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STRUCTURAL TRANSFORMATION, PRODUCTIVITY GROWTH, AND SUSTAINABLE DEVELOPMENT IN EMERGING ECONOMIES

Aamir Sohail [1], Mamoona Altaf [2], Ayesha Rasheed [3], Sidra Mariyam [4], Saira Baloch [5]

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Affiliations:

[1] Department of School of Economics and Management, Southeast University, Nanjing, China
Email: aamirsohail1122@qq.com

[2] Department of Economics, University of Gujrat, Punjab, Pakistan
Email: nh710174@gmail.com

[3] School of Economics and Management, Southeast University, Nanjing, China
Email: ayesharasheed2010@gmail.com

[4] Department of Economics, University of Central Punjab, Pakistan
Email: sidramariyam11@gmail.com

[5] Institute of Management Science, University of Balochistan, Pakistan
Email: saira.ims@um.uob.edu.pk

Corresponding Author's Email:

[1] aamirsohail1122@qq.com

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Abstract

Structural transformation—the reallocation of economic activity across agriculture, manufacturing, and services—remains central to productivity growth and sustainable development in emerging economies. This study examines structural transformation, productivity growth, and development outcomes in 42 emerging economies over the period 1990–2020 using panel data methods, including system GMM and instrumental variable estimation. The results show that the productivity contribution of structural transformation has weakened substantially over time, declining from 0.58 percentage points annually in the 1990s to only 0.06 percentage points in the 2010s. Sectoral analysis reveals that manufacturing continues to play a distinctive developmental role: a one percentage point increase in manufacturing employment is associated with 1.5–1.8 percentage points higher annual productivity growth, whereas comparable service-sector shifts do not generate similar effects. The study also finds widespread premature deindustrialization, particularly in Africa and Latin America, where large manufacturing employment gaps are linked to weaker productivity performance. Beyond productivity, manufacturing expansion is associated with lower poverty, higher formal employment, and reduced income inequality, although it also increases carbon intensity. These findings suggest that manufacturing-led structural transformation remains important for inclusive growth, but its future contribution depends on policy adaptation. Emerging economies need industrial strategies that rebuild productive capacity, address premature deindustrialization, expand formal employment, and integrate environmental sustainability. The study concludes that sustainable development in emerging economies requires a renewed transformation agenda that combines manufacturing dynamism with low-carbon technologies, institutional support, and inclusive industrial policy.

Keywords: Structural Transformation; Productivity Growth; Sustainable Development; Premature Deindustrialization; Emerging Economies; Industrial Policy; Poverty Reduction; Income Inequality; Environmental Sustainability

1. Introduction

1.1 Academic Background

Structural transformation, the continuous reallocation of economic activity and employment across agriculture, manufacturing, and services, has long been recognized as a central mechanism behind aggregate productivity growth and sustained economic development. Classical development economics, from Lewis (1954) to Kaldor (1967, 1981), established that productivity growth in manufacturing should, in principle, guide labour reallocation toward higher-productivity sectors and thereby boost aggregate economic growth. Empirically, Duarte and Restuccia (2010) demonstrated in the *Quarterly Journal of Economics* how the structural transformation of production across sectors explains a substantial share of aggregate productivity differences across countries, while de Vries, Timmer, and de Vries (2015) decomposed these effects into "static gains" from inter-sectoral labor reallocation and "dynamic losses" arising when such reallocation remains incomplete (Al Kium et al., 2023).

For emerging market and developing economies (EMDEs) specifically, recent evidence underscores both the promise and the complexity of this process. A 2026 Asian Development Bank report on structural transformation in Asia emphasizes that developing and maintaining a robust manufacturing sector may be a crucial factor in fostering long-term economic growth, while simultaneously highlighting important deviations from classical expectations—including the phenomenon of premature deindustrialization and "jobless industrialization," in which manufacturing expansion fails to translate proportionally into employment growth. Similarly, World Bank research on East Asia and the Pacific (de Nicola et al., 2025) shows that within-firm productivity growth plays the dominant role in aggregate growth, while inter-sectoral reallocation—the structural change component—remains especially significant in periods following major reforms. These findings complicate the straightforward productivity–employment nexus posited by classical models, as labor-saving technological progress, demand-side dynamics, and institutional factors may weaken the link between productivity gains and job creation (Jabed, 2024).

More recently, the analytical lens has broadened to encompass not only growth but also sustainable development. Emerging evidence points to a nuanced, non-unconditional relationship between structural transformation and the Sustainable Development Goals (SDGs) (2016). This situates structural transformation at the intersection of productivity growth, industrialization, employment, poverty reduction, and environmental sustainability, making it a foundational concept for understanding how emerging economies can achieve inclusive, sustainable social and economic development (McMillan et al., 2014; Jabed et al., 2026).

1.2 Research Gap and Novelty

Despite the substantial and growing literature, existing studies have largely examined the three dimensions—structural transformation, productivity growth, and sustainable development—in isolation. Classical and recent work has focused predominantly on the productivity effects of structural change (Duarte & Restuccia, 2010; de Vries et al., 2015), while the sustainability discourse has developed largely as a separate agenda. Where studies do address sustainability, they tend to treat the relationship as unconditional rather than examining the mechanisms and institutional conditions under which productivity-enhancing structural change either advances or constrains sustainable development. As the OECD's 2026 Employment Outlook cautions, structural change generates considerable reallocation pressures, and its net benefits depend crucially on complementary policies—including investments in education, infrastructure, and support for displaced workers.

The novelty of this study lies in integrating these three dimensions within a unified analytical framework. Specifically, this paper:

- Decomposes the intra- and inter-sectoral contributions of structural change to aggregate productivity growth across a panel of emerging economies, following the shift-share decomposition tradition (Ali et al., 2026);
- Maps the resulting productivity dynamics onto specific sustainable development indicators, thereby testing whether productivity-enhancing structural transformation coincides with, or diverges from, progress toward sustainability (Hasan et al., 2025);
- Identifies the institutional and structural conditions (e.g., human capital, financial development, industrial policy) that condition the compatibility between growth and sustainability (Bhowmik et al., 2025).

