Journal of Economics

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Dahabo Boru Bulfana & Stephen Githae Njaramba (PhD)

ISSN: 2617-5800

Stratford Peer Reviewed Journals and Book Publishing
Journal of Economics
Volume 10||Issue 2||Page 49-63||July||2026|
Email: info@stratfordjournals.org ISSN: 2617-5800

Human Capital Development, Labor Productivity and Sectoral Labor Productivity Differential in Kenya

[*1]Dahabo Boru Bulfana & [2]Stephen Githae Njaramba (PhD)

[1,2]School of Business, Economics and Tourism, Kenyatta University, Kenya

***Email of the Corresponding Author: dahabobbulfana@gmail.com**

How to cite this article: **Bulfana, D., B. & Njaramba S., G. (2026). Human Capital Development, Labor Productivity and Sectoral Labor Productivity Differential in Kenya. *Journalof Economics,* 10(2) pp.49-63. https://doi.org/10.53819/81018102t3182**

Abstract

Kenya has recorded notable progress in human capital development over recent decades, as reflected in steady improvements in education and health outcomes. However, this progress has not translated into equivalent gains in labor productivity, which has persistently remained between 1.2 and 1.5 percent, well below the 3 percent target set under Vision 2030. Substantial productivity differentials also persist across key economic sectors, with the manufacturing sector exhibiting considerably higher labor productivity than the agricultural sector despite the latter employing the majority of the workforce. This study examined the effects of human capital development on overall labor productivity and sectoral labor productivity differentials in Kenya for the period 1990 to 2023. The study was grounded in the Solow growth model, augmented by the Human Development Index (HDI) as a proxy for human capital. Secondary time series data were sourced from the Kenya National Bureau of Statistics, the International Labour Organization, the World Bank, and World Development Indicators. The Autoregressive Distributed Lag (ARDL) bounds testing approach was applied to estimate both short-run dynamics and long-run equilibrium relationships. Findings revealed that HDI exerted a positive and statistically significant effect on overall labor productivity in both the short run and the long run. However, HDI did not significantly reduce the sectoral labor productivity differential between agriculture and manufacturing, suggesting that Kenya's human capital investments have not been sufficiently targeted toward the lower-productivity agricultural sector. The study recommends sector-specific human capital interventions, particularly in vocational training, agricultural extension services, and health infrastructure, to enhance labor productivity and reduce structural productivity gaps across sectors.

Keywords: *Human Capital, Development, Labor Productivity, Sectoral Labor, Productivity Differential*

1.1 Background of the Study

Labor productivity, measured as the total output generated per unit of labor input, is a critical indicator of economic efficiency and competitiveness (Shcherbakov, 2022). It reflects the efficiency with which labor is utilized in the production process and serves as a key determinant of a country's economic growth trajectory. Labor productivity varies across countries and regions, shaped by a range of factors including health outcomes, educational attainment, income per capita, technological advancement, capital investment, workforce skills, and institutional frameworks (OECD, 2024a). Globally, significant disparities in technologies, capital investments, and human capital endowments drive the observed differences in labor productivity across economies. In developed countries, labor productivity tends to be high, driven by advanced technologies and well-developed infrastructure that enable workers to engage efficiently in the production of goods and services, thereby enhancing output per worker. By contrast, labor productivity in developing countries has generally been more moderate, though relatively stable over time, supported by gradual diversification of their economies and incremental improvements in education, technology, and infrastructure (Agosin & Retamal, 2021).

Developing countries have progressively expanded their service sectors and adopted new technologies, enabling them to cushion labor productivity against external shocks to some degree. Kenya's labor productivity, however, exhibits considerable volatility over time, characterized by substantial fluctuations that reflect the country's heightened sensitivity to external disruptions. Notably, labor productivity declined sharply to -6.16 percent in 2008 in response to the global financial crisis, and further contracted to -4.74 percent in 2020 as a consequence of the COVID-19 pandemic. These episodes underscore Kenya's relatively higher exposure to external shocks compared to more structurally diversified economies. The downward trend in labor productivity recorded in 2002 has been attributed to a persistent mismatch between the demand and supply of skills in the labor market (Kimuyu, 2005). Moreover, Kenya's labor productivity has consistently lagged behind that of other developing countries and, in certain periods, has compared unfavorably even with some less developed economies. This underperformance is largely attributable to the country's heavy reliance on subsistence agriculture, inadequate infrastructure, and limited industrialization, all of which have constrained the growth of labor productivity over time (Jayne et al., 2021).

