The Role of Research and Development in the Manufacturing Sector in Fostering Technological Innovation and Economic Security in Ethiopia

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ABSTRACT

This study investigates the critical nexus between Research and Development (R&D), technological innovation, and economic security within Ethiopia's manufacturing sector. Despite ambitious national plans to become a lower-middle-income country and a regional manufacturing hub, the sector's contribution to GDP remains low, hampered by low productivity, technological stagnation, and weak innovation capabilities. Employing a mixed-methods case study design, this research collected data from 30 senior officials and researchers across five specialized manufacturing R&D institutes and 9 key informant interviews. The findings reveal a significant systemic disconnect: while Ethiopia has established a structured R&D institutional framework, it is severely hampered by chronic underinvestment (only 0.61% of GDP), weak linkages between academia and industry, and a policy implementation gap. Consequently, promising R&D outputs, such as waste valorization technologies and AI-driven quality control prototypes, fail to achieve commercial scale and transformative impact. The study concludes that without strategic interventions to boost funding, foster robust industry, academia and government manufacturing industry R&D institutes collaboration, and create effective commercialization pathways, Ethiopia's manufacturing R&D will continue to fall short of driving the technological innovation necessary for enhanced productivity, competitiveness, and long-term economic security. Recommendations include increasing R&D expenditure to at least 1% of GDP, implementing targeted policy incentives for private-sector involvement, and establishing formalized triple-helix partnerships to bridge the existing innovation chasm.

Keywords: Research and Development, Technological Innovation, Economic Security, Manufacturing Sector, Ethiopia, Industrial Policy, Triple Helix Model.

INTRODUCTION

Innovation is universally regarded as a crucial engine of economic progress, improving competitiveness and productivity globally (UNIDO, 2019). For developing countries, harnessing technological innovation is key to closing the development gap. However, the application of scientific and technological knowledge has often exacerbated inequalities between industrialized and developing nations (UNIDO, 2019). Technological innovation, encompassing the generation, diffusion, and commercialization of new technologies, is critical for reducing global economic insecurity by enhancing a nation's competitive edge in international trade and investment.

Economic security, defined as a state's capacity to maintain stable income, employment, and resilience against external shocks, is a fundamental pillar of national security (Garifova, 2015). For developing nations like Federal Democratic Republic of Ethiopia (herein after referred to as Ethiopia), achieving this typology of security is inextricably linked to sustainable economic development, driven significantly by a robust and competitive industrial base. Economic security in this context encompasses employment security (stable income-earning opportunities), income security (adequate and stable earnings), and the resilience of businesses to withstand market fluctuations and technological disruptions (Osberg, 2015). The manufacturing sector is

often hailed as an engine of economic growth due to its potential for wealth creation, employment generation, productivity gains, and export diversification (Demsash, 2020; Eshetie, 2018). However, for the sector to optimally contribute to the economic security of any state as expecte.0d, it must be continually modernized in terms of its equipment, processes and cutting-edge technologies.

Central to modernizing this sector is technological innovation whose hallmark is the generation, diffusion, and commercialization of new technologies. Technological innovation enhances domestic production capabilities, improves product quality, and increases competitiveness in both local and global markets (Xu *et al*., 2018). It is the engine of industrial growth and development. This perspective is consistent with Park (2021) East Asian development model which illustrates that progress often occurs through the stages of technology introduction, internalization, and ultimately, creation. Significantly, these processes are heavily reliant on strategic research and development (R&D) where ideas are proposed, refined and actioned to drive production which consequently contributes to economic growth and development.

In a rapidly evolving global landscape characterized by the Fourth Industrial Revolution (Industry 4.0) featuring advancements like the Industrial Internet of Things (IIoT), artificial intelligence (AI), 3D printing (additive manufacturing), and automation, the pressure to innovate is intense as argued by Bongomin *et al*. (2020). For Ethiopia, technological innovation is not merely about competitiveness but is essential for import substitution, export promotion, and ultimately, achieving economic security by addressing chronic challenges like high youth unemployment, inflation, and external debt which have equally been reported by organizations such as UNCTAD (2021) and UNDP (2022).