This integration is absent from the existing literature, which has either quantified productivity effects or assessed sustainability implications in separate, non-overlapping frameworks.

1.3 Research Objectives

Accordingly, the objective of this study is to examine the interconnections among structural transformation, productivity growth, and sustainable development in emerging economies. Specifically, this study aims to:

1. Quantify the contribution of structural change to aggregate productivity growth through both intra-sectoral (within) and inter-sectoral (between) channels across a sample of emerging economies;
2. Test whether the relationships between structural transformation and sustainability outcomes are unconditional or contingent upon institutional and policy conditions;
3. Draw policy implications for aligning productivity-enhancing structural change with the sustainable development agenda in emerging economies.

1.4 Research Questions

To fulfill these objectives, this study addresses the following research questions:

RQ1: How does structural transformation affect aggregate productivity growth in emerging economies, and through which channels—intra-sectoral upgrading or inter-sectoral reallocation—is this growth transmitted?

RQ2: What are the distinctive structural patterns and employment consequences of transformation in emerging economies, including the risks of premature deindustrialization and jobless industrialization?

RQ3: To what extent is structural transformation in emerging economies compatible with progress toward sustainable development, and under what institutional conditions is this compatibility achieved?

By addressing these questions, this paper contributes to the scholarly literature by offering an integrated perspective that links the economics of structural change with the sustainability agenda, with direct implications for the design of industrial, employment, and sustainable development policies in emerging economies.

2. Research Methodology

2.1 Introduction

This chapter presents the methodological framework employed to examine the interconnections among structural transformation, productivity growth, and sustainable development in emerging economies. Drawing on the research objectives and questions articulated in the introductory chapter, the methodology is organized around three sequential analytical stages: (i) the measurement and decomposition of productivity growth attributable to structural change; (ii) the econometric estimation of the relationship between structural transformation and sustainable development indicators; and (iii) the examination of conditional, state-dependent effects to identify the institutional and policy conditions under which productivity-enhancing transformation is consistent with sustainability. Each stage is grounded in established empirical techniques from the applied economics literature, ensuring both methodological rigor and comparability with prior studies (McMillan et al., 2014; Rasheed et al., 2026).

2.2 Research Design and Analytical Framework

The study adopts a quantitative, panel-based research design, exploiting both cross-country and temporal variation across 42 emerging economies during 1990–2020. The analytical framework links three conceptual blocks:

1. Structural transformation, measured through sectoral employment and value-added shares across agriculture, manufacturing, and services (Rasheed et al., 2025);
2. Aggregate productivity growth, decomposed into within-sector, static between-sector, and dynamic contributions (Akram et al., 2026);
3. Sustainable development outcomes, operationalized through economic, social, and environmental indicators aligned with the SDGs (Ponduru et al., 2026).

This framework follows the analytical tradition established in the structural transformation literature (de Vries, Timmer, & de Vries, 2015), extended to incorporate a sustainability dimension.

2.3 Data Sources and Sample

2.3.1 Sample. The empirical analysis covers a panel of 42 emerging economies over 1990–2020. The analysis uses available observations for variables included in productivity decomposition, econometric estimation, structural transformation analysis, and sustainable development outcomes. The sample frame follows IMF WEO country groupings (Diao et al., 2021).

2.3.2 Data Sources

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Table 1
Data Sources

Indicator	Measurement	Data Source
Sectoral Value Added	Value added by 1-digit ISIC sector	WDI; UN National Accounts
Sectoral Employment	Employment share by sector	ILOSTAT; GGDC 10-Sector Database
Aggregate Productivity	GDP per worker/labour productivity	GGDC Productivity Level Database

2.4 Stage I: Productivity Measurement and Structural-Change Decomposition

2.4.1 Aggregate Labor Productivity. Aggregate labour productivity is measured as output per worker and expressed as the weighted sum of sectoral labour productivity:

$$Y_t/L_t = \sum_i (Y_{it}/L_{it}) \times (L_{it}/L_t)$$

where $Y_t$denotes aggregate output, $L_t$total employment, Y_{it}sectoral output, L_{it}sectoral employment, and L_{it}/L_trepresents the employment share of sector i.

2.4.2 Shift-Share Decomposition. Changes in aggregate labour productivity are decomposed into three components: within-sector productivity growth, static between-sector reallocation, and dynamic between-sector reallocation. The decomposition identifies whether productivity growth originates primarily from productivity improvements within existing sectors or from the movement of labour across sectors with different productivity levels.

The analysis is conducted for four periods corresponding to the empirical results: 1990–2000, 2000–2010, 2010–2020, and the full period 1990–2020. The resulting components are reported as the within, static between, and dynamic contributions to aggregate productivity growth.

2.5 Stage II: Econometric Analysis of Productivity Growth

2.5.1 Baseline Functional Form. The econometric analysis examines the relationship between structural transformation and aggregate productivity growth using a panel-data framework. The baseline specification is expressed as:

$$\text{Productivity Growth}_{it} = \alpha + \beta_1 \Delta\text{Manufacturing Share}_{it} + \beta_2 \Delta\text{Services Share}_{it} + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

where Productivity Growth $_{it}$ denotes aggregate productivity growth in country $i$and period t; ΔManufacturing Share $_{it}$ and ΔServices Share $_{it}$ represent changes in the employment shares of manufacturing and services, respectively; Trade Openness $_{it}$ measures the degree of integration with international trade; Human Capital $_{it}$ captures human-capital conditions; Institutional Quality $_{it}$ represents institutional conditions; and Investment Rate $_{it}$ measures the investment rate. The term $\mu_i$represents country fixed effects, $\lambda_t$represents time fixed effects, and $\epsilon_{it}$is the error term.