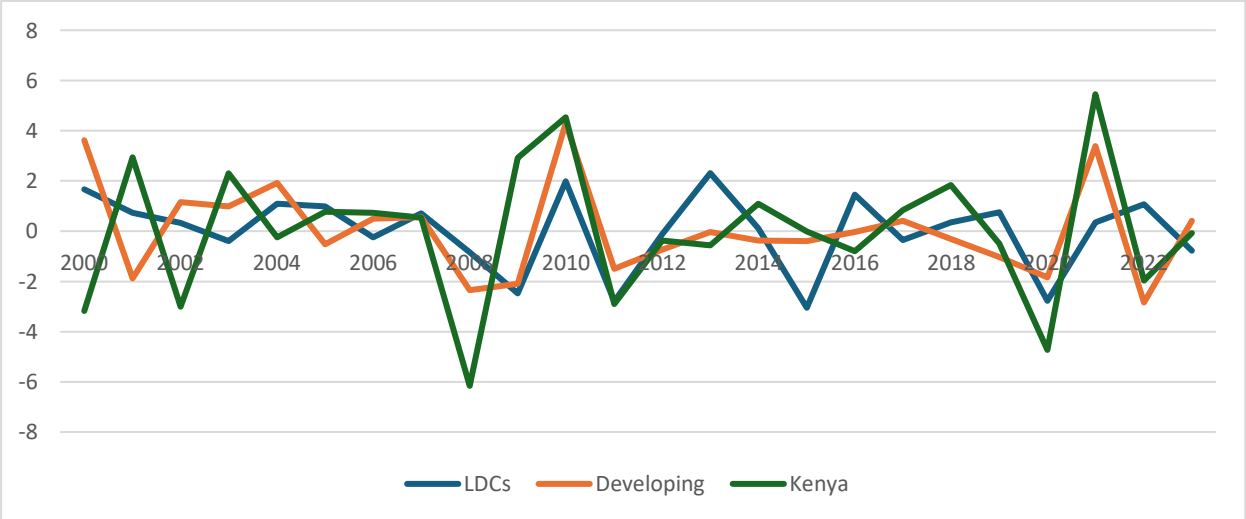

Figure 1: Growth of Labor Productivity

https://doi.org/10.53819/81018102t3182

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Journal of Economics
Volume 10||Issue 2||Page 49-63||July||2026|
Email: info@stratfordjournals.org ISSN: 2617-5800

As illustrated in Figure 1, labor productivity trends have fluctuated considerably across regions and countries since 2000, with moderate growth interrupted by climatic shocks, slow improvements in education, and inadequate healthcare, all of which have contributed to Kenya's persistent labor productivity underperformance (Blanchard & Katz, 2002; Kamau et al., 2018). A significant proportion of Kenya's population remains employed in the informal sector, where low earnings undermine workforce efficiency and constrain inclusive and sustainable growth (Kamau et al., 2018). In response, labor productivity has become a central pillar of Kenya's national development agenda, with Vision 2030 targeting 3 percent productivity growth through sector-specific reforms and institutional interventions, complemented by the Big Four Agenda's emphasis on technological advancement and workforce training to drive sectoral growth (Government of Kenya, 2017). Despite increased allocations to education and training, labor productivity has remained inconsistent, underscoring the need for targeted interventions that build economic resilience across high labor-absorbing sectors such as agriculture and manufacturing (ILO, 2021; Amutabi & Wambugu, 2020). This inconsistency is most pronounced at the sectoral level, where agriculture, which employs approximately 56 percent of the workforce, operates at only 30 percent of its productive potential due to outdated farming techniques and limited investment, while manufacturing, though also below full capacity, achieves a comparatively higher 40 percent efficiency, presenting a structural challenge rooted in the concentration of labor in the least productive sector (KIPPRA, 2022; KNBS, 2022; FAO, 2022).

1.1.1. Labor Productivity and Human Capital Development in Kenya

Kenya's labor productivity has remained low overtime. The performance remains below the government target of 3 percent outlined in the Vision 2030. Although productivity has been low, human capital development has shown growing trend through improvement in education, health and human development. Generally, human capital index has been growing gradually in Kenya with low rate of labor productivity as indicated in Figure 2.

