural change. By focusing on quantitative analysis and leveraging secondary data, the study comprehensively explores the roles played by technology, transformation, talent, and tourism in shaping Africa's economic landscape. This study employed a quantitative research approach to align with the research objectives and the need for statistical analysis. Quantitative methods facilitated the identification of relationships between variables, enabling an examination of correlations and causality (Saunders et al., 2019). This approach allowed for collecting a large volume of secondary data from reputable sources, such as the World Bank, ensuring credibility and reliability. The quantitative methodology also helped avoid bias by focusing on validated datasets (Kothari, 2008), making it particularly suited for exploring the multidimensional aspects of African structural transformation.

This paper adopted a cross-sectional research design, collecting data simultaneously to provide a snapshot of the current dynamics of structural change across 54 African countries. Cross-sectional designs allow for the comparison of groups and the examination of how variables are related to each other at a particular point in time (Creswell, 2019). Diverse factors, such as technological progress, sectoral changes, talent development, and tourism growth, drive Africa's structural transformation. However, the lack of comprehensive, multidimensional analysis in the existing literature motivated the study's design. This research addresses the following key questions: How does technology drive structural changes in Africa's economies and societies? What transformational trends are observed in tourism, agriculture, manufacturing, and services, and how do they influence Africa's economic landscape? How are talent development and utilization addressed in terms of

education, skill enhancement, and workforce integration? What is the growth potential of the tourism industry in Africa, and how does it contribute to structural change?

This study utilized secondary data sourced from the World Bank database, offering a reliable foundation for examining indicators related to technological advancement, economic transformation, talent development, and tourism trends. Secondary data ensured that the analysis adhered to rigorous standards of reliability and validity while minimizing uncertainties (Mohajan, 2017). The study developed a composite indicator to capture the multidimensional nature of structural transformation, integrating variables across the four core dimensions: technology, transformation, talent, and tourism. Careful weighting and selecting these indicators provided a nuanced understanding of the socioeconomic dynamics shaping Africa's structural transformation.

The analysis included several steps and tools. Factor analysis was used to identify underlying structures within the dataset, with the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity ensuring suitability for the analysis. Principal Component Analysis (PCA) was employed to explain total variance in the data, focusing on relationships among variables. Descriptive statistics provided an overview of data distribution and variability, offering initial insights into structural transformation dynamics. Cluster analysis grouped African economies into clusters based on similar patterns of structural change, revealing regional trends and dynamics. Cluster map visualization further illustrated the geographical distribution of these clusters, aiding in the interpretation of regional disparities.

We performed a hierarchical cluster analysis using Euclidean distance, grouping cases based on their proximity (see Hair et al., 2018). Ward's linkage method was applied to determine the optimal number of clusters, minimizing within-cluster variance during the hierarchical clustering process (Malhotra, 2006). The resulting dendrogram (Appendix C) was instrumental in identifying the appropriate number of clusters, providing a visual representation of the hierarchical relationships among countries. By observing the height of the vertical lines in the dendrogram, which reflect the dissimilarity levels between groups, six clusters were identified, each representing a unique development trajectory.

The geographic scope included all 54 African countries chosen for their diverse economic, cultural, and developmental contexts. Africa's rapid urbanization, demographic shifts, and technological advancements make it a critical case for analyzing structural change. The research addressed gaps in global studies, which often overlook African contexts, by offering a comprehensive and inclusive perspective on the continent's transformation. By leveraging secondary data and advanced statistical techniques, the study aimed to provide actionable insights into how technology, transformation, talent, and tourism interact to shape Africa's structural change.

Ethical standards were upheld throughout the study. Using secondary data from reputable sources ensured compliance with established ethical principles. All data sources were appropriately acknowledged, and care was taken to verify the dataset's integrity. Reliability was ensured by prioritizing data from accredited sources, while validity was established through rigorous methodological design and robust data analysis. These measures ensured the findings were credible and actionable, contributing to the broader understanding of Africa's economic transformation.

## 4. Results

### *4.1. Economic Landscape and Development Challenges in Africa*

African economies present a highly heterogeneous landscape, encompassing a broad spectrum of income levels, from low-income to upper-middle and high-income nations. SSA, in particular, is a region marked by stark contrasts, with 22 countries identified as

fragile or conflict-affected and 13 categorized as small states characterized by limited land area and human capital. Despite these disparities, Africa holds substantial strategic advantages. The continent has abundant natural resources, the world's largest free trade area under the AfCFTA, and a burgeoning market of 1.2 billion people. By harnessing these resources and leveraging its demographic strength, Africa is well positioned to embark on a transformative and dynamic path of development (World Bank, 2023).

However, SSA continues to grapple with persistent development challenges. Economic growth in the region is projected to decline from 3.6% in 2022 to 2.5% in 2023. This deceleration is attributed to escalating conflict and violence and climate-related shocks exacerbating vulnerabilities. An estimated 462 million people in SSA are expected to live in extreme poverty in 2023, underscoring the region's development crisis. Furthermore, the convergence of crises—including the COVID-19 pandemic, climate challenges, and rising conflicts—has significantly increased debt burdens. By mid-2023, 21 SSA countries were either at high risk of external debt distress or experiencing it, prompting countries such as Chad, Zambia, and Ghana to initiate debt restructuring programs to restore fiscal sustainability and capacity (Muluh et al., 2022).

Economic performance remains uneven across the continent. East Africa is forecasted to grow at 1.8% in 2023, while West Africa is expected to achieve a higher growth rate of 3.3%. Nevertheless, the underperformance of SSA's most significant economies continues to weigh on overall regional outcomes. South Africa faces energy and transport constraints, while challenges hinder Nigeria could have improved growth in its oil sector. Political instability and conflict in countries such as Sudan, Niger, and Gabon are further dampening growth prospects, particularly in regions such as the Economic and Monetary Community of Central Africa and the Sahel. Despite these challenges, the exploitation of natural resources—including oil, gas, and minerals—offers opportunities to enhance fiscal sustainability and debt management, particularly in the context of global shifts toward low-carbon economies (Bhorat et al., 2023; United Nations Department of Economic and Social Affairs, 2024).

The region's demographic trends present both challenges and opportunities. SSA is poised to experience the fastest growth in its working-age population globally, with a projected net increase of 740 million people by 2050 (Lam et al., 2019). This demographic dividend, however, is at risk of being underutilized due to insufficient job creation. Only about 3 million new formal wage jobs are created annually, far below the 12 million young people entering the labor market yearly (World Bank, 2023). Bridging this gap will require targeted policy initiatives to improve human capital, foster economic diversification, and implement employment-friendly growth strategies. Such measures are expected to ensure that the benefits of economic recovery are equitably distributed, promoting inclusive growth and reducing disparities (United Nations Development Programme, 2021).

