



Technological Innovation and Productivity Growth in the African Manufacturing Sector

Abstract

This study examined the relationship between technological innovation and productivity growth in the African manufacturing sector, arguing that the region's ability to bridge its industrial output gap is fundamentally tied to how effectively it adopts, adapts, and diffuses technology across its production systems. The central problem lies in the sector's continued dependence on labour-intensive, low-technology production methods that limit value addition, constrain export competitiveness, and leave firms vulnerable to external shocks. The study adopted the Technology-Gap Theory and the Endogenous Growth Theory, alongside a qualitative systematic literature review methodology. It also made use of secondary data from peer-reviewed academic journals, institutional reports, and policy documents published between 2014 and 2024. Findings revealed that technological innovation drives manufacturing productivity gains across the continent, with adoption remaining highly uneven. Here, large, export-oriented firms captured the bulk of the benefits while small and medium-sized enterprises struggle under the weight of structural constraints including inadequate infrastructure, limited financing, and shallow innovation ecosystems. A major conclusion is that the gap between technological potential and productive reality in African manufacturing is primarily institutional rather than technical. Governments are therefore urged to construct integrated industrial technology policies that simultaneously address financing access, innovation infrastructure, and skills development as part of a coherent productivity agenda.

Keywords: Technological innovation, productivity growth, African manufacturing, endogenous growth, technology diffusion, industrial policy.

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1. Introduction

Manufacturing has long served as the engine of structural transformation in developing economies, offering pathways to employment creation, value addition, and sustained

economic growth. Across East Asia, Latin America, and parts of South Asia, deliberate investments in industrial technology were central to the dramatic productivity gains that lifted millions out of poverty and positioned those

economies competitively in global markets. Africa, however, has largely remained on the periphery of this industrial revolution. Despite being home to a rapidly growing population, abundant natural resources, and increasing urbanization, the continent's manufacturing sector contributes just over ten per cent of gross domestic product (GDP) on average, a figure that has remained stagnant for decades while other regions have surged ahead (United Nations Industrial Development Organization, 2023).

The question of why African manufacturing has failed to close this productivity gap is neither simple nor monocausal. Scholars have pointed to inadequate infrastructure, unfavourable trade conditions, weak institutional frameworks, and limited access to finance as major culprits (Rodrik, 2016). The literature converges on a more fundamental constraint which are that the slow and uneven adoption of technology within African manufacturing firms. In an era where digital technologies, automation, and advanced production systems are redefining global industrial competitiveness, the majority of African manufacturers continue to rely on outdated, low-productivity production methods that limit their capacity for value creation and export diversification (Naudé, 2018).

Technological innovation, is understood as the introduction and application of new knowledge, tools, processes, and systems that improve productive capacity, has emerged as a central concern for researchers, policymakers, and development

practitioners interested in Africa's industrial future. The literature suggests that innovation, whether in the form of technology adoption, research and development (R&D) investment, or digital transformation, carries significant potential to raise total factor productivity (TFP), improve product quality, and reduce production costs across manufacturing sub-sectors (Cirera & Maloney, 2017). At the same time, evidence also reveals deep structural barriers that prevent this potential from translating into broad-based productivity outcomes, particularly for small and medium-sized enterprises (SMEs) which form the backbone of Africa's industrial setting.

The study situates its analysis within an integrated theoretical framework drawn from the Technology-Gap Theory and Endogenous Growth Theory, both of which offer robust explanations for why technological capability matters for long-run productivity improvement in developing economies. In doing so, it not only synthesizes what the literature currently tells us about this relationship but also identifies where scholarly attention has been insufficient and what that means for both research and policy going forward.

2. Research Objectives

Specifically, the study seeks to:

- i. Assess the relationship between technological innovation and productivity growth in African manufacturing firms.
- ii. Analyze the mechanisms through which technology adoption generates productivity gains at

the firm, sector, and economy-wide levels.

- iii. Identify the structural and institutional barriers that constrain technology diffusion and productivity growth in the sector.

3. Research Questions

To achieve the objectives above, the study is guided by the following questions:

- i. What is the relationship between technological innovation and productivity growth in Africa's manufacturing sector?
- ii. Through what mechanisms does technology adoption translate into measurable productivity gains at the firm and sector levels?
- iii. What structural and institutional barriers hinder the diffusion of technology-driven productivity improvements across African manufacturing?