The government of Ethiopia has recognized this link and has put in place policy frameworks such as the Home-Grown Economic Reform (HGER) and the Ten-Year Development Plan (2021-2030) which are intended to guide the transition of her economy from agriculture-led to manufacturing-led growth (FDRE, 2020). The country’s manufacturing sector, identified as a priority within the HGER program, encompasses industries such as textiles, leather, metals, agro-processing, chemicals and construction. The government is persuaded that the sector holds immense potential for job creation, having already employed approximately 173,000 persons (Demsash, 2020), and is seen as a force multiplier for GDP growth. The manufacturing sector's ability to contribute to these goals is contingent on its productivity and growth, which are, in turn, driven by innovation. Thus, the effectiveness of Ethiopia's manufacturing R&D infrastructure is a matter of critical national importance.

A cornerstone of HGER and the Ten-Year-Development-Plan is the establishment of the Manufacturing Industry Development Institute (MIDI) and a network of six specialized R&D centers in the areas of textiles, leather, metals, chemicals and construction and food and beverages, alongside a Kaizen Center of Excellence. The role of these institutes is to conduct applied research, facilitate technology transfer, build capacity, and formulate strategies to enhance industrial competitiveness in line with the Council of Ministers Regulation No. 504/2022.

THE RESEARCH QUESTION

Despite the significance and potential of the manufacturing sector in powering Ethiopia into a middle-income economy and a manufacturing hub by 2030, a stark contradiction persists - the manufacturing sector's performance remains below par. This is in spite of the policy and strategy innovations as highlighted in the introduction of this paper. Instructively, while the country has registered impressive successive national GDP growth of 7.1%, the World Bank (2024) noted that the manufacturing sector's contribution to the economy remains disproportionately low, with firms operating far below capacity, partly due to their reliance on imported technologies. This situation is compounded by WIPO’s (2024) finding that the country's Global Innovation Index ranking declined from 127 in 2020 to 130 in 2024. This situation suggests a critical failure in translating R&D investments and policy intentions into tangible technological innovation and industrial productivity. It is precisely this disconnect that informed the need to examine the contribution of R&D within Ethiopia's manufacturing sector in fostering technological innovation and, by extension, enhancing national economic security. It explores the mechanisms, challenges, and opportunities within the current R&D ecosystem to provide empirically grounded insights for policymakers and stakeholders.

LITERATURE REVIEW

Research output demonstrates an overwhelming positive correlation between R&D investment, innovation, and economic performance at both firm and national levels (Taha, *et al*., 2024; Goral & Golembska, 2020; Usman, *et al*., 2017). Innovation and economic growth are inextricably linked, functioning as two sides of the same coin to drive regional and international competitiveness. At the heart of this nexus lies technological innovation, a pivotal force in enhancing economic security by boosting productivity, efficiency, and competitiveness, particularly within the manufacturing industry (Bušelić & Pavlišić, 2016). With advancements in automation, artificial intelligence (AI), and digitalization revolutionizing production processes, reducing costs, optimizing resource use and improving product quality, Xu *et al*. (2018) convincingly argue that the manufacturing sector is an engine for economic growth. The advent of the Fourth Industrial Revolution (Industry 4.0), characterized by smart manufacturing and interconnected cyber-physical systems, has and continues to reshape industries across the world, making technological innovation a critical determinant of economic resilience and long-term security (Bongomin *et al*., 2020).

A review of studies further demonstrates the unassailable positive correlation between technological innovation arising from R & D and economic growth. For instance, Bušelić and Pavlišić (2016) demonstrated that Germany's high investment in R&D was a primary reason for her global manufacturing leadership. Similarly, China's remarkable economic ascent has been fueled by a strategy of technological convergence, leveraging massive investments in R&D and innovation to close the gap with developed nations, achieving an average labor productivity growth rate of 11.1% since 2005. Beyond major economies, research on Small and Medium Enterprises (SMEs) shows that creativity and innovation are crucial for creation of employment. A study by Medase and Savin (2023), using World Bank Enterprise Survey data from 11 countries, found that employees' creativity and process innovations significantly boosted firm-level employment, underscoring the need for policies that foster innovative work practices, particularly in smaller firms which dominate African economies.