Africa's development trajectory is at a critical juncture, shaped by its vast potential and enduring challenges. The findings underscore the need for multifaceted approaches integrating natural resource management, human capital development, and economic policy reforms to pave the way for sustainable and inclusive growth. These dynamics form the foundation for the subsequent analysis of sectoral transformations and their role in driving structural change.

### *4.2. Unveiling the Drivers of Structural Transformation in African Economies*

The findings of this study illuminate the multidimensional dynamics shaping structural transformation in African economies. Drawing on a composite analysis of secondary data sourced from the World Bank, the study employed PCA to identify the latent dimensions underpinning structural change across the continent.

The adequacy of the dataset for factor analysis was assessed using the KMO measure and Bartlett's test of sphericity (Table 1). The KMO value of 0.602, while above the acceptable threshold of 0.5, indicates moderate suitability for factor analysis (Hill, 2011). Bartlett's test of sphericity yielded a significant result ($\chi^2 = 81.543$, $p < 0.001$), confirming that the correlation matrix was not an identity matrix and that relationships among variables warranted further exploration. Together, these results validated the dataset's appropriateness for PCA.

**Table 1.** KMO and Bartlett's test (source: own elaboration).

| KMO and Bartlett's Test | | |
|---|---|---|
| KMO | | 0.602 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 81.543 |
| | df | 45 |
| | Sig. | 0.001 |

The study conducted a descriptive analysis of selected indicators across 54 African countries to establish a foundational understanding of the economic, social, and structural conditions relevant to the research objectives. In terms of data distribution, a concentration of African economies at the lowest levels of various variables across the four dimensions points to potential areas for structural transformation. This applies to economic transformation (e.g., gross national income [GNI] per capita, population density), technology (e.g., fixed broadband subscriptions per 100 inhabitants, medium- and high-tech industries), talent (e.g., tertiary enrolment), and tourism (e.g., intensity, expenditure).

The PCA identified five distinct components that together explain 72.93% of the total variance (Appendix B), providing a structured understanding of the key dimensions driving structural transformation in African economies. The rotated component matrix, derived from PCA with Varimax rotation and Kaiser normalization, provides a detailed overview of the five retained components (Table 2). This table is presented to illustrate the relationships between the variables and the extracted components, simplifying complex inter-variable relationships into a manageable structure. The rotated factor loadings quantify the correlation between the variables and the components, with values ranging from −1 to +1. Higher absolute loadings indicate stronger associations with the respective component.

The analysis identified five principal components. These components—structural conditions, public sector capacities, dynamic conditions, urbanization and industry, and growth—represent the critical latent factors that explain the patterns in the dataset. The results demonstrate the effective reduction of dimensionality while preserving the essence of the data, ensuring a focused interpretation of structural transformation dynamics in African economies.

1. **Structural conditions:** This component captures characteristics related to socioeconomic development and technological capacity, reflecting levels of wealth, access to essential services, and the transition to urban and technologically advanced economies. Key variables include GNI per capita (0.913) and fixed broadband subscriptions (0.840), emphasizing the role of infrastructure and governance in enabling transformative potential. Environmental impact (0.830) points to a context of industrialization, while participation in higher education (0.612) reflects the availability of talent, highlighting social progress and the capacity for innovation.
2. **Public sector capacities:** Governance quality and institutional effectiveness are central to this component. Key indicators such as the CPIA (Country Policy and Institutional Assessment) economic management cluster average (0.933) and public sector manage-

ment (0.813) reflect the importance of well-functioning public institutions in fostering talent development, innovation, and sustainable economic growth.

3. **Dynamic conditions:** This component indicates an economy's ability to attract and manage foreign investment and to facilitate global connectivity through air transport and logistics. It also reflects performance in tourism and the presence of medium- and high-tech activities. Variables such as foreign direct investment (0.824), air transport (0.821), tourism expenditure (0.808), and the presence of medium- and high-technology industries (0.564) demonstrate integration with global markets, the ability to explore tourism as a driver of development, and the ability to generate technological innovation.
4. **Urbanization and industry**: Urbanization and industrialization emerge as defining themes within this dimension. Indicators such as population density (0.797) and industry contributions (0.763) capture the influence of urban and industrial development on demographic and economic patterns.
5. **Growth:** This component underscores performance metrics indicative of economic progress and transformative potential. The variables GDP growth per capita (0.789) and tourism intensity (0.704) suggest growing economies, with tourism as one of the enablers of economic development. This component reflects how tourism can act as a driver for increasing productivity and living standards by creating more jobs and opportunities for economic growth.

**Table 2.** Rotated component matrix (source: own elaboration).

| | Component | | | | |
|---|---|---|---|---|---|
| | **1 Structural Conditions** | **2 Public Sector Capacities** | **3 Dynamic Conditions** | **4 Urbanization and Industry** | **5 Growth** |
| Access to electricity | 0.743 | | | | |
| $CO_2$ emissions | 0.830 | | | | |
| GDP per capita growth | | | | | 0.789 |
| GNI per capita, Atlas method | 0.913 | | | | |
| Industry (including construction) | | | | 0.763 | |
| Foreign direct investment | | | 0.824 | | |
| Air transport, registered carrier departures worldwide | | | 0.821 | | |
| Fixed broadband subscriptions (per 100 people) | 0.840 | | | | |
| CPIA economic management cluster average | | 0.933 | | | |
| CPIA policies for social inclusion/equity cluster average | | 0.933 | | | |
| CPIA public sector management and institutions cluster average | | 0.813 | | | |
| CPIA structural policies | | 0.851 | | | |
| Logistics performance index: Overall (1 = low to 5 = high) | | | 0.757 | | |
| Population density | | | | 0.797 | |
| School enrolment, tertiary | 0.612 | | | | |
| % Urban population | 0.521 | | | 0.642 | |
| Tourism intensity (tourist arrival by worker) | 0.418 | | | | 0.704 |
| Tourism expenditure (tourism expenditure/arrivals) | | | 0.808 | | |
| Medium- and high-tech industries | | | 0.564 | | |

The four aspects developed in the article—economic transformation, talent, technology, and tourism—serve as a starting point for understanding the differential capacity of African economies to foster structural change. The economic transformation aspect appears across the different components, such as Component 1, related to structural conditions, and Component 4, related to urbanization and the role of industrialization. Regarding technology, for instance, medium- and high-tech industries (Component 3) suggest the connection between technological innovation and the ability to export or attract global

markets, while fixed broadband subscriptions (Component 1) indicate digital infrastructure as a driver of structural change.

Talent (human capital) is included in Component 1 through tertiary enrollment, which reflects the skills of the workforce. Other variables are also indirectly related to talent, such as the urban population, as more urbanized areas tend to foster the concentration of skilled individuals. Additionally, tourism expenditure (Component 3) and intensity (Component 5) emphasize the relevance of this sector as a catalyst for dynamism and a driver of economic growth. These findings highlight the importance of a multidimensional perspective in the pursuit of structural change, providing a framework for developing typologies of African economies.

