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Human Capital, Structural Transformation, and the Productivity Puzzle in Sub-Saharan Africa: A Structured Narrative Review[1]

Ayodeji B. AJIBOLA ✉
National Research University "Higher School of Economics", Moscow, Russian Federation

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Abstract. Education has expanded rapidly in Sub-Saharan Africa, yet productivity growth, formal employment, and structural transformation remain uneven. This divergence raises an important question: Why has the growth of human capital failed to translate consistently into structural transformation across the region? This paper addresses this question through a structured narrative review of 113 formal-corpus sources identified through structured searches and a documented curated pool. The answer lies in three interconnected dimensions of structural absorption, defined here as an economy's capacity to turn skills into higher-productivity employment. First, labour has moved disproportionately into services, which often generate short-term productivity gains rather than the sustained gains historically associated with manufacturing. Education is therefore more likely to contribute to productivity growth when it provides skills that match the needs of productive activities. Second, demographic growth is increasing the need for new jobs faster than demand for skilled labour is expanding. This limits access to salaried employment for growing cohorts and increases pressure on labour absorption. Third, historically rooted institutional differences continue to shape the distribution of human capital and productive activity. Firm-level evidence also shows that higher productivity does not always lead to employment growth. These factors interact differently across subregions. They help explain why renewed industrialisation in some economies coexists with persistent informality, while others face premature deindustrialisation and uneven productivity convergence. The findings highlight the need to align education reform with productive job creation, firm upgrading, and region-specific approaches to structural transformation.

Keywords: human capital, structural transformation, productivity, labour absorption, demographic transition, premature deindustrialization, services, Sub-Saharan Africa

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ОБЗОРНАЯ СТАТЬЯ

Человеческий капитал, структурная трансформация и загадка производительности Субсахарской Африки: структурированный нарративный обзор

Айоделжи Б. АДЖИБОЛА ✉
Национальный исследовательский университет «Высшая школа экономики», г. Москва, Российская Федерация

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Аннотация. Уровень образования населения в Субсахарской Африке быстро растет, однако темпы роста производительности труда, формальной занятости и отраслевого роста остаются неравномерными. Это расхождение обусловливает необходимость проведения структурированного нарративного обзора причин, по которым растущий запас человеческого капитала не приводит к последовательной структурной трансформации в регионе. На базе анализа 113 источников, отобранных посредством структурированного поиска в базах данных ScienceDirect и Google Scholar, сделан обзор, в котором показано, что проблема отражает три взаимосвязанных измерения структурной абсорбции, понимаемой здесь как способность экономики преобразовывать навыки в высокопроизводительную занятость. Во-первых, перераспределение рабочей силы непропорционально смещается в сторону услуг, которые обеспечивают статичный, разовый прирост производительности, а не устойчивый прирост, исторически связанный с обрабатывающей промышленностью, поэтому образование вносит более последовательный вклад там, где оно дает полезные навыки, соответствующие видам деятельности, которые их вознаграждают. Во-вторых, демографический импульс увеличивает потребность в создании рабочих мест быстрее, чем растет спрос на высококвалифицированную рабочую силу, что снижает доступ к оплачиваемой работе для больших групп населения и увеличивает безработицу. В-третьих, исторически сложившиеся институциональные различия продолжают формировать распределение человеческого капитала и производственной активности, в то время как данные на уровне предприятий показывают, что рост производительности не всегда приводит к росту занятости. Эти факторы взаимодействуют по-разному в разных субрегионах и помогают объяснить, почему возобновление индустриализации в одних странах сосуществует с сохраняющейся неформальной экономикой, преждевременной деиндустриализацией в других и неравномерной конвергенцией производительности. Полученные результаты подтверждают необходимость политики, которая связывает реформу образования с созданием продуктивных рабочих мест, модернизацией предприятий и региональными стратегиями трансформации.

Ключевые слова: человеческий капитал, структурная трансформация, производительность, поглощение рабочей силы, демографический переход, преждевременная деиндустриализация, сфера услуг, Субсахарская Африка

1. Introduction

Sub-Saharan Africa (SSA) has experienced a substantial expansion of education over the past three decades, yet productivity growth, formal employment, and structural transformation have remained uneven. This raises a persistent question in African development: why has the expansion of schooling translated so unevenly into productivity growth and structural transformation?

This tension is evident in aggregate regional trends. As Figure 1 shows, upper-secondary enrolment increased markedly from the late 1990s, while real GDP per capita rose more gradually and manufacturing value added declined as a share of GDP. These patterns are descriptive rather than causal and mask considerable variation across