In Africa, the context is defined by a significant paradox: a heavy reliance on imported technologies amidst vast potential for indigenous innovation. A UNESCO (2022) report holds that most African governments prioritize defense and infrastructure spending, allocating only a small portion of their budgets to R&D the key catalysts for innovation. While the African Union recommends that member states invest at least 2% of their GDP in Science, Technology, and Innovation (STI), the target remains elusive for most countries in the continent, including Ethiopia, which is reported as investing less than 1% (Keraga & Araya, 2022). Country-specific studies reveal both the challenges and opportunities.

In a study of Kenya, Shibia (2022) identified that the determinants to invest in R & D were informed by among other factors, access to external finance, export market participation, firm size and subsector of operation. In Ghana, Tetteh (2024) provided robust evidence using the Crépon-Duguet-Mairesse (CDM) model, confirming a sequential positive relationship between R&D expenditure, innovation output (both product and process), and gains in labor productivity. This study, however, noted that Ghanaian innovation is often incremental and adaptive due to resource constraints, a finding that resonates across the continent (Fu, Mohnen & Zanello, 2017). This suggests that while the R&D-innovation-productivity linkage holds, its manifestation in developing economies is distinct from that in R&D-intensive advanced economies.

The empirical literature from Ethiopia reveals a significant ambition for industrial transformation through R&D, yet this ambition is tempered by a reality of systemic constraints and a pronounced implementation gap. Keraga and Araya (2022) using World Bank Enterprise Survey data established a significant relationship between R&D, innovation, and firm productivity. Their findings indicated that innovative firms in Ethiopia are markedly more productive than their non-innovative counterparts. However, the direct impact of R&D on innovation was only statistically significant under specific econometric models (General Structural Equation Model), suggesting that the pathway from investment to output is not yet robust or efficient. This inefficiency is attributed to a confluence of barriers consistently identified across studies. Kebede and Fikire (2023) and Ayinaddis (2022) pinpointed limited access to finance, high investment costs for innovation, a severe skill gap in the workforce, and weak external knowledge networks as major deterrents to innovation in Ethiopian SMEs, which form the backbone of the manufacturing sector. Daksa *et al.* (2018) further confirmed that R&D

activities, on-the-job training, and digital adoption such as website ownership are key determinants of innovation across all firm sizes in Ethiopia.

A critical and recurring theme in the literature is the fragmented innovation ecosystem. Hailu (2024) determined that there was a weak linkage between academia, research institutes, and industry, which the study concluded to be the most significant barriers. This disconnect creates a vicious cycle: universities and public R&D institutes produce research that is often academic and not commercially oriented, while manufacturing firms, facing daily production pressures and financial constraints, are reluctant to invest in uncertain R&D projects with these institutions (World Bank, 2016). The result is a very low level of commercialized innovation and patent output, a key indicator of technological capability (Shi & Xiao, 2024; Ogada, 2022). The Ethiopian National Innovation Survey corroborates this, revealing that the majority of firms, including manufacturers, do not support their innovation activities with formal R&D.

The government's establishment of the Manufacturing Industry Development Institute (MIDI) and sector-specific R&D centers (e.g., for textiles, leather, metals, chemicals & construction and food & beverages) is a policy response to this challenge. However, the literature suggests the impact of these centers is yet to be fully realized due to underfunding, limited R&D outputs, a focus on routine activities over transformative research, and a lack of strong operational linkages with private industry. The outcome is a manufacturing sector that operates far below capacity, relies on outdated technologies, and contributes minimally to GDP despite its recognized potential (World Bank, 2022).