### *4.3. Understanding the Diversity of African Economies*

Cluster analysis was employed to classify African economies into six distinct groups based on their performance across the five retained components identified before: structural conditions, public sector capacities, dynamic conditions, urbanization and industry, and growth. This classification allowed for grouping countries with shared characteristics, shedding light on the multidimensional nature of structural transformation in Africa.

The clusters and their respective countries are detailed in Table 3. These clusters range in size, with some containing a single country and others grouping as many as 24 nations.

**Table 3.** Case summaries (source: own elaboration).

| Cluster | Countries |
|---|---|
| 1 | (1) Algeria; (2) Angola; (3) Botswana; (4) Congo, Rep.; (5) Equatorial Guinea; (6) Gabon; (7) Libya; (8) Morocco; (9) Tunisia |
| 2 | (1) Benin; (2) Burkina Faso; (3) Cameroon; (4) Congo, Dem. Rep.; (5) Cote d'Ivoire; (6) Guinea; (7) Kenya; (8) Madagascar; (9) Mali; (10) Mauritania; (11) Niger; (12) Rwanda; (13) Senegal; (14) Tanzania; (15) Togo; (16) Uganda |
| 3 | (1) Burundi; (2) Central African Republic; (3) Chad; (4) Comoros; (5) Djibouti; (6) Eritrea; (7) Eswatini; (8) Ethiopia; (9) Gambia, The; (10) Ghana; (11) Guinea-Bissau; (12) Lesotho; (13) Liberia; (14) Malawi; (15) Mozambique; (16) Namibia; (17) Nigeria; (18) Sao Tome and Principe; (19) Sierra Leone; (20) Somalia; (21) South Sudan; (22) Sudan; (23) Zambia; (24) Zimbabwe |
| 4 | (1) Cabo Verde; (2) Mauritius |
| 5 | (1) Egypt, Arab Rep.; (2) South Africa |
| 6 | (1) Seychelles |

Figure 1 illustrates the average performance of the six clusters across the five retained components, highlighting their strengths and challenges. Each component score (Z-scores) represents relative performance, where positive values indicate above-average performance and negative values signify below-average performance.

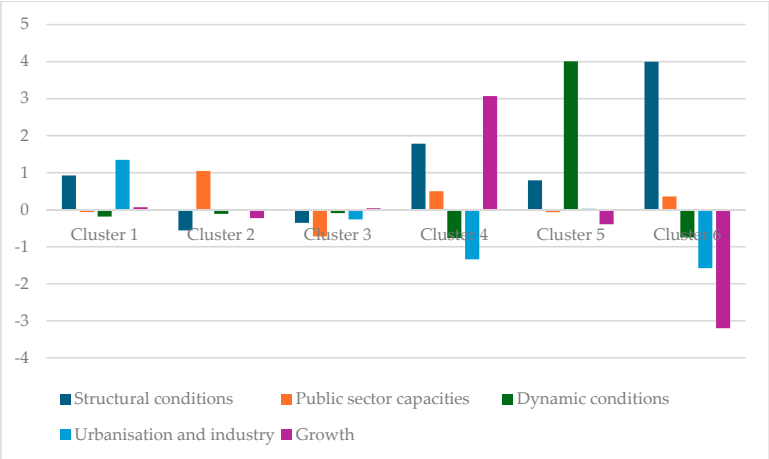


**Figure 1.** Performance of clusters across retained components (source: own elaboration).

Figure 1 underscores the multidimensional nature of structural transformation in Africa, where clusters display distinct strengths and weaknesses across key components. The clusters have been named based on their unique characteristics, providing deeper insights into the developmental pathways and challenges facing African economies.

**Cluster 1: Developing African Economies**

Countries in this cluster are characterized by moderately favorable structural conditions, with a mean value of 0.9248, indicating a solid foundation for economic development. However, they face slight challenges in public sector capacities (−0.0661) and dynamic conditions (−0.1863), which could hinder progress. The strong urbanization and industry score (1.3450) highlights potential in urban development and industrialization, while their modest growth score (0.0661) suggests the need for targeted strategies to unlock their full economic potential.

**Cluster 2: African Economies in Transition**

This cluster includes economies that face significant structural challenges, reflected by a negative mean value for structural conditions (−0.5593). Despite a favorable performance in public sector capacities (1.0435), these countries struggle with urbanization and industry (−0.1017) and growth (−0.2273). These mixed results suggest that while governance and institutional quality are relatively strong, broader structural and industrial reforms are needed to achieve sustainable development.

**Cluster 3: Low-Middle Performing African Economies**

With modest scores across most components, this cluster represents countries with limited progress in structural transformation. Structural conditions (−0.3550), public sector capacities (−0.7217), and urbanization and industry (−0.2613) highlight persistent barriers to economic growth and industrialization. However, a slightly positive growth score (0.0373) reflects potential areas of improvement through targeted investments in infrastructure and governance.

**Cluster 4: Developed Insular African Economies**

This cluster comprises countries with highly favorable structural conditions (1.7812) and growth (3.0667). However, challenges in dynamic conditions (−0.7683) and urbanization and industry (−1.3400) suggest limited economic diversification and industrialization. These countries appear to leverage their insular characteristics, focusing on specific industries like tourism or fisheries, which contribute significantly to their economic performance.

**Cluster 5: African Powerhouses**

Representing the continent's leading economies, this cluster excels in dynamic conditions (4.0053) and structural conditions (0.7931). However, growth (−0.3923) and urbanization and industry (0.0258) scores indicate room for improvement in translating these strengths into broader economic gains. These countries play a pivotal role in shaping regional development and attract investments due to their robust infrastructure and skilled workforce.

**Cluster 6: Small Economic Outlier: Seychelles**

Seychelles stands out with exceptionally high structural conditions (3.9968) and favorable public sector capacities (0.3563), reflecting strong governance and infrastructure. However, negative scores in urbanization and industry (−1.5786) and growth (−3.2016) highlight the limitations of its small size and reliance on specific sectors. Despite these challenges, Seychelles demonstrates how small economies can achieve prosperity through strategic resource utilization and effective governance.

Figure 2 shows a map of the countries and the corresponding clusters.