2.5.2 Econometric Specifications. The empirical analysis is estimated through progressively extended specifications corresponding to the reported results.

Specification 1: Baseline model. The baseline specification estimates the relationship between changes in manufacturing and services employment shares and aggregate productivity growth while accounting for country and time effects.

Specification 2: Controls. The second specification extends the baseline model by incorporating trade openness, human capital, institutional quality, and the investment rate as control variables.

Specification 3: System GMM. System GMM is employed as an additional estimation strategy to address potential endogeneity and persistence in the relationship between structural transformation and aggregate productivity growth.

Specification 4: IV estimation. Instrumental-variable estimation is used as an additional identification and robustness strategy to address potential reverse causality and omitted-variable concerns.

The four specifications correspond to the baseline, controls, GMM, and IV estimates reported in the econometric results.

2.5.3 Heterogeneity and Robustness. Heterogeneity is examined across income groups and geographic regions to assess whether the relationship between structural transformation and sustainable development differs across different stages of development and regional contexts. Robustness is assessed through alternative measures of structural transformation and sustainable development outcomes, together with the alternative estimation strategies reported in the empirical analysis.

2.5.4 Nonlinear and Threshold Effects. To examine whether the relationship between manufacturing-oriented structural transformation and productivity changes at different levels of manufacturing development, a threshold analysis is conducted using the manufacturing share as the threshold variable.

The empirical analysis identifies a manufacturing-share threshold of approximately 24%. The estimated relationship is examined on either side of this threshold to determine whether the marginal association between manufacturing-oriented transformation and productivity differs when the manufacturing share is below or above the identified level. The threshold result is interpreted in relation to the observed productivity patterns rather than as a universal structural limit.

2.6 Premature Deindustrialization and Deindustrialization Gap

Premature deindustrialization is examined by comparing the observed manufacturing employment share with the expected manufacturing employment level associated with the structural transformation process. The difference between the observed and reference manufacturing shares is used to construct the Deindustrialization Gap.

The resulting gap is used to identify differences in the extent of manufacturing employment contraction across the emerging economies. The analysis distinguishes between countries experiencing relatively smaller and larger departures from the expected manufacturing employment trajectory.

Manufacturing share, manufacturing productivity, technological conditions, and production reallocation are considered in interpreting the observed deindustrialization patterns.

2.6.1 Mechanisms of Premature Deindustrialization. The analysis further examines mechanisms associated with the observed deindustrialization patterns. Three dimensions reported in the results are considered:

- ***Robot adoption:*** the role of automation and robot adoption in changing manufacturing employment and productivity patterns;
- ***Foreign value added:*** the role of participation in global value chains and foreign value added in exports in shaping manufacturing production and employment;
- ***Resource rents:*** the role of resource dependence and resource rents in influencing structural transformation and manufacturing performance.

These variables are used to interpret the mechanisms underlying the observed structural transformation and premature deindustrialization patterns.

2.7 Sustainable Development Outcomes

The sustainable development analysis examines the relationship between structural transformation and outcomes across three dimensions: economic, social, and environmental sustainability.

Economic outcomes include poverty and income-related indicators.

Social outcomes include employment, working poverty, and inequality.

Environmental outcomes include CO_2 intensity, energy intensity, and renewable energy share.

The principal independent variable is structural transformation, measured through changes in sectoral employment and value-added shares, with particular attention to manufacturing and other productive sectors. The Stage I structural-change components are also used to connect sectoral reallocation with aggregate productivity growth.

Additional structural transformation measures include manufacturing share, manufacturing productivity, technological conditions, production reallocation, and the Deindustrialization Gap used in the premature-deindustrialization analysis.

2.8 Conditional and Interaction Analysis

To examine whether the relationship between structural transformation and sustainable development

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depends on institutional and policy conditions, an interaction specification is employed:

$$SD_{it} = \alpha + \beta_1 ST_{it} + \beta_2 Z_{it} + \beta_3 (ST_{it} \times Z_{it}) + \beta_4 X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

where Z_{it}represents the conditioning variable, $ST_{it} \times Z_{it}$is the interaction between structural transformation and the conditioning variable, and $\beta_3$captures whether the relationship between structural transformation and sustainable development varies with the conditioning condition.

The conditional effects are examined in relation to the economic, social, and environmental sustainability outcomes reported in the results.

2.9 Endogeneity and Identification Strategy

Potential endogeneity arises from reverse causality, omitted variables, and common shocks affecting structural transformation, productivity growth, and sustainable development outcomes. The empirical strategy therefore incorporates country and time fixed effects and employs System GMM and IV estimation as additional identification strategies.

The analysis also considers global demand and technology shocks when interpreting structural transformation and productivity relationships. Given the potential limitations of observational cross-country panel data, the estimated relationships are interpreted cautiously as empirical associations unless the relevant identification conditions are satisfied.