Figure 2: Kenya Human Development Index (HDI) and Labor Productivity (1990-2023)

According to Figure 2, Kenya has made notable strides in Human Capital Development (HCD) as reflected in the gradual growth of its Human Development Index (HDI). HDI quantifies how well a country is investing in its people and provides a measure of the future productivity

https://doi.org/10.53819/81018102t3182

capacity of the next generation of workers. According to the World Bank (2020), survival rates in Kenya have steadily improved due to expanded healthcare services, education services through the expected years of schooling and based on current enrolment rates. In Kenya, this figure shows a significant growth in HDI, largely driven by effectiveness of policies like free primary education and the Ministry of Education's push for 100% transition to secondary school (Ministry of Education, 2019).

1.1.2. Sectoral Labor Productivity Differential and Human Capital Development in Kenya

The productivity differentials between the manufacturing and agricultural sectors in Kenya from 1990 to 2023 are presented in Figure 3.

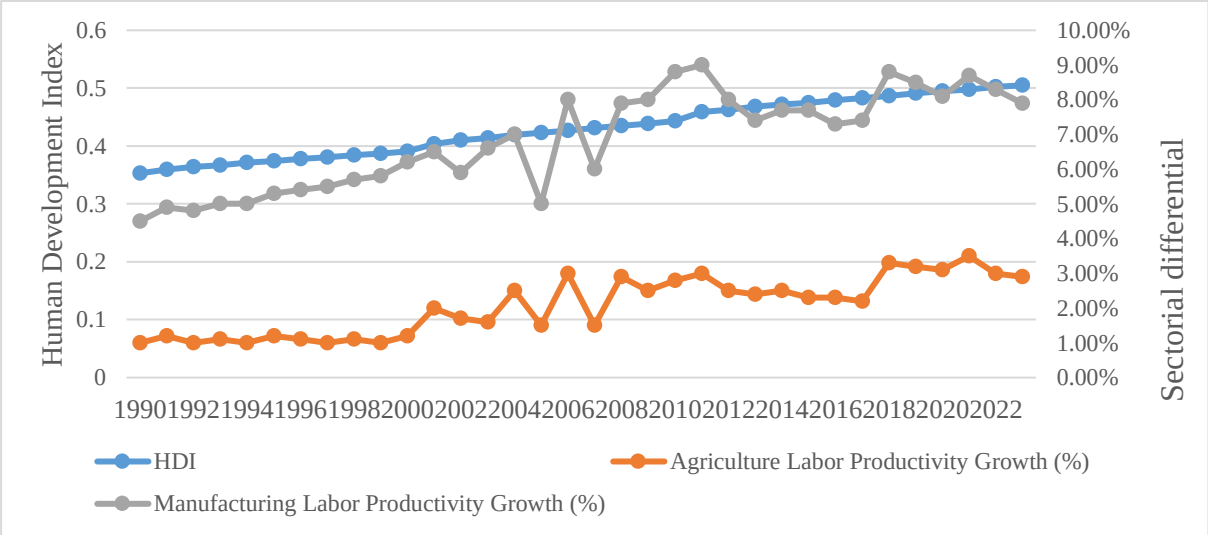

Figure 3: Sectorial differential and Human Development Index in Kenya

Figure 3 reveals significant and persistent disparities in sectoral labor productivity between the manufacturing and agricultural sectors against the backdrop of gradually improving human capital development. Labor productivity in Kenya varies significantly across sectors, driven by differences in capital intensity, technological adoption, workforce skills, and educational attainment, with these variations being particularly pronounced between agriculture and manufacturing due to differences in mechanization, access to credit, and reliance on informal labor (McMillan & Zeufack, 2022). The manufacturing sector contributes approximately 7.5 percent to GDP and employs 12 percent of the formal workforce, reflecting its relatively higher capital intensity and productive efficiency (Kenya National Bureau of Statistics, 2022). In contrast, the agricultural sector, despite remaining the cornerstone of Kenya's economy by contributing approximately 22 percent to GDP and employing around 40 percent of the total workforce with even higher employment rates in rural areas, exhibits a stark contrast between its employment share and its economic output, as its GDP contribution remains disproportionately smaller relative to the size of its labor force (FAO, 2023).

While the Human Development Index has risen steadily over the study period, labor productivity in manufacturing has consistently outpaced that of agriculture, which has persistently lagged behind due to ongoing vulnerability to weather unpredictability and inadequate infrastructure, in contrast to manufacturing's sustained gains from technological advancement and improved access to financial resources, factors that have collectively widened

the sectoral productivity gap over time (Omollo, 2023). This deepening differential presents an urgent structural challenge, as a more balanced distribution of productivity across sectors is essential for achieving inclusive economic growth and reducing income inequality (AfDB, 2023). Although the government has invested in human development, these investments have largely remained untargeted with respect to the sector-specific skills and health needs of the agricultural workforce, with educational expenditure remaining relatively stable but insufficiently aligned with the growing demand for technical and vocational training institutions capable of directly enhancing productivity across both sectors.