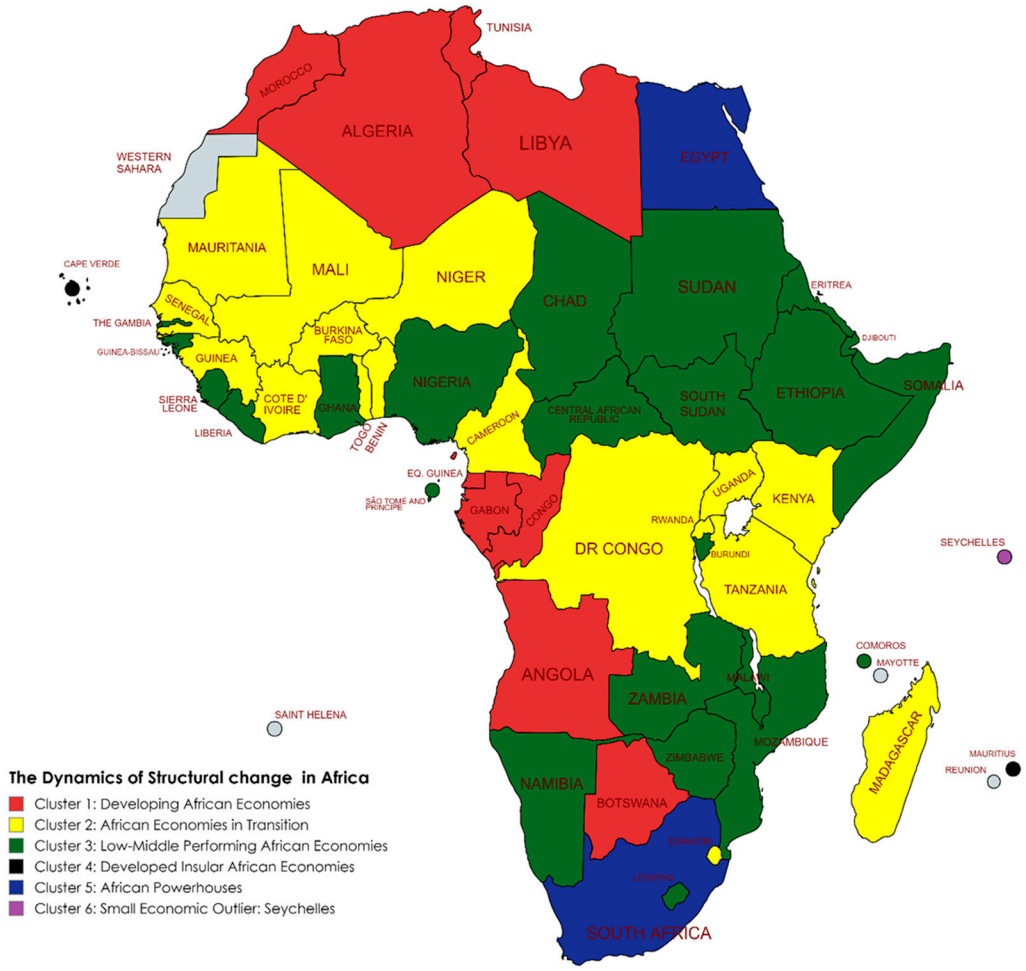


**Figure 2.** Typologies of African countries concerning structural change (source: own elaboration).

The cluster analysis results emphasize the critical role of understanding African structural transformation through a multidimensional lens. By categorizing countries based on their performance in key components, this study reveals distinct development pathways, highlighting strengths and areas requiring intervention. The typologies underscore that while specific clusters, such as African Powerhouses and Developed Insular Economies, leverage their structural and dynamic conditions effectively, others, like Economies in Transition and Low-Middle Performing Economies, face entrenched challenges demanding comprehensive reforms. These insights clarify the diversity of African economies and provide a strategic foundation for tailoring policies to specific national contexts.

This classification serves as a framework for exploring actionable strategies that align with each cluster's characteristics. For instance, enhancing governance and infrastructure in Economies in Transition or fostering industrial and urban development in Developing African Economies could pave the way for greater inclusivity and growth. Additionally, the performance of small nations like Seychelles highlights the potential of focused economic strategies, even under resource and geographic constraints. These findings set the stage for a deeper discussion on how regional and national strategies can be aligned with these typologies to unlock Africa's developmental potential while addressing the persistent challenges of inequality, poverty, and underutilized human capital.

## 5. Discussion

This section discusses the study's findings, connecting them to the research objectives and broader literature. The Discussion highlights the multifaceted dynamics driving

structural transformation in African economies, emphasizing the role of technology, key sectoral transformations, talent development, and the potential of the tourism industry.

The role of technology emerges as a catalyst for structural transformation, as reflected in the retained components that highlight variables like access to electricity, broadband subscriptions, and medium- and high-tech industries. These indicators suggest that technological infrastructure and digital capacity are enablers of economic diversification and critical for addressing socioeconomic inequalities. Countries with robust technological bases tend to exhibit more substantial growth and development trajectories, reflecting the potential of technology to bridge development gaps. The positive impacts of developed technological infrastructure are expected for both manufacturing and the services sector (Malah Kuete & Asongu, 2023; Ofori et al., 2022). Accordingly, limited infrastructure development is seen as a determinant of the slow pace of structural change in some SSA economies (Grabowski & Self, 2024).

In addition, the findings of the present paper also underscore Africa's persistent digital divide, a barrier to broader economic participation. Bhorat et al. (2023) demonstrate that Africa lags significantly behind G20 economies in digital public participation, digital finance, and entrepreneurship despite some progress in reducing relative digital vulnerability. This suggests a need for nuanced policy interventions beyond infrastructure development, including capacity building, digital literacy, and inclusive access to technological resources underlining the link between the technology and talent dimensions. This approach could reduce the risk of digital exclusion, with the aim of bringing the benefits of technological advances to marginalized populations and contributing to sustainable development. Therefore, our paper also highlights the need to consider other structural conditions alongside infrastructure, especially in African economies in transition and in low- and middle-performing African economies.

Sectoral transformations reveal a complex interplay of historical legacies, geographic disparities, and policy challenges. While agriculture remains the backbone of many sub-Saharan African economies, its productivity has stagnated, contributing to a slower structural shift toward industrialization. As the International Labour Organization (2021) points out, the services sector has absorbed much of the labor force exiting agriculture, but this shift has yet to translate into commensurate productivity gains. The findings suggest that sectors such as manufacturing and trade require targeted support to enhance their competitiveness and productivity. For example, Mensah et al. (2023) highlight that the industrial sector in Africa needs to be utilized despite its potential to drive high-value-added production. Investments in infrastructure, coupled with policies to attract foreign direct investment and support small- and medium-sized enterprises, could enable African economies to harness industrial growth as a pathway to diversification and resilience. Furthermore, urbanization presents both an opportunity and a challenge, as rapid population growth in urban areas necessitates coordinated efforts in housing, transportation, and industrial planning to avoid exacerbating inequalities.

Talent development is another dimension of structural transformation. This study highlights the importance of education, governance, and workforce integration in fostering a skilled and innovative labor force. These findings align with evidence from the World Bank (2023), which underscores the gap between Africa's demographic dividend and job creation capabilities. With millions of young people entering the labor market annually, failing to create sufficient formal wage jobs risks perpetuating cycles of poverty and inequality. It is not simply a matter of encouraging talent development by increasing the number of university degrees, as the continent is characterized by graduates with limited options who end up working in precarious jobs (Ofori et al., 2022).