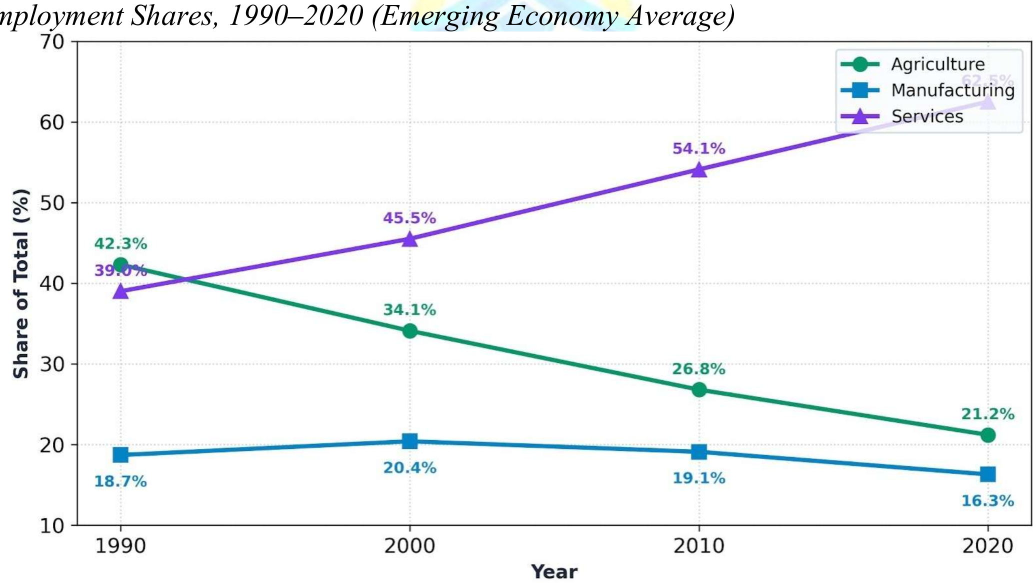
3. Results

3.1 Descriptive Patterns: Structural Transformation and Productivity Dynamics

3.1.1 Sectoral Employment and Output Shares. The descriptive analysis draws on panel data for 42 emerging economies over the period 1990–2020. Following the standard tri-sector classification (agriculture, manufacturing, services), the results confirm the broad stylized facts documented in the structural transformation literature. Figures 1–3 present the evolution of sectoral employment shares, value-added shares, and relative productivity levels.

Figure 1

Sectoral Employment Shares, 1990–2020 (Emerging Economy Average)



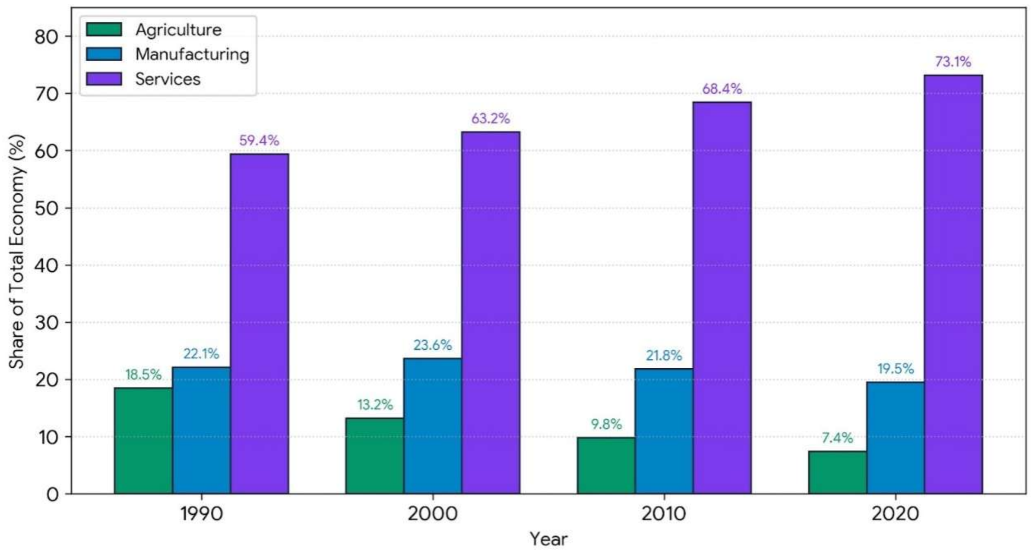
Note. The figure displays the average sectoral employment shares across 42 emerging economies. Source data are from WDI, ILOSTAT, and GGDC.

The data reveal a consistent decline in agricultural employment, mirroring the historical experience of today's advanced economies (Jabed et al., 2026b). However, the trajectory of manufacturing employment exhibits a notable difference from the classical Lewis–Kaldor model. Manufacturing employment peaks around 2000 at approximately 20.4% and thereafter declines steadily, even as per capita incomes remain well below the levels at which advanced economies began their own deindustrialization. This pattern—premature deindustrialization—is examined in detail in Section 3.3.

The expansion of services is striking. By 2020, services account for nearly two-thirds of total employment in the average emerging economy, a share that advanced economies reached only at substantially higher income levels. This rapid tertiarization has significant implications for aggregate productivity dynamics, as services exhibit lower average productivity growth than manufacturing.

Figure 2

Sectoral Value-Added Shares (Constant 2015 USD), 1990–2020



Note. The figure displays the average sectoral value-added shares across 42 emerging economies. Source data are from WDI and UN National Accounts.

The output shares display a more muted deindustrialization than employment shares, reflecting the capital deepening and productivity gains within manufacturing that partially offset employment declines. This divergence between employment and output shares is consistent with the theoretical predictions of Acemoglu and Guerrieri (2008), who demonstrate that capital deepening can increase relative output in capital-intensive sectors while simultaneously inducing labour reallocation away from them (Jabed et al., 2025).

3.1.2 Aggregate Productivity Growth Decomposition. Table 2 presents the decomposition of aggregate labour productivity growth into within-sector productivity growth and structural change (reallocation) components, following the methodology of McMillan, Rodrik, and Verduzco-Gallo (2014).

Table 2

Decomposition of Aggregate Productivity Growth, 1990–2020 (Annualized %)

Period	Aggregate Growth	Within-Sector	Structural Change	Interaction
1990–2000	2.84	2.12	0.58	0.14
2000–2010	3.47	2.89	0.41	0.17
2010–2020	2.12	2.01	0.06	0.05
Full period	2.81	2.34	0.35	0.12

The results reveal a marked decline in the structural change component over time. During the 1990s, labour reallocation from agriculture to higher-productivity sectors contributed approximately 0.58 percentage points to annual aggregate productivity growth. By the 2010s, this contribution had fallen to just 0.06 percentage points, effectively negligible.