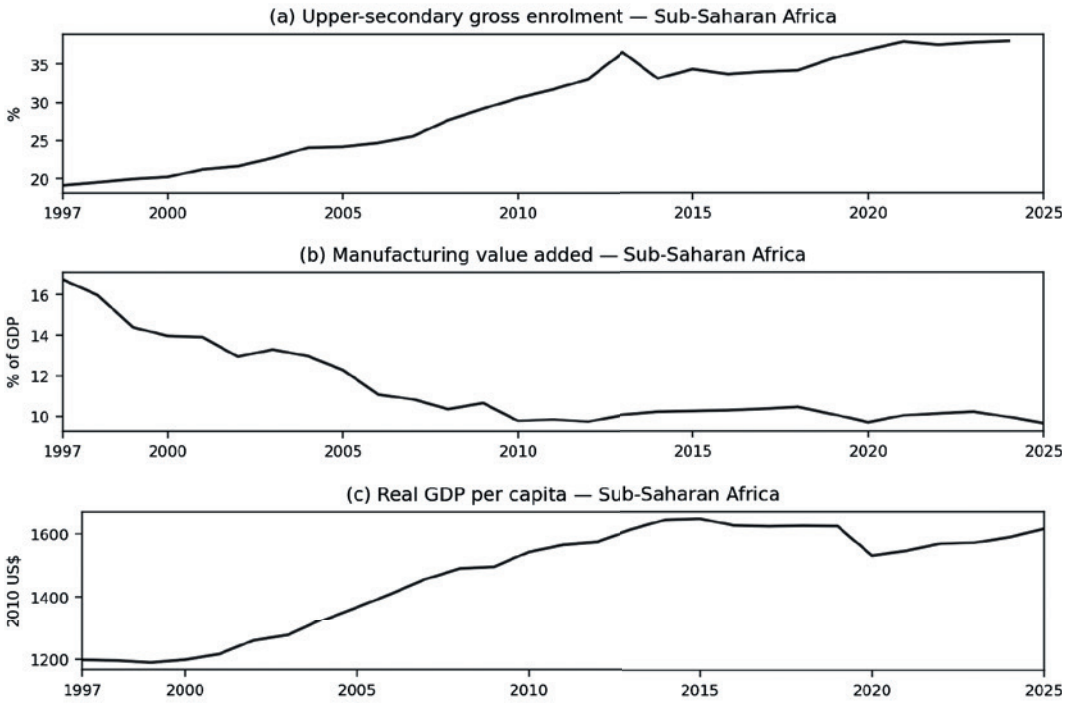


Fig. 1. *Education Expansion, Manufacturing Share and Real Income in Sub-Saharan Africa*
Source: UNESCO Institute for Statistics (2026), Upper-Secondary Gross Enrolment, World Bank Regional Aggregate as Processed by Our World in Data; World Bank World Development Indicators (2026), Manufacturing Value Added (% of GDP); World Bank WDI Via FRED, Real GDP Per Capita (Constant 2010 US$).

countries, but they illustrate the gap between the expansion of human capital and the pace and nature of structural transformation.

Human-capital theory provides one part of the answer by linking education to worker productivity, innovation, and technological diffusion (Schultz, 1961; Lucas, 1988; Benhabib & Spiegel, 1994). Structural-transformation theory points to a second mechanism: aggregate productivity can increase when labour and other resources move towards activities with higher productivity and greater potential for learning and technological upgrading (Lewis, 1954; Duarte & Restuccia, 2010; Herrendorf et al., 2014). Evidence from African economies suggests that both mechanisms matter. Labour reallocation contributed positively to productivity growth in parts of the post-2000 period, although the magnitude and direction of these effects varied across countries, working-time adjustments, and the sectors receiving labour (McMillan et al., 2014; McCullough, 2017; Mensah et al., 2023b).

Yet an expansion in schooling does not necessarily translate into productive employment or structural transformation. The outcome depends not only on the skills acquired, but also on whether firms and sectors generate sufficient demand for those skills. Learning deficits remain substantial in many African education systems (Bold et al., 2017; Arias et al., 2019). At the same time, formal wage employment remains limited, while agriculture and household enterprises continue to absorb a large share of new labour-market entrants (Fox et al., 2013; Filmer & Fox, 2014; Fox et al., 2016).

Rapid demographic growth further increases the number of jobs that economies need to generate each year. At the firm level, the adoption of capital-intensive technologies can create an additional constraint when increases in productivity and output are not accompanied by comparable increases in employment (Diao et al., 2025; Tinta, 2025).

These patterns point to a broader issue of how effectively economies can connect human capital with productive opportunities. Human-capital quality and deployment, differences in structural-transformation paths, demographic pressures, institutional conditions, and firm-level capabilities all shape this process. Earlier research shows that productive employment has expanded more slowly than labour-force entry in many African economies (Losch, 2016; Benjamin & Mbaye, 2020), but less attention has been given to why this imbalance produces different productivity and employment outcomes across countries and sectors.

This article uses structural absorption as an organising concept for this problem. The concept refers to an economy's capacity to absorb an expanding and increasingly educated labour force into productive activities. It brings together several dimensions that are often examined separately: the quality and distribution of human capital, sectoral demand for labour, demographic dynamics, institutions, and firms' capacity to adopt and productively deploy technology. This perspective is particularly relevant in SSA, where structural transformation has followed diverse paths. Services-led reallocation can generate productivity gains without the sustained learning traditionally associated with manufacturing (McMillan et al., 2014; Rodrik, 2016), while premature deindustrialisation may narrow an important historical channel through which skills contribute to productivity growth (Rodrik, 2016). At the same time, colonial and pre-colonial institutional legacies continue to shape the spatial distribution of human capital and productive activity (Michalopoulos & Papaioannou, 2013, 2020; Cogneau & Moradi, 2014).

Against this background, the article addresses three questions:

1. Under what conditions does human capital contribute to productivity growth and structural transformation in SSA?

2. How do structural-transformation paths differ across African subregions and major country cases?

3. How do demographic dynamics, institutions, sectoral demand, and firm capabilities shape the conversion of skills into productive employment?

By bringing these dimensions together, the article examines why similar increases in educational attainment can produce different economic outcomes across African economies. The structural-absorption perspective provides a framework for understanding how the supply of skills interacts with the capacity of sectors and firms to use them productively, and why improvements in education alone may not be sufficient to generate broad-based productivity growth and structural transformation.

2. Review Design, Evidence Base and Methodology

2.1. Review Design and Search

This study is a structured narrative review of literature on sectoral decompositions, cross-country panels, household surveys, firm panels, historical quasi-experiments, policy diagnostics and theoretical models that estimate different quantities and cannot support a common pooled effect (Grant & Booth, 2009; Snyder, 2019). The design prioritises reproducible thematic coverage and disciplined comparison across methods

and settings. Reporting and evidence presentation were also checked against SANRA's narrative-review criteria on search description, referencing, scientific reasoning, evidence level and relevant endpoint data (Baethge et al., 2019).

Searches were conducted in ScienceDirect and Google Scholar over a 1980–2026 window, supplemented by backward and forward citation tracking and targeted retrieval of foundational and Africa-specific studies. Search blocks combined terms for structural transformation, productivity, industrialisation, services, human capital, skills, demography, institutions, firms, technology and SSA. Table 1 summarizes the exact strings, platform counts, and screening fields.