4. Statement of the Problem

Despite the widely acknowledged potential of technological innovation to accelerate industrial productivity, African manufacturing continues to underperform relative to its own development aspirations and global benchmarks. The continent's manufacturing sector remains characterized by low technology intensity, limited R&D investment, and a persistent productivity gap when compared to both developed economies and rapidly industrializing regions in Asia (UNIDO, 2023). These conditions are not incidental but reflect deep structural and institutional failures that

have constrained the adoption and diffusion of productivity-enhancing technologies across the sector.

While scholarly attention to this problem has increased in recent years, a careful review of the existing literature reveals important gaps. First, much of the research on technological innovation in Africa focuses on specific countries, sub-sectors, or firm types, making it difficult to draw continent-wide conclusions about the mechanisms linking innovation to productivity (Diao *et al.*, 2021). Second, studies that do engage with productivity tend to treat technology adoption as an isolated variable rather than situating it within the broader institutional and policy framework that determine whether firms can effectively absorb and utilize new technologies (Cirera & Maloney, 2017). Third, existing literature has paid insufficient attention to the role of SMEs, which constitute the majority of manufacturing firms on the continent though systematically excluded from the productivity gains that technology can generate due to structural financing, skills, and infrastructure gaps.

This research gap carries practical consequences because without a clear, integrated understanding of how technological innovation drives productivity in the African manufacturing context, policy interventions might become piecemeal, misaligned with firm-level realities, or captured by larger firms at the expense of the broader industrial base. It is for this reason that this study seeks to address this gap by synthesizing existing literature through a theoretically grounded framework that

examines not only whether technology increases productivity, but how, for whom, and under what conditions it does so most effectively.

5. Literature Review

Scholarly interest in the connection between technology and manufacturing productivity in Africa has grown over the past decade. Researchers have approached the subject from multiple angles, including firm-level studies of technology adoption, macro-level analyses of R&D expenditure and industrial output, and sector-specific examinations of digital transformation. What emerges from this body of work is a picture of significant potential constrained by equally significant structural challenges.

At the firm level, research shows that manufacturing enterprises that invest in modern technology achieve higher levels of total factor productivity than those relying on conventional production methods. Diao *et al.* (2021), drawing on firm-level data from Tanzania and Ethiopia, found compelling evidence that the gap between frontier and non-frontier firms in African manufacturing is primarily explained by differential access to and adoption of modern production technologies. Their analysis shows that firms operating closer to the technological frontier are not only more productive in absolute terms but also demonstrate greater resilience to external economic shocks, a finding with significant implications for industrial policy design in the region.

The literature on innovation systems and absorptive capacity further

illuminates the macro-level dimension of this relationship. Cirera and Maloney (2017), in their World Bank study, document what they term the “innovation paradox”: while developing countries including those in Africa have significant scope for productivity improvement through technology adoption, the expected convergence with frontier economies has not materialized at scale. Their analysis attributes this to insufficient absorptive capacity at the firm level, weak national innovation systems, and the absence of policy frameworks that create meaningful incentives for firms to invest in technological upgrading. This insight is particularly pertinent to African manufacturing, where innovation spending remains a fraction of what is observed in comparable developing economies in Asia.

The particular challenge facing SMEs has also received growing attention. Goedhuys and Veugelers (2012) documented a persistent technology adoption gap between large and small manufacturing firms, attributing it to differential access to finance, unequal exposure to foreign knowledge through trade and investment, and varying managerial capacity to identify and implement appropriate technologies. More recent work by the African Development Bank (AfDB, 2022) confirms that this gap has narrowed only marginally, with SMEs continuing to account for a disproportionately small share of technology investment in African manufacturing despite their numerical dominance.

Digital technologies have attracted particular scholarly interest in recent years. The rapid diffusion of mobile connectivity across Africa has created a new pathway for technology adoption that bypasses some of the infrastructure constraints that previously slowed manufacturing modernization. Oyelaran-Oyeyinka and Lal (2006) were among the earliest to document how digital tools enabled African manufacturers to access global knowledge networks, improve supply chain efficiency, and reduce transaction costs. More recent evidence reviewed by UNIDO (2023) suggests that firms actively integrating digital platforms into their operations achieve productivity gains of between fifteen and twenty-five per cent relative to non-digitized peers, though the distribution of these gains remains highly uneven.