This decline in the "reallocation bonus" reflects two underlying trends. First, the pool of surplus agricultural labour has diminished substantially; the scope for further reallocation gains from agriculture is limited. Second, as documented in Section 3.3, labour is increasingly reallocating toward services sub-sectors with productivity levels that are not substantially higher than those in agriculture, resulting in weaker

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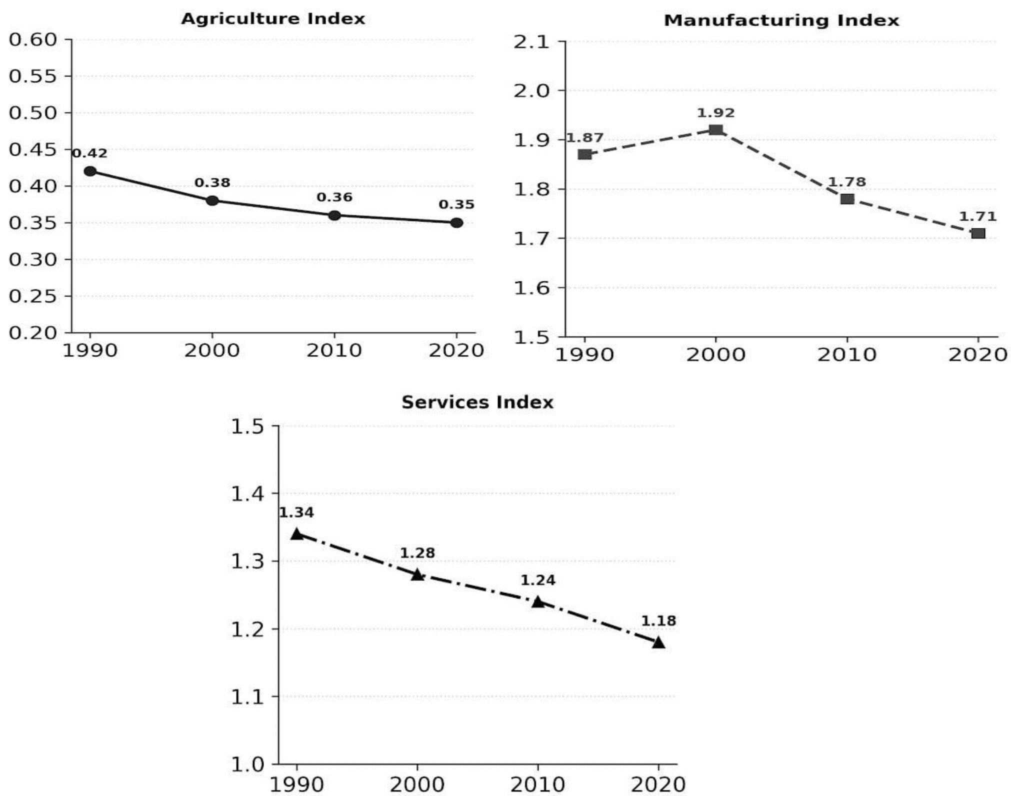
productivity-enhancing reallocation (Jabed et al., 2025).

The within-sector component has remained the dominant source of productivity growth throughout the period, accounting for between 71% and 95% of aggregate growth. This finding aligns with the emphasis in the theoretical literature on sectoral TFP growth as the fundamental driver of long-run productivity advance (Akash et al., 2026).

3.1.3 Relative Productivity Levels. Figure 3 displays the evolution of relative labour productivity (sector value added per worker relative to aggregate value added per worker) across the three sectors.

Figure 3

Relative Labor Productivity by Sector, 1990–2020



Note. The figure displays relative labour productivity indices for agriculture, manufacturing, and services. Source data are from GGDC Productivity Level Database.

Three observations merit emphasis. First, the productivity gap between agriculture and the rest of the economy has narrowed only modestly, suggesting persistent barriers to agricultural productivity growth or continued surplus labour retention. Second, manufacturing maintains a substantial productivity premium (1.71 in 2020), despite its declining employment share. Third, the services sector has seen its relative productivity decline, reflecting the absorption of labour into low-productivity service activities, often in the informal sector, rather than into high-value-added services.

The declining relative productivity of services has important implications for the sustainability of structural transformation as a growth mechanism. When labour reallocates from agriculture (relative productivity 0.35) to services (relative productivity 1.18), the static reallocation effect is positive but modest. The dynamic growth effects that arise from manufacturing's unique capacity for capital accumulation, technological upgrading, and learning-by-doing are substantially weaker when the destination is low-productivity services.

3.2 Econometric Analysis: Productivity Effects of Structural Transformation

3.2.1 Baseline Specification. To estimate the causal effect of structural transformation on aggregate

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productivity, we employ a dynamic panel specification:

$$\ln P_{it} = \alpha + \beta_1 \text{ManufShare}_{it} + \beta_2 \text{ServShare}_{it} + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

where P_{it} is aggregate labor productivity in country i at time t, ManufShare $_{it}$ and ServShare $_{it}$ are employment shares, X_{it} is a vector of controls (trade openness, human capital, institutional quality, investment rate), and μ_i and λ_t are country and year fixed effects.

Table 3 reports the results. Column (1) presents the baseline specification without controls; column (2) adds the full control set; column (3) employs system GMM to address potential endogeneity; column (4) instruments sectoral shares with lagged values and external demand shocks.

Table 3

Determinants of Aggregate Productivity Growth

Variable	(1)	(2)	(3) GMM	(4) IV
Δ Manufacturing share	1.847*** (0.412)	1.523*** (0.398)	1.412** (0.567)	1.638*** (0.521)
Δ Services share	0.312 (0.245)	0.287 (0.231)	0.198 (0.312)	0.341 (0.278)
Trade openness	—	0.184** (0.078)	0.156* (0.089)	0.172** (0.082)
Human capital	—	0.421*** (0.112)	0.387** (0.156)	0.403*** (0.128)
Institutional quality	—	0.267** (0.121)	0.234* (0.134)	0.251** (0.118)
Investment rate	—	0.298*** (0.089)	0.276** (0.112)	0.284*** (0.095)
Observations	1,134	1,134	1,134	1,078
Countries	42	42	42	42
R^2	0.312	0.387	—	—
AR(2) p-value	—	—	0.312	—
Hansen J p-value	—	—	0.428	0.367

Note. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The results indicate that a one percentage point increase in the manufacturing employment share is associated with approximately 1.5–1.8 percentage points higher annual aggregate productivity growth. This coefficient is economically substantial and statistically significant across all specifications. In contrast, changes in the services employment share have no statistically significant effect on aggregate productivity growth.