Table 1

Search Strategy

ID	Platform	Theme	Exact search string	Actual CSV
SD-S1	Science-Direct	Structural transformation / institutions	"Sub-Saharan Africa" AND "structural transformation" OR "sectoral reallocation" AND "skill absorption" AND "demographic transition" AND "premature deindustrialization" AND "labor absorption" AND "productivity puzzle" AND "Regional heterogeneity within Africa"	100
SD-S2	Science-Direct	Human capital / skills / firms	"Africa" AND "between-sector productivity" OR "within-sector productivity" AND "cognitive skill" OR "learning outcomes" OR "education quality" AND "employment" OR "labour absorption" AND "firm"	84
SD-S3	Science-Direct	Services-led sectors / informality	"Sub-Saharan Africa" AND AND "services-led development" AND "between-sector productivity" OR "within-sector productivity" AND "labor absorption" OR informality"	58
SD-S4	Science-Direct	Demography / technology / misallocation	"SUB-SAHARAN AFRICA" AND "demographic transition" OR fertility OR "population growth" AND "productivity puzzle" AND "technology" OR "technology adoption" AND misallocation OR "resource misallocation"	72
GS-S1	Google Scholar	Structural transformation / institutions	Sub-Saharan Africa AND structural transformation OR sectoral reallocation AND skill absorption AND demographic transition AND premature deindustrialisation AND labor absorption AND productivity puzzle AND Regional heterogeneity within Africa	48
GS-S2	Google Scholar	Human capital / skills / firms	"Africa" AND "between-sector productivity" OR "within-sector productivity" AND "cognitive skill" OR "learning outcomes" OR "education quality" AND "employment" OR "labour absorption" AND "firm"	47
GS-S3	Google Scholar	Services-led sectors / informality	"Sub-Saharan Africa" AND AND "services-led development" AND "between-sector productivity" OR "within-sector productivity" AND "labor absorption" OR informality"	18
GS-S4	Google Scholar	Demography / technology / misallocation	"SUB-SAHARAN AFRICA" AND "demographic transition" OR "population growth" AND "technology adoption" AND "resource misallocation"	26

Source: compiled by the author, 2026.

2.2. Evidence Base and Study Scope

Eight search sets across ScienceDirect and Google Scholar yielded 453 records; deduplication left 433, and title/abstract screening retained 155. These records were merged with a 120-source curated pool assembled during scoping, producing 269 unique candidates after six overlaps were removed. Detailed assessment focused on 88 records: 62 newly identified high-priority studies and 26 curated studies requiring confirmatory assessment. The remaining candidates comprised curated records already classified during scoping and lower-priority reserve records retained for gap-filling. Eighty-four of the 88 assessed records were retained, and 26 foundational or methodological sources from the classified pool produced an initial corpus of 110. A final targeted citation audit added Bandiera et al. (2022), Haraguchi et al. (2017) and Kruse et al. (2023) because they filled specific gaps in the demographic, deindustrialisation and industrialisation evidence, yielding a formal corpus of 113 sources. Eighteen additional references provide theory, review methodology or contextual interpretation outside the structured empirical corpus. Table 2 below reports the full sequence.

2.3. Eligibility, Appraisal and Synthesis

Studies were eligible when they addressed at least one link among human capital, sectoral change, productivity, employment, demography, institutions or firm capability

Table 2

Screening Flow and Construction of the Formal Review Corpus

Stage	Records	Decision / operation
Search exports	453	Actual rows in the eight ScienceDirect and Google Scholar CSV exports
Deduplication	433	18 exact-title duplicates removed and 2 near-duplicate records merged
Title/abstract screening	155 retained; 278 excluded	Eligibility based on SSA relevance and direct connection to the review domains
Merge with curated pool	269 unique candidates	155 search records merged with a 120-source curated pool; 6 overlaps, 149 new candidates
Priority eligibility review	88 assessed	62 new records plus 26 curated records requiring confirmatory assessment
Priority records retained	84	61 core analytical and 23 supporting / background; 4 excluded
Foundational/methodological sources	+26	Selected from the curated pool for distinct theoretical or methodological functions
Initial formal corpus	110	84 retained priority records plus 26 foundational / methodological sources
Targeted citation audit	+3	Bandiera et al. (2022), Haraguchi et al. (2017) and Kruse et al. (2023), added to strengthen three evidence gaps
Final formal corpus	113	Initial 110-source corpus plus 3 targeted empirical additions
Complete bibliography	131	113 formal-corpus sources plus 18 theory, review-methodology, benchmark and contextual references outside the structured empirical corpus

Source: compiled by the author, 2026

in SSA, or supplied a necessary comparative framework. Evidence was weighted by research design, geographical fit, measurement quality and relevance to the review questions. Quasi-experimental and credible instrumental-variable designs receive greater weight for causal claims; sectoral decompositions are treated as accounting evidence; and observational panels are interpreted as conditional associations unless their identification strategy supports stronger inference. Quantitative magnitudes are reported when they clarify a mechanism.

3. Results

3.1. Stylised Facts: The Empirical Pattern to be Explained

Education, sectoral reallocation and firm growth have all advanced across SSA over the past three decades, but their combination has produced markedly different rates of productivity growth and employment upgrading across countries. Seven recurring observations organise this pattern and are developed in the thematic sections that follow.

The first two patterns concern the productivity mechanics of labour reallocation. Sectoral productivity gaps are large in national accounts data but shrink substantially once labour inputs are measured more carefully, which lowers the productivity gain that reallocation alone can plausibly deliver. Even where reallocation has turned positive, within-sector productivity growth remains a major source of aggregate gains. SSA's post-2000 structural-change contribution is therefore important, although it explains only part of the region's productivity record.

The next two locate the problem spatially and by destination. Regional trajectories differ sharply: South Africa combines a mature but contracting industrial base with high unemployment; East Africa has experienced agricultural exit alongside uneven industrial and service growth; West Africa combines resource dependence with persistent informality; and North Africa has a distinct demographic and urban starting point. Within each trajectory, the destination of displaced agricultural labour matters because some activities sustain productivity growth while others provide only an initial level gain.

Two further observations connect allocation to labour supply. Schooling has expanded faster than learning quality and the availability of skill-using jobs in many settings, so rising enrolment has not translated proportionately into productive capability. Demographic pressure intensifies this mismatch because wage-employment growth continues to lag labour-force entry and larger youth cohorts face measurably poorer salaried-employment prospects.

The final observation moves the explanation from sectors to firms: productivity and employment growth often concentrate in different enterprises, and the most productive or innovative firms are not necessarily those absorbing the most labour. Table 3 presents these seven patterns and shows where the subsequent sections develop each one.