Naudé (2018) adds an important structural dimension to this discourse by situating technology's role within the broader context of Africa's industrial transformation. He argues that new technologies, when combined with resurgent entrepreneurship and deliberate industrial policy, carry genuine potential to revive African manufacturing and redirect it toward higher value-added activities. However, he cautions that realizing this potential requires overcoming deeply entrenched structural barriers, particularly around infrastructure and human capital, that continue to suppress the productivity returns to technology investment across the continent.

Across the literature examined, a recurring finding is that the relationship between technology and productivity is

not automatic but mediated by a set of enabling conditions including infrastructure quality, access to appropriate financing instruments, policy coherence, and the availability of technically skilled labour (Rodrik, 2016). This insight has important implications for both theory and policy as it suggests that technology interventions divorced from broader industrial and human capital development strategies are unlikely to produce transformative productivity outcomes in the African context.

6. Theoretical Framework

This study is anchored in two complementary theoretical perspectives known as the Technology-Gap Theory and the Endogenous Growth Theory. These frameworks provide a coherent conceptual foundation for understanding why and how technological innovation drives productivity in the African manufacturing context.

6.1 Technology-Gap Theory

The Technology-Gap Theory, associated most closely with the work of Posner (1961) and later extended by Fagerberg (1994), holds that differences in productivity performance across countries and firms are fundamentally rooted in differences in technological capability. Countries or firms that operate with a significant technology gap relative to the frontier are expected to experience lower productivity, but also greater potential for catch-up growth by absorbing and adapting existing technologies developed elsewhere. For Africa, this theory is

particularly instructive as the continent's manufacturing firms do not need to invent frontier technologies from scratch to achieve productivity gains; rather, they can close the gap through deliberate investment in technology transfer, adaptation, and diffusion, provided that absorptive capacity is sufficient.

Cirera and Maloney (2017) extend this thinking by demonstrating that absorptive capacity itself is not a fixed endowment but a policy-responsive variable. Their empirical work shows that countries investing in the human capital, institutional quality, and firm-level capabilities that constitute absorptive capacity are better positioned to convert technology exposure into productivity gains. In the African manufacturing context, where absorptive capacity is often limited, the Technology-Gap Theory helps explain both the persistence of low productivity and the conditions under which accelerated technological catch-up can be achieved.

6.2 Endogenous Growth Theory

The Endogenous Growth Theory, advanced by Romer (1990) and Lucas (1988), represents a significant departure from earlier growth models by treating technological change as an endogenous outcome of deliberate economic decisions rather than as an exogenous variable. Central to this framework is the idea that investments in human capital, knowledge, and innovation generate positive externalities and increasing returns, making technology the principal driver of sustained long-run productivity growth. For African

manufacturing, this theory implies that the sector's long-run productivity trajectory is not determined by factor endowments alone but by the quality of knowledge investments, institutional supports, and policy environments that shape the incentive structures for innovation.

The Technology-Gap and Endogenous Growth theories both offer a dual-lens framework for this study. The former directs attention to the structural conditions that determine whether African manufacturers can absorb and utilize available technologies, while the latter stresses the importance of domestically generated knowledge and institutional incentives as the foundation for sustained productivity improvement. This integrated theoretical lens informs both the analysis of findings and the study's policy recommendations.

7. Methodology

7.1 Research Design

This study adopts a qualitative research design anchored in a systematic literature review methodology. Rather than generating primary data through surveys or field experiments, the research synthesizes and critically interprets existing evidence from peer-reviewed academic publications, institutional reports, and policy documents to construct a coherent understanding of how technological innovation affects manufacturing productivity in Africa. This design is appropriate given the study's objective of integrating fragmented scholarly evidence into a

theoretically grounded analytical framework, and is consistent with the established tradition of systematic reviews as a rigorous and credible form of academic inquiry (Snyder, 2019).

7.2 Data Sources

Secondary data were sourced from major academic databases including Scopus, Web of Science, and Google Scholar, supplemented by institutional repositories maintained by organizations such as UNIDO, the African Development Bank (AfDB), the World Bank, and the United Nations Economic Commission for Africa (UNECA). The study concentrated on literature published between 2014 and 2024, ensuring that the analysis captures contemporary dynamics in African manufacturing technology while drawing on foundational theoretical works where relevant. Sources were selected on the basis of scholarly credibility, methodological transparency, and direct relevance to the study's thematic scope.