Addressing this challenge requires a multi-pronged strategy that includes reforming educational systems to align with labor market needs, strengthening governance to reduce brain drain, and fostering entrepreneurship as an alternative to formal employment. For instance, Chabi and Saygılı (2024) suggested that West African economies align talent development with current trends, such as ICT services. In line with our results, this recommendation highlights the interconnection between the dimensions of talent and technology. Additionally, our findings suggest that governance structures play a significant role in shaping the efficacy of talent utilization. Countries with higher CPIA scores for social inclusion and public sector management tend to exhibit better outcomes in human capital development, reinforcing the need for institutional reforms to create enabling environments for growth. These results align with the study by Adjei et al. (2024), which identified governance as a key factor for the economic growth of SSA economies. Tourism emerges as a transformative sector with the potential to drive economic diversification and community development The findings demonstrate that countries with strong tourism indicators, such as Kenya and Tanzania, have successfully leveraged natural and cultural assets to generate significant economic benefits. Wildlife tourism, in particular, plays a pivotal role, contributing billions of dollars to GDP and supporting local economies. However, the sustainability of tourism is threatened by environmental degradation, inadequate infrastructure, and unequal distribution of benefits. Bacsi et al. (2023) note that tourism contributes substantially to GDP but often fails to create equitable opportunities for local populations. Addressing these challenges requires a paradigm shift toward sustainable tourism models prioritizing community participation, environmental conservation, and equitable benefit-sharing mechanisms.

Furthermore, our results suggest that tourism as a driver of structural change should not be analyzed in isolation. This paper links this sector to the dynamism and economic growth of African economies, supporting other empirical studies (see Alcalá-Ordóñez & Segarra, 2023). At the same time, there is some evidence that tourism is also influenced by economic development (Alcalá-Ordóñez et al., 2024) and levels of governance (Ofori et al., 2022). This shows that tourism is interlinked with the other three dimensions, as it requires digitalization, a skilled workforce, and policies aimed at structural change based on sustainability. As such, by integrating tourism into broader development strategies, African countries are expected to enhance their contributions to structural transformation while preserving the cultural and natural heritage that underpins their success. These findings highlight the interconnectedness of the dimensions explored in this study. Integrating technology into agriculture could enhance productivity and drive more efficient resource use. At the same time, urbanization paired with thoughtful industrial planning has the potential to create synergies between demographic growth and job creation. Similarly, aligning tourism strategies with governance reforms and talent development could improve tourism's potential as a driver of inclusive economic growth. The multidimensional nature of structural transformation underscores the need to consider the interdependencies among sectors, governance systems, and human capital in any development initiative.

Other points of discussion involve access to resources. Some empirical studies have emphasized that the resource curse undermines structural change in Africa (e.g., Grabowski & Self, 2024; Malah Kuete & Asongu, 2023). Malah Kuete and Asongu (2023) tested this hypothesis by looking at total natural resources as a percentage of GDP in 2021. Using the typology of our paper, the ten African economies with the highest percentages of this variable can be classified as African developing economies (e.g., Libya, Congo, Rep., Angola), African transition economies (e.g., Congo, Dem. Rep.) and African low-middle performing economies (e.g., Zambia). These findings raise concerns about the growth of wealth distribution per capita and the limited dynamism of these countries.

In addition, the capacity of the public sector remains a key issue for developing African economies and especially for low–middle performing ones. These challenges are often more pronounced in landlocked economies, which are predominantly concentrated in the low–middle-performing economies cluster.

Policy implications derived from the findings emphasize the relevance of holistic and integrated approaches to development. Policymakers should consider strategies that balance immediate economic growth with long-term sustainability, ensuring that investments are inclusive and equitable. This includes expanding access to technology in rural and underserved areas, where digital and infrastructural disparities remain barriers to growth. Additionally, the development of industrial clusters aligned with urban planning can help maximize synergies between demographic expansion and job creation. Furthermore, regulatory frameworks should also be established to promote sustainable tourism, protecting natural and cultural heritage while distributing economic benefits equitably to local communities. By systematically addressing these interconnected challenges, Africa can leverage its diverse strengths to advance a sustainable, inclusive, resilient development pathway.

## 6. Conclusions

This study highlights the multifaceted dynamics of structural transformation in African economies, emphasizing the continent's potential and challenges. Africa's economies are diverse, encompassing nations at various stages of development. While some countries have achieved notable progress in economic growth and diversification, others remain constrained by persistent obstacles such as political instability, economic fragility, and limited access to critical services.

A key conclusion of the study is the centrality of technology as a driver of structural change. Access to electricity, broadband infrastructure, and investment in high-tech industries were identified as pivotal in enabling economic transformation. Countries prioritizing these areas demonstrate enhanced growth potential and are expected to be more resilient to external shocks, underscoring the importance of technological readiness in modern economies.

The findings also underscore the transformative role of sectors such as tourism, agriculture, manufacturing, and services. These sectors are essential for diversifying economies, creating employment opportunities, and fostering innovation. This study reveals that economic progress is most pronounced in countries where these sectors are well integrated with governance frameworks and human capital development.

Human capital emerged as another pillar of structural transformation. Countries investing in education, skills development, and integration of labor markets exhibit greater economic dynamism and innovation. Strong governance structures that promote equity and social inclusion further enhance the productivity and potential of the workforce, making human capital development an indispensable component of sustainable growth.

Finally, the study suggests a critical role for tourism in shaping Africa's economic trajectory. Tourism, especially in countries rich in natural and cultural heritage, has demonstrated potential to drive economic transformation. Sustainable tourism strategies that leverage local resources while protecting the environment and cultural assets can be a powerful engine for inclusive development.

Structural change serves as a significant catalyst for economic transformation and dynamism, fostering innovation, productivity, and growth. However, this process often entails substantial disruption, as it may lead to the displacement of stable employment and adversely impact established industries and sectors (Di Tommaso et al., 2025). Such consequences can provoke resistance and antagonism among affected stakeholders, who may strive to preserve the prevailing status quo to safeguard their economic interests. This

tension underscores the dual nature of structural change: while it propels progress and adaptation, it simultaneously generates discontent and resistance, highlighting the need for carefully designed policies to balance progress with social and economic stability.

Future research should delve deeper into the localized impacts of structural transformation within African economies. This includes exploring the micro-level dynamics of regional disparities, sector-specific challenges, and the role of informal economies in shaping development trajectories. Given Africa's vulnerability to environmental shocks, comprehending climate change's impacts on economic resilience and sectoral productivity is particularly critical. Additionally, studying the role of regional integration initiatives, such as the AfCFTA, can provide insights into fostering cross-border synergies and economic cohesion. Research on the interplay between cultural factors and economic decision-making could further enrich our understanding of structural transformation, enabling more contextually grounded policy interventions. These avenues of inquiry hold the potential to deepen our understanding of Africa's developmental landscape and inform policy for sustainable and inclusive growth.

**Author Contributions:** H.P., conceptualization, investigation, formal analysis, methodology, software, writing—review and editing, and validation; E.O., investigation, formal analysis, methodology, and writing—original draft; L.F.C.V., conceptualization, investigation, writing—review and editing, and validation; C.N., conceptualization, writing—review and editing, and validation. All authors have read and agreed to the published version of the manuscript.