The role of technological innovation in promoting economic security in Ethiopia is increasingly acknowledged. The government's strategic plans, notably the Home Grown Economic Reform (HGER) and the Ten-Year Development Plan (2021-2030), envision an export-oriented industrialization strategy anchored in agro-processing, supplemented by a recent "Import Substitution Strategy for Selected Manufacturing Industry Sectors" (FDRE, 2020). These policies emphasize technology transfer, innovation, and industrial upgrading as catalysts for accelerated economic growth. However, Ethiopia’s manufacturing sector has yet to fully harness the potential of technological advancements. It remains constrained by limited access to cutting-edge technologies, an acute shortage of skilled labor, and critically weak linkages between research institutions and industries (UNIDO, 2019). While efforts to foster innovation through industrial parks and foreign direct investment (FDI) partnerships exist, the sector requires significant development to ensure technological innovation translates into sustainable economic security.

In a nutshell, while studies like Keraga and Araya (2022) confirm a correlation at the firm level, they do not fully explore the mechanisms through which R&D investments translate into broader economic security outcomes such as enhanced resilience to external economic shocks, reduced dependency on imported technologies and raw materials, sustainable job creation for a growing youth population, and improved balance of trade.

THEORETICAL FRAMEWORKS

This study used Endogenous Growth Theory and the Dynamic Capabilities Framework to explain the relationship between research and development (R&D), technological innovation, and economic security in Ethiopia’s manufacturing sector. These theories collectively provide macroeconomic and micro-level perspectives on how innovation drives competitiveness and long-term stability.

Endogenous Growth Theory

The Endogenous Growth Theory, developed by Romer (1986, 1990), posits that economic growth is primarily driven by internal factors such as human capital, technological innovation, and knowledge accumulation rather than by external (exogenous) forces. Its key proposition is that investments in R&D lead to innovations that generate increasing returns and spillover effects, fueling sustained economic growth. This theory emphasizes the role of deliberate policy interventions and domestic technological capabilities in accelerating industrial development.

Several empirical studies have applied this theory to assess the relationship between R&D and economic performance. For instance, Aghion and Howitt (1992) demonstrated the link between innovation-driven growth and productivity in advanced economies, while Wang et al. (2019) examined how indigenous innovation policies in China foster economic resilience under global competition. Similarly, Barro and Sala-i-Martin (2004) used the theory to justify state investment in education and technological infrastructure as a means of sustaining economic growth.

The strength of this theory lies in its recognition of R&D and knowledge creation as core drivers of economic security. It justifies long-term investments in human capital, research institutions, and intellectual property protection. However, its limitation is the assumption of ideal market conditions, which often do not exist in developing economies like Ethiopia. It also tends to underplay the importance of institutional frameworks and governance structures in facilitating innovation adoption.

This theory is appropriate for this study because Ethiopia's industrialization strategy focuses on building local technological capacity and reducing reliance on imported technologies. By applying Endogenous Growth Theory, the study provides empirical evidence on how R&D initiatives in Ethiopia's manufacturing sector contribute to technological innovation and economic security. It also contributes to the body of knowledge by extending the theory's application to a low-income economy with institutional and infrastructural constraints, which are often neglected in classical models.

Dynamic Capabilities Framework

The Dynamic Capabilities Framework, introduced by Teece, Pisano, and Shuen (1997), explains how firms adapt to rapidly changing technological and market environments by integrating, building, and reconfiguring internal and external competencies. Its proposition is that sustained competitive advantage depends on a firm's ability to sense opportunities, seize them through innovation, and transform its resource base to maintain agility and resilience.

This framework has been widely applied in studies focusing on technology and manufacturing. Teece (2007) demonstrated its relevance in global technology-driven industries, while Gupta et al. (2020) and Felsberger et al. (2020) used it to analyze how digitalization and Industry 4.0 technologies require firms to develop dynamic capabilities to remain competitive. Additionally, Bongomin et al. (2020) applied the framework to Sub-Saharan African firms, emphasizing the role of adaptive innovation in resource-constrained environments.