3.2. Regional Trajectories

Africa's regional variation is easier to interpret against a general theory of development paths than as a set of independent country narratives. East Asia's manufacturing-led industrialisation converted rising human capital into sustained productivity growth by moving workers into activities with continuous learning and scale economies; Latin America's earlier, more premature deindustrialisation shows how the same reallocation can stall when manufacturing loses employment share

Table 3

Seven Stylised Facts and Their Structural-Absorption Implications

Stylised fact	Implication for structural absorption	Developed in section	Representative supporting studies
1. Sectoral productivity gaps	Large sector gaps create reallocation potential, but hours-worked adjustments reduce the apparent gain from moving labour	3.4	Gollin et al. (2014); McCullough (2017); McMillan et al. (2014)
2. Within-sector growth remains central	Positive reallocation contributes to growth most strongly when productivity also improves within sectors	3.4	McMillan et al. (2014); Charpe (2023); Azenui & Rada (2021)
3. Regional trajectories diverge	Different regional production structures create different absorption constraints and policy needs	3.2	Diao et al. (2017); Rodrik (2008); Breisinger et al. (2014)
4. Destination matters	The productivity effect of labour movement depends on the sectors and activities that receive workers	3.4	De Vries et al. (2015); Yeboah & Jayne (2018); McMillan & Zeufack (2022)
5. Human-capital deployment is conditional	Schooling raises potential skill supply; learning quality and skill-using jobs determine how much becomes productive capability	3.5	Bold et al. (2017); Arias et al. (2019); Angrist et al. (2021)
6. Demographic absorption pressure	Rapid cohort growth raises job-creation requirements and intensifies competition when skill-intensive demand expands more slowly	3.3	Garenne & Joseph (2002); Fox et al. (2013); Filmer & Fox (2014)
7. Firm heterogeneity	Aggregate productivity gains spread more broadly when high-productivity firms also expand employment and labour-absorbing firms upgrade	3.7	Söderbom & Teal (2004); Van Biesebroeck (2005); Barasa et al. (2019)

Source: compiled by the author, 2026

before absorbing a comparable share of the labour force (Rodrik, 2016). Rodrik's (2016) comparison of manufacturing-employment peaks, around $14,000 in 1990 dollars for early Western European industrialisers against roughly $700 for India and many SSA economies, places most of the region closer to the premature-deindustrialisation pattern, though with substantial variation across countries and subregions. The four subregional accounts below use this framework to ask whether the constraint on structural absorption looks like a demand-side failure to generate manufacturing employment, a supply-side mismatch in where skills and firms are located, or a combination distinctive to that subregion's institutional and resource endowments.

3.2.1. North Africa

North Africa enters the comparison from a markedly different demographic and structural starting point. Losch (2016) groups the five North African states with South Africa as comparatively urbanised, diversified and lower-fertility, while UN WPP estimates confirm that fertility remained below the SSA average despite post-2008 increases in Egypt and Algeria. The region serves as an external comparison to the formal SSA synthesis. Relative to the East Asia / Latin America benchmark, its higher urbanisation and earlier demographic transition place it closer to conditions associated with successful labour reallocation, although its manufacturing trajectory has not reproduced East Asia's scale-intensive, export-oriented industrialisation.

3.2.2. East Africa: Agricultural Exit and Uneven Firm Scaling

Ethiopia pursued one of the region's most explicit state-led industrialisation strategies, yet its employment and productivity outcomes reveal substantial absorption constraints. Labour shifted out of agriculture largely into low-productivity informal services, manufacturing's employment share declined despite sustained policy support, and aggregate productivity growth came mainly from within-sector gains (Gebreeyesus & Abegaz, 2025). This contrasts with the more positive reallocation pattern reported across a wider set of low-income African economies, where manufacturing's employment share is still expanding, albeit slowly (Diao et al., 2017). Firm-level evidence sharpens the contrast: panels from Ethiopia and Tanzania show that firms leading in productivity growth were not the main source of employment expansion (Diao et al., 2025), while Kenya exhibits a related pattern in which informal employment remains dominant as youth skill levels rise (Balwanz, 2013). Across East African manufacturing, institutions and firms' internal learning capabilities influence how far innovation translates into efficiency gains (Barasa et al., 2017, 2019), and internal migration can raise employment probability, with gains varying by education and destination (Chalie, 2026). This combination of labour movement into low-productivity services and a declining manufacturing employment share places Ethiopia closer to a premature-deindustrialisation path than to the East Asian pattern, despite sustained state-led industrial policy.

3.2.3. West and Central Africa: Resources, Informality and Formal-Sector Depth

West Africa is represented by a larger body of evidence than Central Africa. Ghana's simulated oil-led growth path shows Dutch-disease effects could constrain economy-wide transformation unless revenues are channelled into productive investment (Breisinger et al., 2014), consistent with broader evidence that natural-resource dependence depresses growth in non-resource sectors across SSA (Asiamah et al., 2022), though this structural effect varies with the depth of financial development (Nwani et al., 2023). Commodity sectors can instead support industrialisation where policy deliberately builds domestic linkages and capabilities (Morris & Fessehaie, 2014), while in Francophone Africa persistent informality coincides with slow expansion of formal firms (Benjamin & Mbaye, 2020).

Nigerian manufacturing evidence reveals both a demand-side industrial constraint and a distributional one. Using financial data from 36 of 44 manufacturing companies listed on the Nigerian Stock Exchange (2009–2020), Wolf (2023) finds industrial policy and infrastructure-led demand growth drove rapid capital accumulation in building materials, but wage and tax growth lagged well behind profit growth, so purchasing power did not diffuse into a broader consumer base; the food and beverage sector, Nigeria's largest manufacturing sub-sector, grew more slowly and shed workers even as productivity rose, so expansion was output- and productivity-led without being labour-absorbing in its largest sub-sector.

Applying machine-learning methods to nightlight satellite data, Otchia and Asongu (2021) identify natural resources, agricultural growth, institutions and manufacturing imports as the main correlates of industrial growth across SSA, arguing for a multisector approach rather than industry-led policy alone. Resource dependence and persistent informality place West and Central Africa's structural-absorption problem closer to a demand-side failure to generate manufacturing employment at scale, with Nigeria's evidence showing the constraint on absorption can be distributional as much as sectoral.