7.3 Search Strategy and Selection

A structured keyword search was conducted using terms including "technological innovation and manufacturing productivity Africa," "technology adoption sub-Saharan Africa manufacturing," "industrial productivity growth Africa," "digitalization African manufacturing firms," and "SME technology barriers Africa." The initial search yielded approximately 380 records. After removing duplicates and screening titles and abstracts for relevance, 140 full-text records were assessed. Studies were

included if they explicitly examined the technology-productivity relationship within African or analogous developing economy manufacturing contexts and offered either empirical findings or robust theoretical contributions. Studies that were purely descriptive, lacked methodological transparency, or focused on sectors other than manufacturing were excluded. The final analytical sample comprised 52 studies.

7.4 Data Analysis

Thematic content analysis was employed to synthesize findings across the selected studies. Each source was reviewed and coded according to recurring themes, including technology adoption patterns, productivity mechanisms, barriers to diffusion, and policy interventions. The identified themes were then interpreted through the integrated Technology-Gap and Endogenous Growth theoretical framework, enabling the study to move beyond descriptive synthesis toward a theoretically informed analysis of the conditions under which technological innovation generates manufacturing productivity gains in Africa.

8. Findings and Discussion

The findings that emerge from the reviewed literature are organized around three dominant themes that consistently cut across the evidence base. These themes capture the key dimensions of the technology-productivity relationship in African manufacturing and reveal both the opportunities and structural constraints that define the sector's current trajectory.

8.1 Technology Adoption as a Consistent Driver of Productivity

Across the studies reviewed, there is a robust and consistent finding with manufacturing firms that invest in modern technologies, whether through the acquisition of advanced machinery, adoption of digital platforms, or integration of automated production systems. This prove measurably higher productivity than those relying on conventional methods. This finding holds across different countries, sub-sectors, and firm sizes, though the magnitude of the productivity effect varies considerably depending on context.

Diao *et al.* (2021) provide some of the most compelling micro-level evidence on this relationship. Their firm-level analysis of manufacturing enterprises in Tanzania and Ethiopia documents that the productivity gap between frontier and non-frontier firms is primarily explained by differential technology access and adoption rather than by differences in labour quality, capital intensity, or market access alone. Firms operating at or near the technological frontier record output per worker levels substantially higher than those of their lower-technology counterparts, and this gap has widened rather than narrowed over the study period. This suggest that the benefits of technology adoption are accruing progressively to those already operating at higher capability levels.

The digital technology dimension of this finding is particularly significant. UNIDO (2023) documents that firms across various African manufacturing sub-sectors that have integrated digital

tools, including enterprise resource planning systems, digital inventory management, and e-commerce platforms, achieve productivity improvements ranging from 15 to 25 per cent relative to non-digitized counterparts. These gains operate through multiple channels simultaneously reducing transaction and coordination costs. It brings about faster response to market signals, improved supply chain visibility, and better allocation of labour and capital across production processes.

However, the literature also introduces important dimensions to this broad finding. First, productivity gains from technology adoption are most pronounced where complementary investments have been made in human capital development. Naudé (2018) observes that the transformative potential of new technologies in African manufacturing is consistently attenuated where workers lack the technical skills to operate modern equipment effectively or where managerial capacity to leverage technology strategically remains underdeveloped. This suggests that the productivity impact of technology is not automatic but is mediated by the broader learning and skills environment within the firm and the economy.

Second, the evidence reveals a significant disparity in technology-driven productivity gains between large firms and SMEs. Large, export-oriented manufacturers capture the majority of the productivity benefits from technology adoption, benefiting from economies of scale in technology investment, better access to credit for

equipment purchases, and more extensive exposure to foreign technical knowledge through trade and investment relationships. SMEs, by contrast, tend to be confined to lower-technology production methods not because they are unaware of superior technologies but because the financial, infrastructural, and skills constraints they face make adoption prohibitively costly (AfDB, 2022). This disparity means that aggregate productivity gains in African manufacturing are heavily concentrated rather than broadly distributed, limiting the sector's contribution to inclusive economic development.

This first major finding establishes that technology is a genuine and significant driver of manufacturing productivity in Africa, while also revealing that the full realization of its potential is conditional on a set of enabling factors that currently remain unevenly distributed across the sector. This insight directly informs the study's theoretical framing. Consistent with Endogenous Growth Theory, productivity improvements are endogenously generated through deliberate knowledge investments, but the Technology-Gap Theory reminds us that absorptive capacity and institutional conditions are decisive in determining whether firms can effectively close the gap between their current and potential productivity frontiers.