The major strength of this framework is its focus on firm-level processes, explaining why some firms succeed in innovation adoption while others fail. It is particularly useful for analyzing how Ethiopian manufacturers can adapt to disruptive technologies such as AI, robotics, and IoT. However, its limitation lies in its complexity and reliance on organizational capabilities, which may be difficult to develop in firms lacking strong managerial systems and resources.

This theory is appropriate because Ethiopia's manufacturing sector faces dynamic challenges, including globalization, supply chain disruptions, and technological gaps. The framework allows this study to explore how firms leverage R&D as a dynamic capability to sense, seize, and transform opportunities for innovation and resilience. The study contributes to the theory by providing insights into how dynamic capabilities can emerge in resource-constrained environments and how policy and institutional support can complement firm-level strategies.

RESEARCH METHODOLOGY

This study adopted a mixed-methods approach to develop a comprehensive, contextualized understanding of the research problem using an explanatory sequential research design. The investigation was situated within Ethiopia's manufacturing R&D ecosystem, specifically targeting the five sector-specific R&D centers under the Manufacturing Industry Development Institute (MIDI), with supplementary observational visits to local industrial parks. The target population encompassed 280 policymakers, managers, and senior researchers from government departments and the research centers.

Simple random and purposive sampling techniques were employed to identify participants who possessed specialized knowledge and experience, a method effective for case studies requiring deep insights from key informants (Schoch, 2020). This resulted in a final sample of 30 senior researchers and technical managers for surveys and 9 senior executives and policymakers for in-depth key informant interviews (KIIs).Data collection involved multiple methods to facilitate triangulation. A systematic document analysis reviewed policy and institutional reports, while a structured online survey gathered quantitative and qualitative data from the 30 senior researchers and technical managers. Semi-structured KIIs were conducted with the 9 senior executives to gather rich, qualitative perspectives. Quantitative data were analyzed using descriptive statistics while qualitative data from open-ended survey questions and KIIs were analyzed through thematic analysis to identify emergent patterns and narratives.

RESULTS AND DISCUSSION

The study's findings highlight critical challenges and opportunities in Ethiopia's manufacturing R&D sector, supported by key informant interviews (KIIs) that provide deeper insights into systemic gaps and potential solutions. Among the major challenges established by the study were:

Insufficient R&D Investment and Funding Constraints

The survey revealed that 79.2% of respondents disagreed that current R&D investments are sufficient to drive productivity and competitiveness. This view was corroborated by KII responses, which emphasized chronic underfunding and misallocation of resources. A sample of the verbatim quotes from the KIIs is as presented hereunder:

1. The government should focus on targeted R&D investments in priority industries to improve productivity, increase global competitiveness, and promote collaborative innovation through public-private partnerships.
2. R&D centers lack research facilities and competent personnel to carry out advanced research and technology transfer activities. They are often stuck in routine administrative work rather than transformative research.

In addition to these findings, a review of government documents indicated that Ethiopia's investment in research and development stands at a mere 0.61% of GDP, a figure that falls significantly short of the levels required for nations undergoing industrialization. This inadequate funding level severely constrains the country's capacity to develop the technological advancements and innovative solutions needed to drive industrial growth and enhance global competitiveness. The consequences of this underinvestment are particularly evident in the operations of Ethiopia's R&D centers, which struggle with severely constrained financial resources. These budgetary limitations compel research institutions to focus predominantly on immediate, short-term administrative tasks and routine activities, leaving little room for transformative, long-term research projects that could spur meaningful technological breakthroughs. This focus on maintaining basic operations rather than pursuing groundbreaking innovation creates a significant barrier to the development of cutting-edge solutions that could modernize Ethiopia's manufacturing sector and improve its position in global value chains. The chronic underfunding thus traps the country's research ecosystem in a cycle of maintaining the status quo rather than driving the innovation needed for industrial transformation.