3.2.4. Southern Africa: Industrial Maturity and Labour-Market Exclusion

South Africa combines the region's deepest industrial base with long-run manufacturing contraction, high unemployment and capital intensity. Manufacturing's share of the labour force fell from roughly 12 % in the mid-1980s to below 7 % by 2000, with formal manufacturing employment declining from 1.6 million in 1990 to 1.2 million in 2004 (Rodrik, 2008). This decline is attributed mainly to falling relative profitability rather than wage-push factors, with productivity growth itself reducing employment (an elasticity of roughly -0.2) even as output rose, a direct instance of the productivity-without-absorption pattern traced elsewhere in this review. The contraction matters beyond the sector itself given manufacturing's strong backward linkages and disproportionate role in economy-wide demand (Tregenna, 2008, 2009; Andreoni & Tregenna, 2021).

Stokke (2008) shows how resource booms, sectoral productivity and real-exchange-rate adjustment can further reshape South Africa's structural path. Recent evidence provides limited support for a sustained manufacturing recovery: firm- and worker-level distortions continue to constrain productive reallocation and worker progression (Newman, 2026), while Industry 4.0 is associated with manufacturing value added and a changing skill composition of employment (Ngepah et al., 2024). Mauritius followed a contrasting trajectory: Subramanian and Roy (2001) find that openness to trade and FDI and institutional quality are incomplete explanations on their own, and point to idiosyncratic factors in how the country's ethnic and economic diversity was politically managed. South Africa's combination of a mature industrial base and persistent employment contraction therefore illustrates a form of premature deindustrialisation that followed an earlier phase of industrial development.

3.3. Demographic Pressure, Skill Demand and Labour Absorption

Demography affects the composition and returns of labour as well as the number of jobs required. Fertility decline began earlier in many African urban areas than national averages imply, and the transition remains slow and uneven across SSA (Garenne & Joseph, 2002; Bongaarts & Casterline, 2013; Bongaarts, 2017). The resulting age structure expands labour supply for years after fertility begins to fall, raising potential output as a larger working-age share enters productive employment (Canning et al., 2015), while intensifying pressure on land and accelerating movement into non-farm work (Thurlow et al., 2019).

Drawing on evidence from 28 African countries, Fox et al. (2013) show that the number of new labour-market entrants is large relative to the existing number of wage jobs. Even with sustained economic growth, household farms and enterprises continue to absorb most new workers because wage employment starts from a relatively small base. Filmer and Fox (2014) project industrial wage jobs growing by 55 % and the service wage share from 13 % to 22 % over the decade, but from a base small enough that agriculture and household enterprises still absorb the large majority of labour-force growth.

Using harmonised data from 68 low- and middle-income countries, Bandiera et al. (2022) find young adults in Africa less likely to hold salaried jobs than peers at comparable development levels, with the disadvantage larger for bigger cohorts. Youth employment varies with macroeconomic conditions, demographic structure and sectoral composition (Anyanwu, 2013), and a 41-country panel confirms the youth bulge as a supply-side driver of unemployment alongside slow job creation on the demand side (Baah-Boateng, 2016). Productive job creation is accordingly central to the policy response (Fox et al., 2016; ILO, 2024).

The imbalance also affects relative returns to skills: when cohorts of secondary- and tertiary-educated entrants grow faster than vacancies in skill-intensive firms, competition rises, and adjustment can appear as unemployment, occupational downgrading, or informal self-employment, which continue to dominate African employment trends (Yeboah & Jayne, 2018). Balwanz (2013) documents this tension between skill development and informal opportunities in Kenya. For Burkina Faso, Ouédraogo and Traoré (2026) find the return to education statistically indistinguishable between formal and informal employment, with the earnings gap instead reflecting a formality premium of roughly 76 % and education contributing an independent ~44 % gain through human-capital channels rather than differential sectoral pricing.

Recent micro evidence shows that employment can shift towards less-educated workers even as aggregate attainment rises. Road-induced competition in Ethiopia lowers informal firms' capital intensity and shifts employment towards workers without primary education, with informal wages and productivity unchanged (Perra et al., 2024). Larger manufacturers' capital-intensive techniques are similarly associated with slower employment expansion than at smaller firms (Diao et al., 2025). Rapid labour-force growth can therefore coincide with slow skill-intensive employment growth when expanding activities are low-capital informal firms or frontier firms use labour sparingly.

Absorption pressure also appears through underemployment, mobility constraints and labour-force detachment. Fox and Thomas (2016) emphasise underemployment and job quality, and the ILO (2024) reports about 53 million young people in SSA not in employment, education or training in 2023. Rural-urban migration rates remain low in several settings despite sizeable potential gains (De Brauw et al., 2014; Girard, 2023), while cross-border mobility raises labour productivity mainly through total factor productivity and capital efficiency, with particularly strong gains in services (Gnimassoun, 2025).

The demographic evidence is strongest on job-creation pressure and access to salaried work: larger cohorts face poorer prospects, and rapid labour-force growth leaves agriculture, household enterprises and informal work carrying much of the adjustment (Filmer & Fox, 2014; Bandiera et al., 2022). Evidence remains thinner on the next step, from relative skill supply to wage premia and firms' technology choices.

3.4. Industrialisation, Deindustrialisation and Services

Manufacturing remains central because tradability, scale, learning and production linkages support sustained productivity growth. Rodrik (2016) documents the manufacturing-employment hump shifting downward and toward lower income levels: employment peaked at incomes of about $14,000 (1990 dollars) among early Western European industrialisers but only around $700 in India and many SSA countries, illustrating rather than formally estimating the logic of premature deindustrialisation. Export capability, infrastructure and state coordination are identified as complements to manufacturing growth (Ajakaiye & Page, 2012; Aryeetey & Moyo, 2012; Page, 2012; Mijiyawa, 2017), while trade and financial integration also condition structural transformation (Alagidede et al., 2020).

Recent evidence challenges a uniform deindustrialisation interpretation. Nguimkeu and Zeufack (2024) find no general collapse of manufacturing employment across Africa, with conclusions depending on the indicator used, while Haraguchi et al. (2017) show that manufacturing's global contribution to value added and employment remained

broadly stable after 1970. More recent evidence from the Economic Transformation Database, covering 51 economies over 1990–2018, points to renewed industrialisation in several low-income countries in Asia and SSA, partly driven by employment growth in unregistered firms (Kruse et al., 2023). These findings support a measurement- and country-specific assessment of deindustrialisation that considers employment, value added, firm type and timing together.