**Funding:** H.P. is supported by the FCT—Portuguese Foundation for Science and Technology (UIDB/04020/2020 and CEEC—INST/00052/2021/CP2792/CT0001).

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data presented in this study are available upon request to the email cinturs@ualg.pt. Access to the data is subject to the approval of the corresponding author of the article.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## Appendix A

**Table A1.** Descriptive statistics.

| | Mean | Std. Deviation | Missing N |
|---|---|---|---|
| Access to electricity | 56.822 | 26.822 | 0 |
| $CO_2$ emissions | 1.055 | 1.578 | 0 |
| GDP per capita growth | 1.724 | 3.496 | 2 |
| GNI per capita, Atlas method | 2557.885 | 2553.314 | 2 |
| Industry (including construction) | 27.445 | 13.958 | 4 |
| Foreign direct investment | 853,152,210.343 | 2,260,278,140.078 | 1 |
| Air transport, registered carrier departures worldwide | 18,834.922 | 24,550.567 | 17 |
| Fixed broadband subscriptions(per 100 people) | 3.302 | 6.063 | 11 |
| CPIA economic management cluster average | 3.146 | 0.617 | 14 |
| CPIA policies for social inclusion/equity cluster average | 3.146 | 0.617 | 14 |
| CPIA public sector management and institutions cluster average | 2.897 | 0.493 | 14 |
| CPIA structural policies | 3.154 | 0.509 | 14 |
| Logistics performance index: Overall (1 = low to 5 = high) | 2.537 | 0.2653 | 24 |
| Population density | 110.351 | 137.993 | 0 |
| School enrolment, tertiary | 15.914 | 9.153 | 27 |
| % Urban population | 47.731 | 18.896 | 0 |
| Tourism intensity (tourist by worker) | 0.355 | 0.7435 | 1 |
| Tourism expenditure (tourism expenditure/arrivals) | 713,589.338 | 1,334,622.040 | 11 |
| Medium- and high-tech industries | 13.348 | 7.993 | 20 |

Notes: For each variable, missing values are replaced with variable mean; CPIA = Country Policy and Institutional Assessment; GNI = Gross National Income. Source: Computation of data from the World Bank.

# Appendix B

**Table A2.** Communalities.

| Variables | Initial | Extraction |
|---|---|---|
| Access to electricity | 1.000 | 0.719 |
| $CO_2$ emissions | 1.000 | 0.878 |
| GDP per capita growth | 1.000 | 0.753 |
| GNI per capita, Atlas method | 1.000 | 0.852 |
| Industry (including construction) | 1.000 | 0.646 |
| Foreign direct investment | 1.000 | 0.692 |
| Air transport, registered carrier departures worldwide | 1.000 | 0.703 |
| Fixed broadband subscriptions (per 100 people) | 1.000 | 0.780 |
| CPIA economic management cluster average | 1.000 | 0.880 |
| CPIA policies for social inclusion/equity cluster average | 1.000 | 0.880 |
| CPIA public sector management and institutions cluster average | 1.000 | 0.745 |
| CPIA structural policies | 1.000 | 0.776 |
| Logistics performance index: Overall (1 = low to 5 = high) | 1.000 | 0.633 |
| Population density | 1.000 | 0.729 |
| School enrolment, tertiary | 1.000 | 0.623 |
| % Urban population | 1.000 | 0.699 |
| Tourism intensity (tourist by worker) | 1.000 | 0.712 |
| Tourism expenditure (tourism expenditure/arrivals) | 1.000 | 0.735 |
| Medium- and high-tech industries | 1.000 | 0.422 |

Note: Extraction Method: Principal Component Analysis. Source: Computation of data from the World Bank.

**Table A3.** Total variance explained.

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 4.654 | 24.496 | 24.496 | 4.654 | 24.496 | 24.496 | 3.814 | 20.076 | 20.076 |
| 2 | 3.523 | 18.542 | 43.038 | 3.523 | 18.542 | 43.038 | 3.369 | 17.730 | 37.807 |
| 3 | 2.474 | 13.020 | 56.058 | 2.474 | 13.020 | 56.058 | 3.128 | 16.465 | 54.271 |
| 4 | 1.968 | 10.357 | 66.415 | 1.968 | 10.357 | 66.415 | 1.915 | 10.079 | 64.351 |
| 5 | 1.238 | 6.515 | 72.930 | 1.238 | 6.515 | 72.930 | 1.630 | 8.580 | 72.930 |
| 6 | 0.904 | 4.758 | 77.688 | | | | | | |
| 7 | 0.712 | 3.748 | 81.437 | | | | | | |
| 8 | 0.691 | 3.636 | 85.072 | | | | | | |
| 9 | 0.552 | 2.905 | 87.977 | | | | | | |
| 10 | 0.498 | 2.622 | 90.599 | | | | | | |
| 11 | 0.427 | 2.247 | 92.845 | | | | | | |
| 12 | 0.383 | 2.015 | 94.861 | | | | | | |
| 13 | 0.305 | 1.604 | 96.465 | | | | | | |
| 14 | 0.232 | 1.219 | 97.684 | | | | | | |
| 15 | 0.167 | 0.877 | 98.560 | | | | | | |
| 16 | 0.136 | 0.718 | 99.278 | | | | | | |
| 17 | 0.090 | 0.475 | 99.754 | | | | | | |
| 18 | 0.047 | 0.246 | 100.000 | | | | | | |
| 19 | $-1.110 \times 10^{-16}$ | $-5.843 \times 10^{-16}$ | 100.000 | | | | | | |

Note: Extraction Method: Principal Component Analysis. Source: Computation of data from the World Bank.