1.2 Statement of the Problem

Kenya has made notable achievements in human capital development over the past decades, with improvements in both the education sector and health outcomes reflecting growing efficiency in human development investment. For example, the country's Human Development Index grew from 0.3 in 1990 to 0.5 in 2023 (World Bank, 2023). Similarly, the health index, measured through life expectancy, increased from 0.45 in 1990 to 0.56 in 2023, while the education index, derived from school enrollment and attainment gains, expanded from 0.35 in 1990 to 0.5 in 2023 (ILO, 2023). These trends collectively indicate that the government's sustained interventions across education and healthcare have resulted in increased access to essential services and a gradual strengthening of the country's human capital base (UNESCO, 2022; Ministry of Health, 2022).

Despite these gains, labor productivity has remained persistently below the government's target of 3 percent outlined in Vision 2030, and significant productivity disparities continue to exist across key economic sectors, particularly between manufacturing and agriculture, which are central contributors to Kenya's GDP. While the agricultural sector employs approximately 56 percent of the national workforce, it operates at only 30 percent of its productive potential and contributes less efficiently to economic output relative to its labor absorption capacity. In contrast, the manufacturing sector, which employs only 11.5 percent of the workforce, exhibits labor productivity levels that are 3.5 times higher than those recorded in agriculture (KNBS, 2022). This persistent mismatch between human capital development and sectoral labor productivity highlights significant inefficiencies in human capital allocation and reflects the inadequacy of existing investment strategies in addressing the sector-specific skills and health needs required to close the productivity gap between agriculture and manufacturing in Kenya.

1.3 Objectives of the Study

The overall goal of the study was to examine the effect of human capital development on labor productivity and sectoral productivity differentials in Kenya.

1.3.2. Specific objectives

i. To analyze the effect of human capital development on labor productivity in Kenya.
ii. To investigate the effect of human capital development on sectoral labor productivity differentials in Kenya.

2.0 Literature Review

The section presents the theoretical and empirical literature employed by this study.

2.1 Theoretical Literature

This includes the Endogenous Growth Theory, Solow growth theory, Production theory, Human Capital Theory and Research and Development theory**.**

2.1.1 Solow Growth Theory

The Solow growth theory, advanced by Robert Solow (1956) and later augmented by Mankiw, Romer, and Weil (1992), provides the foundational framework for analyzing the determinants of long-term economic growth, namely capital accumulation, labor, and technological progress. The theory posits that output in an economy is a function of capital, labor force, and technological progress, expressed as;

$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$.

Where technology is treated as an exogenous variable. Although the original model retained labor input as homogenous, its augmented version incorporated human capital encompassing education, skills, and health as an additional factor of production that enhances labor productivity and fosters sustained economic growth (Mankiw et al., 1992). The theory assumes constant returns to scale in production, diminishing returns to individual factors, and a constant savings and population growth rate within a closed economy, underscoring the role of capital accumulation and savings in boosting productivity (Morrison & Siegel, 1997).

In relation to this study's variables, the Solow model provides a basis for understanding how human capital formation enhances both aggregate labor productivity and sectoral labor productivity. Sectors characterized by higher levels of human capital development exhibit greater labor productivity, reflecting differences in education, health standards, and income across the economy (Baharin et al., 2020). The model further implies that more technologically advanced and capital-intensive sectors benefit disproportionately from improvements in human capital, thereby contributing to sectoral productivity differentials between agriculture and manufacturing. Integrating the Solow model with human capital development therefore highlights the importance of targeted investments in education and health for driving sustainable economic growth and reducing labor productivity gaps across sectors (Bykova et al., 2024).

2.1.2 Endogenous Growth Theory

The Endogenous Growth Theory (EGT), pioneered by Romer (1986) and Lucas (1988), was developed in response to the limitations of the Solow-Swan model, which relied on exogenous technological progress as the primary driver of long-term growth. EGT shifts the analytical focus to internal economic factors particularly innovation, human capital, and research and development as the critical engines of sustained productivity growth. Unlike the Solow model, EGT posits that economic actors can directly influence growth outcomes through deliberate investments in education, skills development, and innovation, generating increasing returns to scale as knowledge accumulates and diffuses across sectors (Romer, 1990). The theory further recognizes that supportive government policies and institutional development shape growth outcomes by promoting innovation and facilitating the long-term accumulation of productive human capital (Lucas, 1988).