Services absorb much of the labour leaving agriculture. Distributive-trade employment in the 11-country Africa Sector Database rose from about 11 % in 1990 to 20 % in 2010, generating static gains since its productivity exceeded agriculture's, though slow subsequent productivity growth produced dynamic losses (De Vries et al., 2015). Service composition matters: ICT, finance and professional services differ from retail, accommodation and personal services in skill, scale and tradability (Nayyar et al., 2021), and South African evidence identifies tradable and business services as potential sources of productivity and employment growth (Asmal & Rooney, 2026).

Resource dependence can weaken diversification through several channels: distorting agricultural development (Dorinet et al., 2021), depressing non-resource sectors (Asiamah et al., 2022), and generating Dutch-disease effects through large mining sectors, though domestic and foreign sectoral productivity matter more than trade integration in an 11-country open-economy model (De Vries et al., 2026). These effects vary with resource type and institutions (Huang et al., 2026), and commodity sectors can instead support industrialisation where policy builds local processing and supplier linkages (Morris & Fessehaie, 2014). Energy-price volatility adds a further labour-market channel, strengthening the case for reducing production's exposure to volatile costs (Augustin & Nkemgha, 2026).

Agricultural productivity can support structural transformation through higher farm returns, market integration and labour release. Intensification and market orientation raise within-agriculture returns (Aihounton & Christiaensen, 2024), commercial farming generates heterogeneous spillovers to neighbouring smallholders in Mozambique (Glover & Jones, 2019), and farm location shapes occupational choice in Tanzania (Mtaturu, 2024). Trade openness conditions this relationship more broadly (Daymard, 2025), while FDI is positively associated with agricultural productivity in SSA (Joseph, 2025). The aggregate productivity effect ultimately depends on whether released labour enters activities with stronger and sustained productivity growth.

3.5. Human-Capital Quantity, Quality and Deployment

Human-capital studies point to the same mechanism: schooling contributes more consistently when it produces usable skills matched to activities that reward them, addressing Pritchett's (2001) broader puzzle that educational expansion need not translate mechanically into growth. African studies identify both quality and matching constraints: severe teacher-knowledge and effort deficits (Bold et al., 2017), mixed growth evidence overall (Glewwe et al., 2014), and differing contributions from foundational, technical and socio-behavioural skills (Arias et al., 2019). Learning-adjusted measures formalise the distinction between schooling years and acquired capability (Angrist et al., 2021).

Higher education can improve individual outcomes even when aggregate job creation and structural change proceed more slowly. Senegal's 2000 higher-education reform raised employment for young high-skilled workers by about nine percentage points relative to older cohorts (Boccanfuso et al., 2015), and in Burkina Faso education raises

youth earnings by about 44 % on average, operating mainly through direct human-capital channels rather than differential formal/informal returns (Ouédraogo & Traoré, 2026). Cognitive and non-cognitive skills jointly shape Kenyan youth outcomes (Onsomu et al., 2025), and capabilities link to livelihood strategies in Rwanda (Bird et al., 2022). Short-cycle tertiary expansion, by contrast, is associated with slower SSA growth, driven by a mismatch between programme content and labour-market needs, unlike the positive association found for primary and bachelor's-level attainment (Mutai et al., 2026). These findings locate the return to education in specific labour-market destinations rather than in attainment alone.

Cross-country estimates also link human capital to productivity and structural transformation. Woldemichael and Shimeles (2019) report a positive association. Using 43 SSA countries over 2000–2022, Gebrehiwot et al. (2025) estimate a human-capital coefficient of 0.160 (SE = 0.025) in their dynamic QML specification; the interaction between human capital and institutional quality is 0.012 (SE = 0.021) and statistically indistinguishable from zero. Das and Drine (2020) relate human capital to distance from the technology frontier, while Ndour (2026) finds that educational effects differ across agriculture, manufacturing and services.

Technology determines how effectively firms use workers' skills. Salmi et al. (2025) link advanced digital skills to the region's capacity to adopt new technologies. Myovella et al. (2020) find a positive digitalisation-growth relationship alongside a substantially smaller digital infrastructure base in SSA than in OECD economies, while Kanayo and Tian (2025) document education and skill transfer associated with Chinese private enterprises in Nigeria. The productivity return to human capital therefore varies with the technologies and jobs available to use it.

3.6. Institutions and Historical Legacies

Institutions shaped the initial supply of human capital and the spatial and social conditions governing its later productive use. Historical evidence points to two persistent channels, colonial education policy and extractive political institutions, while contemporary governance influences investment, mobility and allocation on top of those inherited conditions.

Colonial education policy created durable differences in where formal schooling expanded and who gained access to it. Mission schools accounted for the overwhelming majority of enrolment in British Africa in the early twentieth century, with British colonies' gross primary enrolment roughly two-and-a-half times that of French colonies by 1950, a gap Frankema (2012) attributes to a more permissive environment for missionary activity under British administration. Nunn (2014) reviews evidence that this variation produced persistent differences in educational attainment. Acemoglu et al. (2014) separate human-capital and institutional channels using settler mortality for institutions and historical missionary presence for human capital, finding independent effects of both on long-run development. Michalopoulos and Papaioannou (2020) identify a related institutional channel at colonial borders, while Cogneau and Moradi (2014) show that British and French educational policies on either side of the Ghana-Togo border produced persistent differences in human capital. Nunn (2008) adds an extractive channel through the long-run effects of slave-trade exposure, which Michalopoulos and Papaioannou (2013) relate to pre-colonial political organisation and contemporary institutional capacity.

These historical legacies also concentrated human capital geographically, particularly in the urban centres served by colonial missionary and administrative infrastructure (Michalopoulos & Papaioannou, 2013). Post-independence investment often reinforced these inherited spatial patterns. Geographic concentration can raise matching costs for firms outside major urban centres when they seek qualified workers, creating one plausible link between historical human-capital geography and contemporary firm behaviour. Firm-level studies discussed later document technology–skill mismatches and uneven employment scaling (Diao et al., 2025). However, the full causal chain linking colonial institutions to current technology choices has not been directly estimated.