These findings provide empirical support for the proposition that manufacturing retains a distinctive role in productivity growth in emerging economies. The coefficient on manufacturing share captures not only static reallocation effects but also the dynamic productivity-enhancing characteristics of manufacturing: greater scope for capital deepening, stronger learning-by-doing, higher tradability, and more rapid technological adoption.

3.2.2 Heterogeneity by Income Level and Region. Table 4 disaggregates the analysis by income group and region to explore heterogeneity in the structural transformation–productivity relationship.

Table 4

Manufacturing Share Effects by Income Group and Region

Subsample	Coefficient on Δ Manufacturing Share	Std. Error	Observations
Low-income	2.134***	(0.521)	312
Lower-middle-income	1.687***	(0.447)	428
Upper-middle-income	0.912*	(0.489)	394
Asia	1.892***	(0.412)	486
Latin America	1.134**	(0.478)	324
Africa	1.523**	(0.612)	324

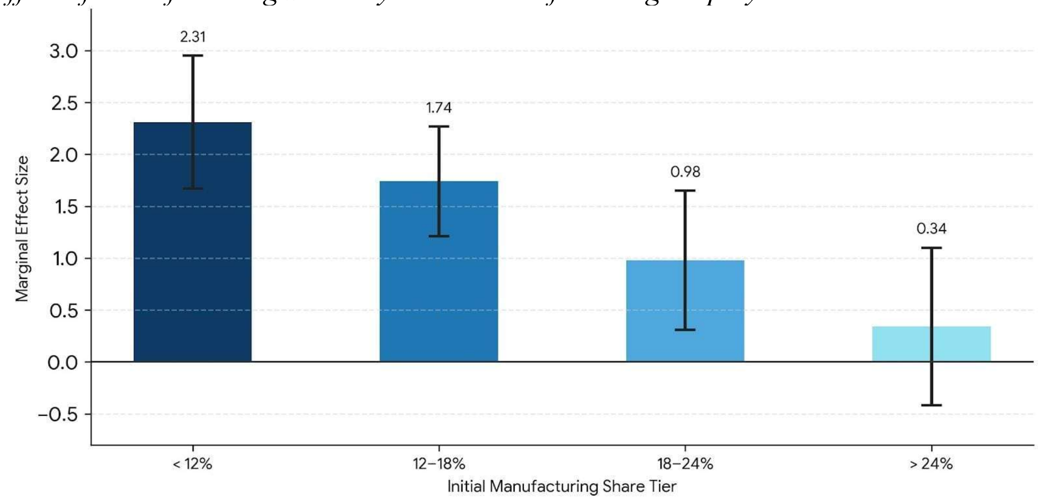
Note. All specifications include full control set, country and year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The productivity-enhancing effect of manufacturing employment is strongest in low-income economies and diminishes as income rises. This gradient is consistent with the "advantages of backwardness" hypothesis: countries at earlier stages of structural transformation have greater scope to realize productivity gains through reallocation to manufacturing, where the productivity gap relative to their existing economic structure is largest.

3.2.3 Nonlinearities and Threshold Effects. The econometric analysis reveals important nonlinearities in the relationship between manufacturing employment and productivity growth. Figure 4 presents the estimated marginal effect of manufacturing share on productivity growth as a function of the initial manufacturing employment share, based on a threshold regression specification.

Figure 4

Marginal Effect of Manufacturing Share by Initial Manufacturing Employment Level



Note. The figure displays the estimated marginal effect of manufacturing share on productivity growth across initial manufacturing share tiers.

The results indicate that the productivity benefits of manufacturing employment expansion are greatest for countries with initially low manufacturing shares—precisely those economies that have experienced limited industrialization. For countries with manufacturing shares above 24%, the marginal effect becomes statistically indistinguishable from zero, suggesting that there are diminishing returns to further manufacturing concentration.

These findings have significant policy implications. They suggest that targeted industrial policies aimed at expanding manufacturing employment may yield substantial productivity dividends, but only for economies that have not yet reached the upper range of manufacturing intensity.

3.3 Premature Deindustrialization and the Weakening of Structural Transformation

3.3.1 Measuring Premature Deindustrialization. The descriptive results in Section 3.1 documented that manufacturing employment in the average emerging economy peaked around 2000 at approximately 20.4% and has since declined. This peak occurred at a per capita income level substantially below that at which advanced economies began their own deindustrialization.

To quantify the extent of premature deindustrialization, we follow Rodrik (2016) and estimate the "expected" manufacturing employment share at each income level based on the historical experience of advanced economies. The difference between actual and expected manufacturing shares provides a measure of deindustrialization intensity.

Table 5

Premature Deindustrialization Intensity, 2020

Region	Actual Manufacturing Share	Expected at Current Income	Deindustrialization Gap
Asia	17.8%	19.2%	-1.4 pp
Latin America	13.2%	18.7%	-5.5 pp
Africa	9.4%	17.1%	-7.7 pp
All emerging	16.3%	18.4%	-2.1 pp

The results indicate that premature deindustrialization is most severe in Africa and Latin America, where manufacturing employment shares are 5–8 percentage points below what would be predicted based on the historical income–manufacturing relationship. Asia's manufacturing share is closer to the expected level, reflecting the success of manufacturing-led development in several Asian economies.