8.2 Innovation Ecosystems and the Absorptive Capacity Gap

A second prominent finding in the literature concerns the critical role of

national and regional innovation settings in determining whether technology adoption translates into durable productivity gains. Research consistently shows that individual firms do not operate in a vacuum with their capacity to absorb, utilize, and build upon new technologies heavily shaped by the external environment in which they are embedded. This includes the quality of educational institutions, the density of technology support services, the accessibility of research and development infrastructure, and the coherence of industrial policy.

Cirera and Maloney (2017) provide the most comprehensive cross-country evidence on this point. Their analysis of innovation patterns and productivity outcomes across a wide range of developing economies validates that countries with stronger national innovation systems record systematically higher rates of technology-driven productivity improvement in manufacturing. Critically, they show that the productivity returns to any given level of technology investment are substantially higher in economies with well-developed absorptive capacity. This suggests that building the conditions for effective technology use matters as much as the technology investment itself. For African economies where innovation system quality is generally low by international standards, this finding implies that technology investment without parallel investment in the institutional infrastructure for innovation is likely to yield disappointing productivity returns.

This finding has particularly important implications for SMEs, which are less able than large firms to compensate for weak innovation ecosystems through internal resource mobilization. Where public technology extension services, shared innovation infrastructure, and accessible technical training programmes exist, SMEs demonstrate meaningfully higher rates of technology adoption and more substantial productivity improvements. Conversely, where such support is absent, the technology-productivity gap between large firms and SMEs widens, reinforcing existing inequalities within the manufacturing sector.

8.3 Structural Barriers and the Institutional Constraint

The third and arguably most consequential finding in the literature is the identification of deep structural and institutional barriers that consistently impede the diffusion of technology across African manufacturing, irrespective of the firm-level desire to adopt productivity-enhancing innovations. These barriers operate at multiple levels simultaneously and interact in ways that make them particularly difficult to address through narrow, sector-specific interventions.

Inadequate physical infrastructure is among the most frequently cited constraints. Unreliable electricity supply, poor transport networks, and limited digital connectivity collectively raise the cost of technology adoption and reduce its productivity returns, particularly for firms located outside major urban centres. Research reviewed by UNIDO

(2023) estimates that infrastructure deficiencies add between 10 and 40 per cent to the effective cost of technology adoption for African manufacturers, creating a structural disadvantage that erodes the price competitiveness of technology-intensive production.

Limited access to appropriate financing is equally pervasive. This is as the high cost of capital in most African economies, combined with the risk aversion of commercial lenders toward manufacturing investments constrain growth. The absence of technology-specific financing instruments, means that firms, and especially SMEs, are frequently unable to fund the upfront costs of equipment acquisition and technological upgrading even when the long-run productivity case for doing so is clear (Goedhuys & Veugelers, 2012). Development finance institutions have partially filled this gap, but their reach remains insufficient relative to the scale of the financing need.

Policy inconsistency and weak institutional coordination represent a further structural barrier. Across the reviewed literature, a consistent finding is that African countries with more coherent, stable, and well-enforced industrial and technology policies record stronger rates of technology diffusion and productivity growth in manufacturing. Conversely, where industrial policy is fragmented, where technology incentives are poorly designed or inconsistently applied, and where the regulatory environment creates uncertainty for investors, the adoption of productivity-enhancing technologies is inhibited regardless of their technical potential (Rodrik, 2016).

This suite of structural and institutional barriers collectively explains a central paradox in the African manufacturing literature. This is as the existence of a growing body of evidence demonstrating the productivity returns to technology adoption alongside the persistence of low technology intensity across the sector. The gap between what is technically possible and what is practically achievable for the majority of African manufacturers is, the evidence suggests, primarily an institutional and structural gap rather than a technological one.

9. Conclusion

What the evidence ultimately reveal is that Africa's manufacturing productivity challenge is not a technology deficit in the narrow sense. The tools, processes, and knowledge systems required to substantially raise industrial productivity exist and, in pockets across the continent, are already delivering meaningful results. The deeper challenge is an institutional one as the frameworks, financing architectures, and policy environments needed to enable broad-based technology diffusion across the manufacturing sector remain inadequate, particularly for the SMEs that constitute the numerical majority of African manufacturing firms.