Contemporary institutions influence structural transformation through investment incentives, resource allocation and the functioning of labour and product markets. Using a panel VAR for 18 SSA countries, Anya and Nzepang (2022) find that dependence of the legislature and judiciary on the executive reduces structural change and within-industry productivity, with judicial dependence producing the stronger effect. Forson et al. (2021) identify a non-linear relationship among innovation, institutions and growth. Haldar and Sethi (2022) find that the growth and structural-transformation effects of sectoral foreign aid vary with institutional quality and human capital. Kebede et al. (2024) similarly report that governance and human capital alter the structural effect of FDI across SSA and East Asia-Pacific comparators.

Recent studies identify employment and within-sector productivity as channels through which institutions affect structural outcomes. Gnangnon and Chen (2026) estimate how governments' compliance with constitutional rules affects sectoral employment in SSA. Gomado and Amedanou (2026) find that reforms in network sectors and employment protection reduce unemployment in selected African countries principally through within-sector improvements in dynamic, productive and allocative efficiency; effects on sectoral reallocation are less robust. Institutional reform can therefore raise productivity before substantial labour reallocation occurs.

Cross-country evidence also questions a simple model in which institutional quality must be high before human capital can influence structural transformation. Gebrehiwot et al. (2025) model institutional quality as a moderator of the human capital-structural transformation relationship across 43 SSA countries and find the interaction term statistically indistinguishable from zero across all six disaggregated Worldwide Governance Indicators, even though human capital and institutional quality are each independently significant. Their estimates support interpreting human capital and institutional quality as independent, parallel pathways within the 2000–2022 panel, challenging an institutions-as-prerequisite interpretation. This result does not imply that institutions are unimportant: the historical and firm-level evidence reviewed in shows that institutions can still shape where skills are formed, allocated and used productively.

3.7. Firms, Technology and Resource Allocation

Firm-level studies provide a more direct link between human capital, technology, and labour demand. African enterprise surveys show substantial differences in productivity, costs, and firm size even within the same sector (Bigsten & Söderbom, 2006; Eifert et al., 2008). Manufacturing competitiveness depends not only on wages, but also on other production costs and price levels (Gelb et al., 2020). Evidence from Ghanaian manufacturing firms further shows substantial differences in factor prices across firm sizes and potential for gains from improved resource allocation, while productivity differences cannot be

explained by observable skills alone (Söderbom & Teal, 2004). Exporting also appears to raise productivity among manufacturing firms in SSA (Van Biesebroeck, 2005).

Technology adoption depends on complementary capabilities inside firms. Combining foreign technology with internal R&D or human-capital development improves technical efficiency more consistently than either alone, based on 418 manufacturing firms (Barasa et al., 2019). In Ghana, intermediary institutions and organisational capability shape technology transfer (Osabutey & Croucher, 2018; Osabutey & Jackson, 2019), with related diffusion and labour-market constraints identified in Angola (Santos & Halkias, 2021). Using an IV strategy based on lightning exposure across eight SSA countries, Girollet (2026) finds that mobile connectivity increases sales and profits among informal firms, with the largest gains among active users. However, adoption remains constrained by affordability and skill gaps.

Employment responses differ sharply from productivity responses. Across 2,450 manufacturing firms in 30 African countries, innovation and R&D improve firm performance but generate no consistent employment gain (Tinta, 2025). In Ethiopia and Tanzania, larger firms are more productive and more capital-intensive but expand employment less, while smaller firms expand employment faster with lower productivity growth (Diao et al., 2025), and technology choice similarly changes the labour-productivity effect of industrial policy (Sié, 2023). This split between productivity and employment growth makes employment scaling a separate condition for structural absorption.

The Hsieh-Klenow framework provides a benchmark for the allocation component. Hsieh and Klenow (2009) model differentiated plants under monopolistic competition and CES demand, using dispersion in revenue productivity as a signal of firm-specific wedges; their counterfactual TFP gains of about 30–50 % for China and 40–60 % for India apply only to those two settings. African economies contain larger informal and micro-firm segments, more heterogeneous technologies and more segmented markets, so neither the assumptions nor the counterfactual magnitudes can be transferred directly. Restuccia and Rogerson (2008, 2017) and Bartelsman et al. (2013) provide the broader allocation framework, while African firm evidence indicates that allocation, capability and employment scaling should be analysed jointly.

Across these studies, structural absorption reflects the interaction between sectoral reallocation and firm capability. Differences in firm capabilities can be more important than convergence within sectors. Digital and imported technologies generate larger productivity gains when firms have the capacity to use them effectively, while highly productive firms may expand employment only slowly. At the same time, informal firms can absorb large numbers of workers while upgrading more gradually. Ultimately, firm-level differences in productivity, technology adoption, and employment growth shape whether sectoral change translates into higher labour productivity at the economy-wide level.

4. Discussion: Structural Absorption and the Productivity Puzzle

Educational expansion reaches structural transformation through a sequence of capability formation, labour allocation and productive use inside firms. Schooling and training first shape the capabilities entering the labour market; sectoral and occupational allocation then determine where those capabilities are deployed; firms finally combine labour with capital, technology and organisation. Demographic change alters the number and composition of entrants competing for productive work, while institutions influence

mobility, investment, innovation and the geography of economic opportunity. Structural absorption refers here to an economy's capacity to keep these elements sufficiently aligned for a growing supply of skills to support higher-productivity employment.

Capability formation contributes to structural transformation when schooling produces usable skills and workers can move into activities that reward those capabilities. Years of schooling remain an imperfect measure because learning quality differs substantially across systems (Hanushek & Woessmann, 2012; Angrist et al., 2021). African evidence shows stronger productivity effects where workers acquire usable skills and reach activities with sustained demand for them (Bold et al., 2017; Gebrehiwot et al., 2025). Labour allocation adds a separate margin: movement out of agriculture produces larger and more persistent gains when destination activities combine higher initial productivity with continued upgrading, while agricultural intensification and rural non-farm linkages can raise productivity without immediate sectoral exit (De Vries et al., 2015; Aihounton & Christiaensen, 2024). Human capital therefore becomes economically transformative through the interaction of skill formation and productive deployment.