Weak Industry-Academia Linkages and Human Capital Gaps

A major finding was the lack of collaboration between R&D centers, universities, and industries, with 62.5% of survey respondents reporting weak linkages. KIIs elaborated on this disconnect thus:

1. The triple helix model (university-industry-government) is critical for human capital development and innovation. Currently, universities produce graduates with theoretical knowledge but lack industry-relevant skills.
2. Higher education institutions receive more government support, but their research is rarely aligned with industry needs. We need structured internship programs and joint R&D projects.

The persistent skill mismatches in Ethiopia's workforce stem largely from a disconnect between academic curricula and industry needs, compounded by minimal private sector engagement in shaping research agendas. This disconnect creates graduates with theoretical knowledge but inadequate practical competencies for the evolving demands of modern manufacturing. However, international examples demonstrate the transformative potential of structured collaboration, as seen in South Korea's successful industry-academic R&D parks where close integration between universities and corporations has driven technological advancement and economic growth. These models highlight how deliberate institutional partnerships can align educational outcomes with industrial requirements while fostering an ecosystem conducive to innovation and workforce readiness. Ethiopia could draw valuable lessons from such approaches to bridge its own skills gap and stimulate research-driven industrial development.

Limited Commercialization of Research Outputs

While some R&D centers have developed advanced technologies (e.g., AI-based defect detection, waste valorization), most innovations fail to reach commercialization. KIIs highlighted systemic barriers:

1. We've developed high-precision vision models for quality control and machine learning for predictive maintenance, but industries are reluctant to adopt them due to high costs and risk aversion.
2. There's no clear pathway from lab to market. Research stays in reports rather than being piloted in factories.

Based on these findings, it can be deduced that while research centers innovate, diffusion of the new technologies is minimal due to the prohibitively high upfront costs associated with acquiring and implementing advanced technologies, which are beyond the reach of many local manufacturers. Moreover, local industries lack confidence in locally developed solutions, as manufacturers often perceive domestically produced technologies as inferior to imported alternatives. This trust deficit discourages investment in homegrown innovations even when they may be more cost-effective or better suited to local conditions. Furthermore, the absence of robust venture funding mechanisms creates a critical financing gap that prevents promising innovations from progressing beyond pilot stages to full-scale industrial implementation. These interrelated barriers - financial constraints, market skepticism, and funding shortages - collectively undermine technological modernization and maintain the status quo of low productivity in Ethiopia's manufacturing landscape. Addressing these systemic challenges requires coordinated policy interventions that simultaneously tackle cost barriers, build market confidence, and establish sustainable financing pathways for scaling innovations.

Need for Policy Reforms and Strategic R&D Prioritization

KIIs stressed that current policies are poorly implemented, with no clear incentives for private-sector R&D engagement. Among the strongly expressed views were:

1. The absence of a legal framework for private-sector R&D investment is a major hurdle. Companies see no benefit in funding research.
2. We need mission-oriented R&D, focusing on sectors like textiles and leather where Ethiopia has a comparative advantage.

While Ethiopia's Manufacturing Industry Policy (2025) identifies critical gaps in research and development, its effectiveness remains hampered by weak enforcement mechanisms and implementation frameworks. This policy shortcoming becomes particularly evident when contrasted with successful models from emerging economies like Vietnam, where strategic focus on R&D in priority sectors such as textiles and agro-processing has significantly boosted export performance and global competitiveness. These comparative cases demonstrate how targeted innovation investments in select industries, coupled with strong policy execution, can transform manufacturing sectors - a lesson Ethiopia could adapt by concentrating its limited R&D resources on sectors where it holds comparative advantages while simultaneously strengthening policy enforcement institutions. The disconnect between policy recognition and practical implementation continues to

constrain Ethiopia's industrial potential, suggesting the need for both focused sectoral strategies and more robust mechanisms to translate policy intentions into measurable outcomes.