With respect to the study's variables, EGT offers a framework for explaining why labor productivity and sectoral productivity differentials persist in Kenya. The theory acknowledges that knowledge and innovation do not diffuse uniformly across all sectors, as technological advancements in capital-intensive sectors such as manufacturing may not easily spill over into

lower-productivity sectors such as agriculture (Rodrik, 2006). Consequently, manufacturing benefits more substantially from human capital development and technological innovation compared to agriculture, which is constrained by lower levels of human capital investment and limited access to modern technologies (Kimenyi, 2021). This differential absorption of human capital across sectors directly contributes to the sectoral labor productivity gap that this study seeks to examine, making EGT a critical theoretical lens for understanding how varying degrees of human capital investment translate into divergent productivity outcomes across Kenya's key economic sectors.

2.1.3 Human Capital Theory

Human Capital Theory (HCT), developed by Becker (1964) and Schultz (1961), provides an important economic framework for understanding how investments in education, health, and skills contribute to higher labor productivity and long-term economic growth. The theory treats people as productive assets, arguing that improvements in their knowledge, skills, and health enhance their capacity to contribute effectively to economic output, much as investments in physical capital improve production efficiency. Education and training are identified as central components of human capital formation, equipping individuals with the skills and knowledge needed to perform more efficiently and adapt to evolving technologies (Becker, 1964). Health investments are equally critical, particularly in developing countries, where disease and poor nutrition significantly reduce workers' physical and cognitive productivity (Schultz, 1961; Murphy & Topel, 2006).

In relation to this study, HCT directly informs both the aggregate labor productivity and sectoral productivity differential variables. At the aggregate level, countries with stronger education and health systems tend to experience faster economic growth due to a more skilled and productive labor force, with Barro (1991) and Lucas (1988) demonstrating that human capital contributes to growth through positive spillover effects across the economy. At the sectoral level, however, HCT recognizes that different sectors require different types of skills and knowledge, with manufacturing and technology sectors demanding advanced technical skills while agriculture benefits more from vocational training, extension services, and practical agricultural knowledge (Schultz, 1964). Where investments in human capital are not aligned with sectoral needs, productivity gaps are likely to emerge and widen over time (Sachs & Warner, 1997). This theoretical insight directly underpins the study's examination of why Kenya's broad human capital investments have raised aggregate labor productivity without meaningfully closing the productivity differential between agriculture and manufacturing.

2.1.4 Production Theory

The Theory of Production, introduced by Cobb and Douglas (1928), explains how producers combine factors of production including labor, capital, and land to achieve efficient levels of output. The theory focuses on how producers make decisions regarding resource allocation in response to input prices, including wages and rents, and how these decisions influence the quantity of goods and services produced (Thirlwall & Pacheco-López, 2017). Production involves the transformation of inputs into outputs that satisfy human needs and create economic value, requiring strategic decisions about the optimal combination of inputs under constraints of resource availability, technology, and market demand (Cobb & Douglas, 1928; Walker, 2021). The theory emphasizes efficiency in resource utilization as the cornerstone of maximizing productivity and economic performance.

https://doi.org/10.53819/81018102t3182

In the context of this study, the Production Theory is particularly relevant for examining the relationship between human capital development and labor productivity in Kenya. Human capital encompassing health, education, training, and skills constitutes a critical factor of production whose improvement enhances workers' efficiency and effectiveness, thereby increasing labor productivity (Cobb & Douglas, 1928). The theory further helps explain differences in labor productivity across sectors, as sectors with a more skilled and educated workforce, such as manufacturing, are likely to record higher productivity levels compared to sectors with lower levels of human capital development, such as subsistence agriculture (Thirlwall & Pacheco-López, 2017). By grounding the study in production theory, the analysis is able to demonstrate how better allocation of human capital resources can reduce sectoral productivity disparities and support Kenya's broader economic transformation agenda.

2.2 Empirical Literature

Gul et al. (2022) analysed the contribution of human capital development to labor productivity in Pakistan, specifying labor productivity as the dependent variable and employee age, education, and training as the independent variables. Applying the Generalized Method of Moments (GMM) to determine the effects of human capital on labor productivity, the study established that education had a positive and statistically significant relationship with labor productivity. Furthermore, the findings revealed that a one percent increase in training investment was associated with a 0.10 percentage point increase in productivity. These results are particularly relevant to the Kenyan context, where labor productivity has remained volatile, as they demonstrate the importance of understanding how targeted human capital development influences productive efficiency. The variables examined in Gul et al. (2022) closely mirror those of interest in the present study, providing a comparable analytical foundation for the Kenyan case.