# Appendix C

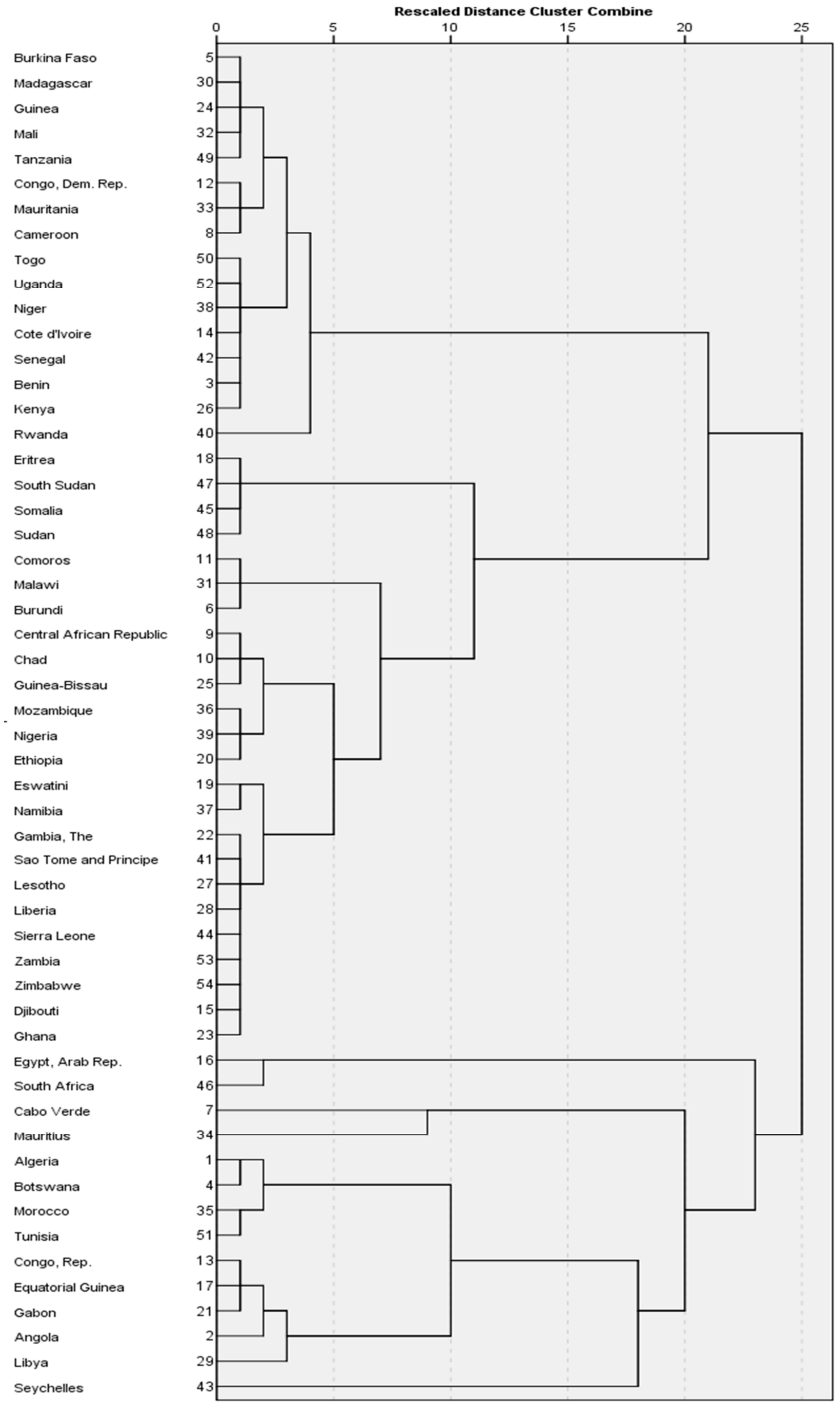


**Figure A1.** Dendrogram with Ward's linkage.

## References

Adjei, A. A. F., Gatsi, J. G., Owusu Appiah, M., Abeka, M. J., & Owusu Junior, P. (2024). Financial globalization, governance and economic growth in Sub-Saharan Africa. *Journal of Financial Economic Policy*, *16*(6), 801–824. [CrossRef]

Alcalá-Ordóñez, A., Brida, J. G., Cárdenas-García, P. J., & Segarra, V. (2024). Tourism and economic development: A panel data analysis for island countries. *European Journal of Tourism Research*, *36*, 1–18. [CrossRef]

Alcalá-Ordóñez, A., & Segarra, V. (2023). Tourism and economic development: A literature review to highlight main empirical findings. *Tourism Economics*, *135*, 48166231219638. [CrossRef]

Amoako, S., Andoh, F. K., & Asmah, E. E. (2022). Structural change and energy use in Ghana's manufacturing and agriculture sectors. *Energy Reports*, *8*(9), 11112–11121. [CrossRef]

Bacsi, Z., Yasin, A. S., & Bánhegyi, G. (2023). Tourism competitiveness in Eastern Africa: RCA and TTCI. *Heritage*, *6*(9), 5997–6015. [CrossRef]

Bennett, J., & Bennett, L. (2003). A review of factors that influence the diffusion of innovation when structuring a faculty training program. *The Internet and Higher Education*, *6*(1), 53–63. [CrossRef]

Bhorat, H., Signé, L., Asmal, Z., Monnakgotla, J., & Rooney, C. (2023). *Digitalization and digital skills gaps in Africa*. Available online: https://www.brookings.edu/global (accessed on 6 January 2025).

Chabi, P., & Saygılı, R. F. (2024). Trade openness and structural change dynamics in West African countries. *Journal of Economic Structures*, *13*(1), 6. [CrossRef]

Creswell, J. W. (2019). *Research design: Qualitative, quantitative and mixed methods approaches* (4th ed.). Sage. [CrossRef]

Diao, X., McMillan, M., & Rodrik, D. (2019). *The recent growth boom in developing economies: A structural-change perspective* (pp. 281–334). Springer International Publishing.

Di Tommaso, M. R., Prodi, E., Di Matteo, D., & Barbieri, E. (2025). Structural change and its discontents. *Structural Change and Economic Dynamics*, *72*, 438–455. [CrossRef]

Eifert, B., Gelb, A., & Ramachandran, V. (2008). The cost of doing business in Africa: Evidence from enterprise survey data. *World Development*, *36*(9), 1531–1546. [CrossRef]

Fabrice, N., Bertrand, N. A. S., & Adamou, N. (2024). Effects of information and communication technologies on structural change in Sub-Saharan Africa. *Journal of the Knowledge Economy*, 0123456789. [CrossRef]

Gabardo, F. A., & Pereima, J. B. (2017, July 25–27). *On the complex dynamics of structural change and growth: The role of consumption, innovation and finance* [Conference presentation]. XX Encontro de Economia da Região Sul, Porto Alegre, RS, Brazil.

Gollin, D. (2014). The lewis model: A 60-Year retrospective. *Journal of Economic Perspectives*, *28*(3), 71–90. [CrossRef]

Grabowski, R., & Self, S. (2024). Are the drivers of structural change different in Asia and Africa? *Applied Economics*, *56*(47), 5650–5664. [CrossRef]

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2018). *Multivariate data analysis* (8th ed.). Cengage Learning. [CrossRef]

Henseler, M., Maisonnave, H., & Maskaeva, A. (2022). Economic impacts of COVID-19 on the tourism sector in Tanzania. *Annals of Tourism Research Empirical Insights*, *3*(1), 100042. [CrossRef]

Hill, B. D. (2011). *The sequential Kaiser-Meyer-Olkin procedure: As an alternative for determining the number of factors in common-factor analysis* (Publication No. 3474663) [Doctoral dissertation, Oklahoma State University].

International Labour Organization. (2021). *Report on employment in Africa (Re-Africa): Tackling the youth employment challenge*. Available online: https://www.ilo.org/wcmsp5/groups/public/---africa/---ro-abidjan/documents/publication/wcms_753300.pdf (accessed on 6 January 2025).

Islam, S. N., & Iversen, K. (2018). *From "Structural Change" to "Transformative Change": Rationale and implications*. DESA Working Paper, No. 155. DESA.