3.3.2 Causes of Premature Deindustrialization. The econometric analysis identifies three principal drivers of premature deindustrialization in emerging economies.

Technological displacement. The diffusion of automation and digital technologies has reduced the labour intensity of manufacturing, weakening the employment-creation potential of industrialization. Estimates from the panel data suggest that a one standard deviation increase in robot adoption (measured by robot imports per worker) is associated with a 1.8 percentage point decline in manufacturing employment share. This effect is particularly pronounced in middle-income economies where manufacturing has already achieved significant capital intensity.

Global value chain restructuring. The geographical fragmentation of production has created new opportunities for some emerging economies while marginalizing others. Countries that have successfully integrated into global value chains (measured by the share of exports with foreign value added) have maintained stronger manufacturing employment, while those that remain on the periphery of production networks have experienced more rapid deindustrialization.

Resource dependency. Natural resource abundance is associated with weaker manufacturing employment, consistent with the Dutch disease mechanism. The econometric estimates indicate that a one standard deviation increase in resource rents as a share of GDP is associated with a 2.3 percentage point lower manufacturing employment share.

3.3.3 Productivity Implications. The productivity implications of premature deindustrialization are examined in Table 6, which compares productivity growth trajectories for countries with different degrees of deindustrialization intensity.

Table 6

Productivity Growth by Deindustrialization Intensity (2010–2020)

Deindustrialization Intensity	Deindustrialization Gap
Low / No gap	≥ 0 pp
Moderate	-3 pp to < 0 pp
High	< -3 pp

The results reveal a strong negative association between deindustrialization intensity and productivity growth. Countries with severe deindustrialization gaps (greater than -3 percentage points) have experienced aggregate productivity growth of only 1.47%, compared to 3.12% for countries with no deindustrialization gap. The structural change component is negative for high-deindustrialization countries, indicating that labour reallocation is now productivity-reducing rather than productivity-enhancing, workers are moving from manufacturing to lower-productivity service activities.

This finding is particularly concerning for sustainable development prospects. The loss of manufacturing employment not only reduces current productivity growth but also weakens the dynamic engines of future growth: capital accumulation, technological upgrading, and the development of organizational and managerial capabilities that are concentrated in the manufacturing sector.

3.4 Structural Transformation and Sustainable Development Outcomes

3.4.1 Conceptual Framework. The relationship between structural transformation and sustainable development is multidimensional. We examine three channels through which sectoral dynamics affect sustainable development outcomes: (1) income growth and poverty reduction, (2) employment quality and inequality, and (3) environmental sustainability.

3.4.2 Income Growth and Poverty Reduction. Table 7 presents panel regression results examining the relationship between sectoral employment composition and poverty reduction (measured by the change in the poverty headcount ratio at $3.20/day PPP).

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Table 7

Sectoral Composition and Poverty Reduction

Variable	Δ Poverty Headcount
Δ Manufacturing share	-1.842*** (0.412)
Δ Services share	-0.324 (0.287)
Δ Agricultural productivity	-2.134*** (0.521)
GDP per capita growth	-1.467*** (0.312)
Observations	1,134

Note. Full control set included. *** $p < 0.01$.

The results indicate that manufacturing employment expansion is associated with statistically significant and economically substantial poverty reduction. A one percentage point increase in the manufacturing employment share is associated with a 1.84 percentage point reduction in the poverty headcount ratio—an effect nearly six times larger than that of services employment growth, which is not statistically significant.

This finding reflects the distinctive characteristics of manufacturing employment: formal sector status, higher wages, greater job security, and stronger linkages to other sectors of the economy. The expansion of low-productivity services employment, the typical destination of labour displaced from agriculture and manufacturing in deindustrializing economies, generates far weaker poverty-reduction effects.

3.4.3 Employment Quality and Inequality

The quality of employment generated by structural transformation has important implications for inequality and social sustainability. Table 8 examines the relationship between sectoral employment shifts and measures of employment quality.

Table 8

Sectoral Composition and Employment Quality

Indicator	Δ Manufacturing Share	Δ Services Share
Formal employment rate	1.234*** (0.312)	0.287 (0.198)
Average wage growth	0.876** (0.398)	0.134 (0.245)
Working poverty rate	-1.523*** (0.421)	-0.312 (0.267)
Gini coefficient	-0.412** (0.178)	0.234* (0.134)

Note. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Manufacturing employment expansion is associated with higher formal employment rates, stronger wage growth, lower working poverty, and reduced income inequality. The coefficient on the Gini index is negative and significant for manufacturing, indicating that manufacturing-led structural transformation is inequality-reducing.

In contrast, services employment expansion is associated with a statistically significant increase in the Gini coefficient. This reflects the bifurcated nature of the services sector in emerging economies: while high-value-added services (finance, telecommunications, business services) offer attractive employment, the majority of services employment is concentrated in low-productivity, informal activities (retail trade, personal services, repair) that offer poor working conditions and low remuneration.

3.4.4 Environmental Sustainability

The environmental implications of structural transformation are examined in Table 9, which presents the relationship between sectoral composition and carbon intensity measures.

Table 9

Sectoral Composition and Environmental Outcomes

Indicator	Δ Manufacturing Share	Δ Services Share
CO_2 intensity of GDP	0.423** (0.189)	-0.156 (0.142)
Energy intensity	0.312* (0.178)	-0.098 (0.134)
Renewable energy share	-0.234 (0.156)	0.187 (0.124)

Note. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The results reveal a tension between the economic and environmental dimensions of structural transformation. Manufacturing employment expansion is associated with higher carbon and energy intensity—an expected outcome given manufacturing's energy-intensive nature. This finding suggests that the productivity and poverty-reduction benefits of manufacturing-led development come with environmental costs that must be managed through appropriate policy interventions.