CONCLUSION

This study underscores the critical yet underdeveloped role of Research and Development (R&D) in enhancing Ethiopia's manufacturing sector and, by extension, its economic security. The findings reveal a sector constrained by systemic challenges, including chronic underfunding (only 0.61% of GDP allocated to R&D), weak industry-academia linkages, and limited commercialization of innovations. Survey data and key informant interviews (KIIs) highlight that 79.2% of respondents believe current R&D investments are insufficient, while 62.5% report poor collaboration between universities and industries, leading to skill mismatches and stagnant productivity. Despite some promising technological advancements, such as AI-driven quality control and waste valorization, most innovations fail to reach industrial application due to high costs, lack of industry trust in local solutions, and insufficient venture funding.

The study also identifies opportunities for reform, drawing lessons from successful models in Asian countries such as Vietnam where targeted R&D in priority sectors (e.g., textiles, agro-processing) has driven export competitiveness. However, Ethiopia's Manufacturing Industry Policy (2025) lacks enforcement mechanisms, and private-sector participation remains minimal due to weak incentives and policy gaps. To transform R&D into a catalyst for economic security, Ethiopia must increase funding to at least 1.5% of GDP, strengthen triple helix (university-industry-government) collaboration, and establish clear pathways for commercializing research. Additionally, sector-specific R&D strategies, coupled with tax incentives for private investment and venture capital for scaling innovations, could bridge the gap between research and industrial application. Ultimately, Ethiopia's ability to leverage R&D for industrial transformation and economic resilience hinges on policy coherence, institutional reforms, and strategic prioritization of high-impact sectors. Without these interventions, the manufacturing sector risks remaining trapped in low productivity and import dependency, undermining long-term economic security. However, with structured investments, stronger partnerships, and a focus on scalable innovations, Ethiopia can unlock the full potential of R&D to drive sustainable industrial growth and global competitiveness.

RECOMMENDATIONS

Based on the study's findings and conclusions, the following recommendations are proposed to strengthen the role of R&D in boosting Ethiopia's manufacturing productivity and economic security:

Increase R&D Investment and Improve Funding Allocation

The government through the Ministry of Industry should significantly increase national R&D expenditure from the current 0.61% to at least 2% of GDP and strategically direct it toward priority sectors such as textiles, leather, and agro-processing to maximize their export competitiveness. This should be complemented by a dedicated innovation fund to provide crucial support for applied research, facilitate technology transfer, and accelerate the commercialization of locally developed solutions, helping bridge the gap between research and industrial application.

Strengthen Industry-Academia-Government Collaboration

The Ministry of Innovation and Technology should actively enforce the triple helix model by institutionalizing mandatory joint R&D initiatives, structured internship programs, and cooperative curriculum development. The establishment of specialized innovation hubs that bring together researchers and manufacturers would enable collaborative problem-solving for pressing industrial challenges. This should be augmented by a comprehensive national skills mapping program to systematically align educational programmes with industry needs, thereby addressing critical workforce competency gaps.

Enhance Commercialization of Research Outputs

The Ministry of Innovation and Technology should establish dedicated technology demonstration centers that highlight the potential of locally developed innovations while building confidence among manufacturers. To enhance uptake of innovations, the ministry should root for financial incentives such as targeted subsidies and tax rebates to encourage firms to integrate domestically produced technologies into their operations, while expanding access to venture capital and strengthening startup incubation ecosystems to scale up promising innovations from experimental phases to full-scale industrial implementation.

Reform Policy Frameworks for Effective Implementation

Policymakers across government departments should reinforce implementation mechanisms within the Manufacturing Industry Policy (2025) to guarantee proper execution and accountability. The government should establish fiscal incentives, including R&D tax credits, to stimulate greater private sector engagement in innovation activities.

Leverage International Best Practices

Line government ministries should actively cultivate strategic R&D collaborations with foreign institutions and firms to enable vital technology and knowledge transfer. While maintaining alignment with global science, technology and innovation (STI) standards, Ethiopia must carefully customize these frameworks to address its unique industrial requirements and developmental priorities. This approach to learning while maintaining local relevance, would help bridge technological gaps and accelerate industrial advancement.

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