Kumar and Balu (2023) examined the effect of human capital on economic growth and labor productivity in India using the Autoregressive Distributed Lag (ARDL) method with time series data spanning 2005 to 2019. The study found that human capital underutilization had a negative and statistically insignificant relationship with economic growth, while a short-run reduction in time-related underemployment was associated with increased labor productivity. These findings highlight that it is the effective utilization of human capital, rather than its mere availability, that plays a decisive role in enhancing labor productivity and driving economic growth. The study further underscores the importance of labor market efficiency and the optimal allocation of human capital to sectors where skills can generate the greatest productive returns. These insights are particularly pertinent to Kenya, where significant strides in human capital development through education and health have not been matched by commensurate gains in labor productivity, reflecting a persistent misalignment between available skills and sectoral needs for economic transformation.

Herrendorf et al. (2022) investigated how labor productivity varies across sectors in developing countries and how these disparities affect overall economic development. Drawing on a new dataset from the Groningen Growth and Development Centre, the study analyzed labor productivity in agriculture and manufacturing across 64 low-income countries from 1990 to 2018. The findings revealed significant labor productivity gaps between sectors, with manufacturing consistently outperforming agriculture. Notably, higher productivity in the manufacturing sector was associated with positive spillover effects that enhanced productivity in other sectors of the economy. This study provides a valuable framework for understanding sectoral productivity differentials in Kenya, emphasizing that addressing human capital deficits

in lower-performing sectors such as agriculture is essential for uplifting overall labor productivity and achieving more balanced economic development.

3.0 Research Methodology

The study adopted a non-experimental research design grounded in the Solow growth model, which frames labour productivity as a function of technological progress, capital per worker, savings, depreciation, and labour force growth. The framework was extended by treating the Human Development Index (HDI) as a contributor to total factor productivity, yielding empirical models in which labour productivity and the sectoral productivity differential between agriculture and manufacturing are each regressed on HDI, savings, the combined depreciation and labour force growth rate, unemployment, and trade openness. Both models were estimated using the Autoregressive Distributed Lag (ARDL) approach, selected for its suitability with time series variables of mixed integration orders I(0) and I(1) and its capacity to simultaneously capture short-run dynamics and long-run equilibrium relationships. Secondary time series data spanning 1990 to 2023 were sourced from the Kenya National Bureau of Statistics, the International Labour Organization, the World Bank, and World Development Indicators.

4.0 Findings and Discussion

This section presents the empirical findings organized into descriptive statistics, bounds test for cointegration, and ARDL regression results for both study objectives. All estimations used secondary time series data spanning 1990 to 2023, sourced from the Kenya National Bureau of Statistics, the World Bank, the International Labour Organization, and World Development Indicators.

4.1 Descriptive Statistics

Table 1 presents the summary descriptive statistics for all variables over the 34-observation study period, reporting the mean, standard deviation, minimum, and maximum values for each variable.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Labour Productivity (LP)	34	0.200	2.497	−6.160	5.450
Sectoral Labour Productivity Differential (SLP)	34	0.027	0.006	0.017	0.038
Human Development Index (HDI)	34	0.042	0.026	−0.009	0.090
Savings (S)	34	0.113	0.047	0.043	0.224
Depreciation and Labour Growth Rate (δ+n)	34	0.135	0.013	0.111	0.156
Unemployment (Un)	34	0.037	0.023	−0.008	0.081
Trade Openness (Trt)	34	0.500	0.120	0.272	0.729

Labour productivity recorded a mean of 0.200 with a high standard deviation of 2.497 and a range from −6.160 to 5.450, reflecting considerable volatility driven by external shocks including the 2008 global financial crisis and the 2020 COVID-19 pandemic. The sectoral

labour productivity differential averaged 0.027 with a small standard deviation of 0.006, indicating a persistent but gradually evolving productivity gap between agriculture and manufacturing. HDI averaged 0.042, ranging from −0.009 to 0.090, consistent with the moderate and generally positive human capital growth documented by the World Bank (2023) over the period. Gross domestic savings averaged 11.3 percent of GDP, fluctuating between 4.3 and 22.4 percent, reflecting the influence of income levels and fiscal conditions on domestic capital mobilization. The depreciation and labour force growth rate averaged 0.135 with limited variability, suggesting steady capital consumption and labour force expansion. Unemployment averaged 3.7 percent, though this figure likely understates true labour underutilization given Kenya's large informal sector. Trade openness averaged 0.500, ranging from 0.272 to 0.729, confirming a moderately open economy whose integration levels shifted with trade policy changes and global economic conditions.