Demographic pressure alters the scale and composition of labour-market competition by increasing the number of entrants seeking productive employment. Larger cohorts reduce access to salaried work when labour demand expands more slowly, while rapid growth in educated labour supply can increase unemployment, occupational downgrading, informal work or downward pressure on returns to schooling when skill-intensive vacancies lag (Filmer & Fox, 2014; Bandiera et al., 2022). Changes in relative factor supplies may also encourage firms to adopt production techniques better suited to prevailing labour-market conditions (Acemoglu & Zilibotti, 2001; Caselli & Coleman, 2006). As discussed earlier, institutions operate throughout this process by shaping inherited educational geography, contemporary mobility, investment and innovation (Acemoglu et al., 2014; Cogneau & Moradi, 2014; Anya & Nzepang, 2022). The insignificant human-capital and institutional-quality interaction reported by Gebrehiwot et al. (2025) supports a parallel-pathways interpretation in which both contribute independently within the observed panel.

Firm-level absorption determines how skills are combined with capital and technology and whether productivity growth is accompanied by employment expansion. Larger or more innovative firms can lead in productivity while adding workers slowly, whereas smaller firms may absorb labour more rapidly while upgrading at a slower pace (Diao et al., 2025; Tinta, 2025). This divergence is consistent with an allocation-based interpretation of the productivity puzzle, although Hsieh and Klenow's (2009) China and India counterfactuals cannot be transferred directly to SSA. The region's large informal and micro-firm segment suggests that allocation may be important, but its magnitude remains to be estimated directly. The importance of firm scaling also varies across production structures, which helps explain why East African agricultural exit, West African resource dependence and informality, South African deindustrialisation and North Africa's earlier demographic transition produce different absorption outcomes.

Bringing together evidence on skill quality, labour-supply growth, sectoral shifts, and firm-level job creation extends the labour-absorption literature beyond a focus merely on the number of jobs created (Fox et al., 2013; Filmer & Fox, 2014; Fox et al., 2016; Losch, 2016; Benjamin & Mbaye, 2020). The policy implication follows from the specific constraint limiting absorption in each setting. Education reform has greater effects when skill-using jobs expand alongside it. Industrial and digital upgrading delivers broader

gains when productivity growth is accompanied by employment growth. Rural policy also remains important where higher agricultural productivity and non-farm linkages create pathways into more productive work (Arias et al., 2019; Barasa et al., 2019; Bandiera et al., 2022; Kruse et al., 2023; Aihounton & Christiaensen, 2024). Policies should therefore be assessed jointly across learning, productive job creation, skill use, and firm productivity.

Four evidence gaps limit a fuller account of structural absorption across SSA. Worker and firm data are rarely observed together, which makes worker-capability deficits difficult to separate from slow growth in skill-intensive labour demand. Cohort evidence links demographic pressure to salaried-employment prospects, but subsequent effects on skill premia and firms' technology choices remain less directly observed (Bandiera et al., 2022). Sectoral accounts still need finer separation of modern tradable, low-entry-barrier and informal services, even as coverage improves through 2018 (Kruse et al., 2023). Central Africa is represented by fewer studies, and the predominance of English-language sources limits confidence in how widely the identified mechanisms apply across Francophone settings.

5. Conclusion

Human capital contributes most consistently to productivity and structural transformation when schooling produces usable capabilities and those capabilities reach activities with sustained demand for them. Learning quality, sectoral destination and firm technology determine how far educational expansion becomes productive capability. Cross-country evidence supports a positive human-capital association with structural transformation, while Gebrehiwot et al. (2025) find human capital and institutional quality independently significant with no detectable interaction in the 2000–2022 panel, supporting the parallel-pathways interpretation developed in the earlier section.

Transformation paths differ because similar gains in human capital interact with distinct production structures across African subregions. Most sub-Saharan African trajectories diverge from East Asia's manufacturing-led labour absorption, but constraints differ: East Africa faces weak non-agricultural absorption; West and Central Africa, resource dependence and informality; South Africa, deindustrialisation and unemployment; and North Africa, an earlier demographic transition and urbanization. The productivity payoff to the same increase in human capital therefore depends on the production structure into which workers enter.

The conversion of skills into productive employment depends on demographic pressure, inherited spatial inequalities and firms' capacity to scale. Rapid cohort growth raises job-creation requirements and lowers access to salaried employment when skill-intensive vacancies expand more slowly. Historical research shows that colonial education systems, missionary presence, and pre-colonial institutions generated persistent spatial differences in human capital and economic activity. This review interprets these inherited distributions as one potential influence on contemporary worker–firm matching, while recognising that the complete causal chain linking historical conditions to firms' technology choices has not been estimated directly. Evidence at the firm level is clearer regarding the final stage: productivity and employment growth frequently diverge, suggesting that sectoral upgrading requires not only productivity gains but also broad-based labour absorption.

Several limitations define the scope of these conclusions. The structured search relied primarily on English-language sources, leaving Francophone and Central

African scholarship less represented. The corpus combines designs with different estimands and causal strength, precluding a defensible pooled effect, while informal employment and firm productivity remain difficult to compare consistently across countries. Gender differences in structural absorption are also not assessed systematically. Future work should link worker, firm and sectoral data more directly and test the proposed mechanisms with designs capable of identifying changes in skill demand, allocation and technology choice.

In conclusion, structural absorption provides an organizing synthesis of these findings. Learning quality, demographic pressure, sectoral destination, institutional conditions and firm scaling jointly shape Africa's productivity puzzle. The policy objective is a production structure that matches growing capabilities to higher-productivity activities at sufficient scale, supported by institutions and firms able to convert those capabilities into productivity and employment growth.

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About the author

Ayodeji B. Ajibola — PhD student, International Laboratory of Macroeconomic Analysis, Department of Theoretical Economics, National Research University "Higher School of Economics"; https://orcid.org/0000-0003-2341-9835 (11, Pokrovsky Bulvar, Moscow, 109028, Russian Federation; e-mail: adzhibola.a.b@hse.ru).

Информация об авторе

Аджибола Айодеджи Бабатунде — аспирант, Международная лаборатория макроэкономического анализа, Департамент теоретической экономики, Национальный исследовательский университет «Высшая школа экономики»; https://orcid.org/0000-0003-2341-9835 (Российская Федерация, 109028, г. Москва, Покровский бульвар, 11; e-mail: adzhibola.a.b@hse.ru).

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