Karimu, S. (2019). *Structural transformation, openness, and productivity growth in sub-Saharan Africa*. WIDER Working Paper 2019/109. UNU-WIDER. [CrossRef]

Ketels, C. (2017). *Structural transformation: A competitiveness-based view* (pp. 1–31). Working Paper Series N° 258; African Development Bank.

Kothari, C. R. (2008). *Research methodology: Methods and techniques*. New Age International Publishers.

Kuznets, S. (1955). Economic growth and income inequality. *American Economic Review*, *45*(1), 1–28.

Kuznets, S. (1959). 'On the comparative structure of economic structure and the growth of Nations'. In R. Goldsmith (Ed.), *The comparative study of economic growth and structure* (pp. 162–176). National Bureau of Economics Research.

Lam, D., Leibbrandt, M., & Allen, J. (2019). *The demography of the labor force in Sub-Saharan Africa: Challenges and opportunities (GLM | LIC Synthesis Paper No. 10)*. IZA.

Laroche, M., Mérette, M., & Ruggeri, G. C. (1999). On the concept and dimensions of human capital in a knowledge-based economy context. *Canadian Public Policy/Analyse de Politiques*, *25*(1), 87–100. [CrossRef]

Leeson, P. F. (1979). The Lewis model and development theory. *The Manchester School*, *47*(3), 196–210. [CrossRef]

Lewis, W. A. (1954). 'Economic Development with Unlimited Supplies of Labour'. *The Manchester School*, *22*(2), 139–191. [CrossRef]

Lopes, C., & Kararach, G. (2019). *Structural change in Africa: Misperceptions, new narratives and development in the 21st century*. Routledge.

Malah Kuete, Y. F., & Asongu, S. A. (2023). Infrastructure development as a prerequisite for structural change in Africa. *Journal of the Knowledge Economy*, *14*(2), 1386–1412. [CrossRef]

Malhotra, N. (2006). *Pesquisa de marketing: Uma orientação aplicada, 4ª edição*. Bookman.

Marsiglio, S. (2018). On the implications of tourism specialization and structural change in tourism destinations. *Tourism Economics*, *24*(8), 945–962. [CrossRef]

Matthess, M., & Kunkel, S. (2020). Structural change and digitalization in developing countries: Conceptually linking the two transformations. *Technology in Society*, *63*, 101428. [CrossRef]

McMillan, M., Rodrik, D., & Sepúlveda, C. (Eds.). (2016). *Structural change, fundamentals, and growth: A framework and case studies*. International Food Policy Research Institute. [CrossRef]

Mensah, E. B. (2020). *Structural change in developing countries: Patterns, causes and consequences* [Doctoral thesis, Maastricht University]. ProefschriftMaken. [CrossRef]

Mensah, E., Owusu, S., Foster-McGregor, N., & Szirmai, A. (2023). Structural change, productivity growth and labour market turbulence in Sub-Saharan Africa. *Journal of African Economies*, *32*(3), 175–208. [CrossRef]

Minami, R., & Ma, X. (2014). Labor market and The lewisian turning point in China. In *Lewisian turning point in the Chinese economy: Comparison with east asian countries* (pp. 76–100). Palgrave Macmillan UK. [CrossRef]

Mintsa, J. S., & Ndongfack, M. (2017). Strategic analysis of destination image and positioning: Case study of Cameroon. *Journal of Tourism, Heritage & Services Marketing*, *3*(1), 25–33.

Mohajan, H. K. (2017). Two criteria for good measurements in research: Validity and reliability. Annals of Spiru Haret University. *Economic Series*, *17*(4), 59–82. [CrossRef]

Muluh, G. A., Dieubenit, T. M., & Gildas, N. T. (2022). Technological innovations and structural transformation in African economies. *International Journal of Innovative Technologies in Economy*, *2*(38), 31–34. [CrossRef]

Nayyar, D. (2019). *Resurgent Asia: Diversity in development*. Oxford University Press. [CrossRef]

Nguimkeu, P., & Zeufack, A. (2024). Manufacturing in structural change in Africa. *World Development*, *177*(January), 106542. [CrossRef]

Nyasha, S., Odhiambo, N. M., & Asongu, S. A. (2021). The impact of tourism development on economic growth in Sub-Saharan Africa. *European Journal of Development Research*, *33*(6), 1514–1535. [CrossRef]

Ofori, I. K., Dossou, T. A. M., & Akadiri, S. S. (2022). Towards the quest to reduce income inequality in Africa: Is there a synergy between tourism development and governance? *Current Issues in Tourism*, *26*(3), 429–449. [CrossRef]

Page, J. (2016). Africa's economic transformation. *The Journal of Economic Perspectives*, *30*(3), 33–50.

Rodrik, D. (2013). *Structural change, fundamentals, and growth: An overview* (p. 23). Institute for Advanced Study.

Rodrik, D. (2016). Premature deindustrialization. *Journal of Economic Growth*, *21*(1), 1–33. [CrossRef]

Rogers, E. M. (1962). *Diffusion of innovations*. Free Press.

Roztocki, N., Soja, P., & Weistroffer, H. R. (2019). The role of information and communication technologies in socioeconomic development: Towards a multi-dimensional framework. *Information Technology for Development*, *25*(2), 171–183. [CrossRef]

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson Education.

Sen, K. (2023). *Varieties of structural transformation: Patterns, determinants, and consequences*. Cambridge University Press.

Ssozi, J., & Bbaale, E. (2019). The effects of the catch-up mechanism on the structural transformation of sub-Saharan Africa. *Economies*, *7*(4), 111. [CrossRef]

Stiglitz, J. E. (2018). Where modern macroeconomics went wrong. *Oxford Review of Economic Policy*, *34*(1–2), 70–106. [CrossRef]

United Nations Department of Economic and Social Affairs. (2024). *E-Government Survey 2024: Accelerating digital transformation for sustainable development*. United Nations.

United Nations Development Programme. (2021). *Accessing education: Technology's potential for divergence and convergence*. UNDP.

van der Schyff, T., Meyer, D., & Ferreira, L. (2019). Analysis of the impact of tourism sector as a viable response to South Africa's growth and development challenges. *Journal of International Studies*, *12*(1), 168–183. [CrossRef]

Vivarelli, M. (2021). Globalization, structural change and innovation in emerging economies: The impact on employment and skills. *SSRN Electronic Journal [Preprint]*, *11849*. [CrossRef]

World Bank. (2019). *World development report 2019: The changing nature of work*. World Bank. [CrossRef]

World Bank. (2023). *The World Bank in Africa*. Available online: https://www.worldbank.org/en/region/afr/overview (accessed on 16 April 2024).

Zuo, B., & Huang, S. (2020). A structural change and productivity perspective of tourism's contribution to economic growth: The case of Zhangjiajie in China. *Journal of Travel Research*, *59*(3), 465–476. [CrossRef]

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.