4.2 Bounds Test for Cointegration

Prior to estimating the ARDL model, the bounds test for cointegration was conducted following Pesaran, Shin, and Smith (2001) to confirm the existence of a long-run equilibrium relationship among the variables. Table 2 presents the critical bounds values and p-values from the test.

Table 2: Bounds Test for Cointegration

	10%		5%		1%		p-value	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F-statistic	2.444	3.755	2.959	4.456	4.220	6.163	0.000	0.000
t-statistic	−2.531	−4.006	−2.901	−4.464	−3.668	−5.412	0.000	0.000

The computed F-statistic of 11.22 exceeds the upper critical bound at the 1 percent significance level, confirming a long-run cointegrating relationship among the variables. The t-statistic of −7.105 falls below the lower critical bound at the same level, further validating the significance of the long-run level coefficient. Together, these results confirm that the ARDL error correction framework is appropriate for estimating both short-run dynamics and long-run relationships in both models.

4.3 Effects of Human Capital Development on Labour Productivity

The ARDL model was estimated to examine the effect of human capital development on overall labour productivity in Kenya. Table 3 reports the error correction term, long-run coefficients, and short-run dynamics from the ARDL (2,0,2,1,0,1) specification.

Table 3: Effect of Human Capital Development on Labour Productivity

Variable	Coefficient	Std. Error	t-stat	p-value	95% CI Lower	95% CI Upper

Adjustment (ADJ)						
Labour Productivity L1.	−1.886***	0.216	−8.710	0.000	−2.338	−1.435
Long-Run (LR)						
Human Development Index	42.361***	8.278	5.120	0.000	25.094	59.627
Savings	17.566***	6.177	2.840	0.010	4.681	30.452
Depreciation and Labour Force (δ+n)	82.134***	25.821	3.180	0.005	28.273	135.995
Unemployment	0.020	0.027	0.750	0.460	−0.036	0.076
Trade Openness	−4.803**	2.225	−2.160	0.043	−9.444	−0.161
Short-Run (SR)						
Labour Productivity LD.	0.308**	0.131	2.360	0.029	0.036	0.581
Savings D1.	−16.794	13.361	−1.260	0.223	−44.665	11.077
Savings LD.	−36.420***	12.160	−3.000	0.007	−61.786	−11.054
Depreciation and Labour Force D1.	−71.076	55.840	−1.270	0.218	−187.557	45.404
Trade Openness D1.	7.528	5.259	1.430	0.168	−3.442	18.498
Constant	−23.194***	5.434	−4.270	0.000	−34.530	−11.859

The error correction term (L1. LP = −1.886***) is negative and significant at the 1 percent level, confirming that deviations from long-run equilibrium are corrected within subsequent periods, consistent with Engle and Granger (1987) and Pesaran, Shin, and Smith (2001). The R-squared of 0.9394 indicates that the model explains approximately 93 percent of the variation in labour productivity, reflecting strong model fit. In the long run, HDI exerted a positive and highly significant effect on labour productivity (42.361***), indicating that improvements in human capital translate into substantial productivity gains over time, consistent with Audi and Ali (2017) and Wanzala and Obokoh (2024). Savings (17.566***) and the combined depreciation and labour force growth rate (82.134***) were also positive and significant, confirming that domestic capital accumulation and labour force dynamics jointly support long-run productive capacity. Unemployment was positive but insignificant (0.020), while trade openness recorded a negative and significant long-run effect (−4.803**), implying that greater trade integration constrains domestic production through import dependency. In the short run, the lagged difference of labour productivity (0.308**) was positive and significant, confirming positive productivity momentum across periods. Contemporaneous savings (−16.794) were negative but insignificant, reflecting the investment lag between savings mobilization and productivity outcomes, while lagged savings (−36.420***) were negative and significant, suggesting prior-period savings divert resources through channels that take time to mature into productivity gains. Both depreciation and labour force growth (−71.076) and trade openness (7.528) were insignificant in the short run, confirming their limited role as immediate determinants of labour productivity.