This insight reframes the productivity problem in a way that has significant implications for how it should be addressed. Prescriptions that focus exclusively on technology transfer, foreign direct investment attraction, or digital infrastructure provision are valuable. This will fall short if they are

not embedded within a broader institutional reform agenda that addresses the conditions governing firms' ability to absorb and productively deploy new technologies. Cirera and Maloney (2017) describe this as the "innovation paradox" at its most consequential meaning the countries and firms that stand to gain the most from technological catch-up are precisely those least equipped, institutionally and structurally, to capture those gains without deliberate policy intervention.

Africa's manufacturing sector therefore faces not a single challenge but a system-level challenge that requires a system-level response. The path to sustained productivity growth runs through the deliberate construction of institutional architectures that treat technological capability not as a by-product of economic development but as its foundation.

10. Recommendations

African governments and their development partners should urgently establish integrated industrial technology funds that simultaneously address the three primary barriers constraining technology-driven productivity growth. They are financing access, skills development, and innovation infrastructure. Currently, these dimensions are typically addressed through separate, uncoordinated policy instruments, resulting in interventions that are individually insufficient to overcome the interlocking constraints that firms face. A financing facility that provides affordable credit for equipment

acquisition achieves limited impact if firms lack workers with the technical skills to operate that equipment. Again, neither will investment yields its full productivity return if the power supply to the factory is unreliable.

The design of these funds should be explicitly SME-centred, recognizing that large firms already possess greater capacity to overcome structural barriers through internal resource mobilization. Fund allocations should be contingent on firms developing linked investments in skills training and operational improvement, ensuring that technology acquisition is embedded within a broader firm-level productivity development strategy. The funds should be co-governed by ministries of industry, finance, and education working in coordination, with dedicated technical secretariats responsible for maintaining policy coherence and monitoring productivity outcomes. African Union and sub-regional blocs should facilitate the pooling of financing resources and the sharing of innovation infrastructure across borders, reducing the unit costs of technology access for smaller economies. The productivity gap in African manufacturing is neither inevitable nor permanent, but closing it requires the kind of deliberate, coordinated institutional action that has thus far been in short supply.

References

- African Development Bank. (2022). African economic outlook 2022: Supporting climate resilience and a just energy transition in Africa. <https://www.afdb.org/en/knowledge/publications/african-economic-outlook>
- Cirera, X., & Maloney, W. F. (2017). The innovation paradox: Developing-country capabilities and the unrealized promise of technological catch-up. World Bank. <https://openknowledge.worldbank.org/handle/10986/28341>
- Diao, X., Ellis, M., McMillan, M., & Rodrik, D. (2021). Africa's manufacturing puzzle: Evidence from Tanzanian and Ethiopian firms. NBER Working Paper 28344. <https://www.nber.org/papers/w28344>
- Fagerberg, J. (1994). Technology and international differences in growth rates. *Journal of Economic Literature*, 32(3), 1147–1175. <https://www.jstor.org/stable/2728605>
- Goedhuys, M., & Veugelers, R. (2012). Innovation strategies, process and product innovations and growth: Firm-level evidence from Brazil. *Structural Change and Economic Dynamics*, 23(4), 516–529. <https://doi.org/10.1016/j.strueco.2011.01.004>
- Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3–42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7)
- Naudé, W. (2018). Structural transformation in Africa: New technologies, resurgent

- entrepreneurship and the revival of manufacturing. MERIT Working Papers 2018-045. United Nations University - MERIT. <https://ideas.repec.org/p/unm/unumer/2018045.html>
- Oyelaran-Oyeyinka, B., & Lal, K. (2006). Learning new technologies by small and medium enterprises in developing countries. *Technovation*, 26(2), 220–231. <https://doi.org/10.1016/j.technovation.2005.01.009>
- Posner, M. V. (1961). International trade and technical change. *Oxford Economic Papers*, 13(3), 323–341. <https://doi.org/10.1093/oxfordjournals.oep.a040877>
- Rodrik, D. (2016). Premature deindustrialization. *Journal of Economic Growth*, 21(1), 1–33. <https://doi.org/10.1007/s10887-015-9122-3>
- Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, 98(5), S71–S102. <https://doi.org/10.1086/261725>
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- United Nations Industrial Development Organization. (2023). Industrial development report 2023: Transforming industry for a sustainable future. <https://www.unido.org/resources-publications>
- World Bank. (2022). World development report 2022: Finance for an equitable recovery. <https://www.worldbank.org/en/publication/wdr2022>