4.4 Effects of Human Capital Development on Sectoral Labour Productivity Differentials

The second model examined the effect of human capital development on the sectoral labour productivity differential between agriculture and manufacturing in Kenya. Table 4 presents the ARDL (1,0,0,0,1) results with the log of the sectoral differential as the dependent variable.

Table 4: Human Capital Development on Sectoral Labour Productivity Differential

Variable	Coefficient	Std. Error	t-stat	p-value	95% CI Lower	95% CI Upper

Adjustment (ADJ)						
ln_Sectoral Labour Productivity L1.	−0.641***	0.209	−3.070	0.006	−1.079	−0.204
Long-Run (LR)						
ln_Human Development Index	−0.025	0.062	−0.400	0.693	−0.154	0.105
Depreciation and Labour Force (δ+n)	13.113	9.324	1.410	0.176	−6.403	32.628
Unemployment	0.021	0.018	1.140	0.267	−0.018	0.060
Trade Openness D1.	−3.190	1.965	−1.620	0.121	−7.303	0.924
Short-Run (SR)						
Trade Openness D1.	1.270*	0.673	1.890	0.050	−0.139	2.678
Constant	−2.400***	0.790	−3.040	0.007	−4.054	−0.747

The error correction term (L1. ln_SLP = −0.641***) is negative and significant, confirming that deviations from the long-run equilibrium in sectoral productivity differentials are corrected at approximately 64.1 percent per year. The R-squared of 0.5153 indicates that the model explains approximately 52 percent of the variation in the sectoral differential, which is reasonable given the structural complexity of inter-sectoral dynamics. The central finding of this model is that HDI recorded a negative but statistically insignificant long-run effect on the sectoral differential (−0.025, p = 0.693), contrasting sharply with its strong positive effect on aggregate labour productivity in Table 4.6. This divergence suggests that Kenya's human capital investments, while raising overall productive efficiency, have not been sufficiently targeted toward the agricultural sector to meaningfully close the productivity gap with manufacturing, as the skills and capabilities generated tend to accumulate in higher-productivity urban and formal sector environments. Depreciation and labour force growth (13.113), unemployment (0.021), and long-run trade openness (−3.190) were all statistically insignificant, while the significant negative constant (−2.400***) implies that unobserved structural factors including land tenure constraints, fragmented agricultural value chains, and technology access disparities independently suppress the sectoral differential beyond what the included regressors capture. In the short run, trade openness was the only significant variable (1.270*, p = 0.050), suggesting that immediate exposure to international competition introduces efficiency-enhancing pressures that temporarily narrow the productivity gap between sectors, consistent with the short-run competitive discipline effects documented in the structural transformation literature.

5.0 Conclusions

The study concluded that human capital development remains a pivotal driver of labour productivity in Kenya, as evidenced by the positive and statistically significant long-run effect of the Human Development Index on aggregate labour productivity, with savings and capital depreciation jointly reinforcing this productive capacity over time. Despite the government's sustained focus on improving labour productivity through Vision 2030, which targets 3 percent productivity growth, this benchmark has not yet been achieved, underscoring the importance of sustained and consistent investment in education, health, and skills development. With respect to sectoral labour productivity differentials, human capital development, while raising overall productive efficiency, has not significantly reduced the productivity gap between agriculture and manufacturing, reflecting the structural nature of Kenya's human capital investments, which have remained insufficiently targeted toward the sector-specific skills and technological needs of the agricultural workforce. Trade openness was the only variable found to temporarily narrow the sectoral differential in the short run, while unobserved structural factors including land tenure constraints, fragmented agricultural value chains, and limited technology access

continue to suppress agricultural productivity independently. The study therefore underscores the urgent need for targeted, sector-specific human capital interventions that translate improvements in workforce education and health into measurable gains in labour productivity and reduced sectoral productivity disparities across Kenya's economy.

6.0 Policy Implications

The findings highlight the need for sector-specific human capital interventions in Kenya, given that while HDI significantly raises aggregate labor productivity, it fails to reduce the sectoral differential between agriculture and manufacturing. The Ministry of Education should align curricula and vocational training toward technical skills demanded in agriculture and manufacturing, while the Ministry of Health should increase funding for preventive healthcare to sustain labor force participation. The Ministry of Trade should pursue trade agreements that prioritize technology transfer over simple market liberalization, and the government should modernize the agricultural sector through improved access to inputs, extension services, and agro-processing linkages to address the persistent agricultural productivity deficit.

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