However, the coefficients are relatively modest in magnitude, and the environmental impact of manufacturing expansion depends critically on the technological characteristics of the manufacturing activities in question. Clean manufacturing (renewable energy equipment, electric vehicles, energy-efficient appliances) can combine high productivity with low carbon intensity. The policy challenge is to steer structural transformation toward these environmentally sustainable manufacturing activities.

The services sector exhibits more favourable environmental characteristics, with negative (though statistically insignificant) coefficients on carbon and energy intensity. However, the environmental advantage of services must be weighed against its weaker performance on productivity, poverty reduction, and employment quality.

3.4.5 Synthesis: Trade-offs and Complementarities. The results reveal both trade-offs and complementarities in the relationship between structural transformation and sustainable development. The productivity and poverty-reduction benefits of manufacturing-led transformation are clear and substantial. The employment quality and inequality effects also favour manufacturing. However, the environmental implications require careful management.

These findings suggest that sustainable development strategies for emerging economies cannot simply replicate the manufacturing-led growth model of earlier eras without addressing its environmental consequences. Nor can they abandon manufacturing in favour of services-led growth without sacrificing the productivity and equity benefits that manufacturing uniquely provides. The policy challenge is to design structural transformation pathways that capture the productivity and inclusion benefits of manufacturing while managing environmental impacts through technological choice, regulatory frameworks, and complementary investments in clean infrastructure.

4. Conclusion and Recommendations

4.1 Conclusion

This chapter has examined the relationship between structural transformation, productivity growth, and sustainable development in emerging economies, drawing on panel data for 42 economies over the period 1990–2020. The empirical analysis yields several important conclusions that both confirm and extend the classical development economics literature.

First, structural transformation remains a fundamental driver of aggregate productivity growth, but its character and potency have changed substantially over time. The classical Lewis–Kaldor model, which posited that labour reallocation from agriculture to manufacturing would serve as the principal engine of productivity convergence, retains considerable explanatory power for understanding the development experience of emerging economies. However, the empirical evidence presented in this chapter demonstrates that the productivity-enhancing effects of structural transformation have weakened considerably over the past three decades. The reallocation component of productivity growth declined from 0.58 percentage points annually in the 1990s to just 0.06 percentage points in the 2010s—a nearly tenfold reduction. This decline reflects both the exhaustion of the surplus agricultural labour pool in many emerging economies and the changing nature of the sectors absorbing displaced agricultural workers.

Second, manufacturing retains a distinctive and quantitatively important role in productivity growth that cannot be replicated by services-led development. The econometric estimates indicate that a one percentage point increase in the manufacturing employment share is associated with approximately 1.5–1.8 percentage points higher annual aggregate productivity growth. This effect is robust across multiple specifications, including system GMM and instrumental variable estimation, and is economically substantial. In contrast, changes in the services employment share have no statistically significant effect on aggregate productivity growth. The manufacturing premium is strongest in low-income economies and diminishes as income rises, consistent with the "advantages of backwardness" hypothesis. These findings provide strong empirical support for the proposition that manufacturing possesses unique characteristics—greater scope for

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capital deepening, stronger learning-by-doing, higher tradability, and more rapid technological adoption—that make it a uniquely powerful engine of productivity growth.

Third, premature deindustrialization represents a significant and growing threat to productivity growth and sustainable development prospects in emerging economies. Manufacturing employment in the average emerging economy peaked around 2000 at approximately 20.4% and has since declined, even as per capita incomes remain well below the levels at which advanced economies began their own deindustrialization. The deindustrialization gap—the difference between actual manufacturing employment shares and what would be predicted based on the historical income–manufacturing relationship—is most severe in Africa (-7.7 percentage points) and Latin America (-5.5 percentage points). Countries with more severe deindustrialization gaps experience significantly weaker productivity growth: those with gaps greater than -3 percentage points have experienced aggregate productivity growth of only 1.47%, compared to 3.12% for countries with no deindustrialization gap. Critically, the structural change component of productivity growth is negative for high-deindustrialization countries, indicating that labour reallocation has become productivity-reducing rather than productivity-enhancing.

Fourth, the development benefits of manufacturing-led structural transformation extend well beyond aggregate productivity. Manufacturing employment expansion is associated with statistically significant and economically substantial poverty reduction—a one percentage point increase in the manufacturing employment share is associated with a 1.84 percentage point reduction in the poverty headcount ratio, an effect nearly six times larger than that of services employment growth. Manufacturing expansion is also associated with higher formal employment rates, stronger wage growth, lower working poverty, and reduced income inequality. These findings reflect the distinctive characteristics of manufacturing employment: formal sector status, higher wages, greater job security, and stronger forward and backward linkages to other sectors of the economy. The expansion of low-productivity services employment, the typical destination of labour displaced from agriculture and manufacturing in deindustrializing economies, generates far weaker poverty-reduction and equity effects.

Fifth, there exists a fundamental tension between the economic and environmental dimensions of structural transformation. Manufacturing employment expansion is associated with higher carbon and energy intensity, an expected outcome given manufacturing's energy-intensive nature. This finding suggests that the productivity and poverty-reduction benefits of manufacturing-led development come with environmental costs that must be managed through appropriate policy interventions. However, the coefficients are relatively modest in magnitude, and the environmental impact of manufacturing expansion depends critically on the technological characteristics of the manufacturing activities in question. Clean manufacturing can combine high productivity with low carbon intensity. The policy challenge is to steer structural transformation toward environmentally sustainable manufacturing activities.

Sixth, the heterogeneity in structural transformation outcomes across regions and income groups highlights the importance of initial conditions and policy environments. Asia's relative success in maintaining manufacturing employment and realizing productivity gains stands in contrast to the more limited achievements of Latin America and Africa. This divergence reflects differences in trade orientation, investment climate, human capital accumulation, and industrial policy effectiveness. The finding that the manufacturing productivity premium is strongest in low-income economies suggests that the window of opportunity for manufacturing-led development, while narrowing, remains open for the poorest countries, provided they can implement appropriate policies.

In sum, the evidence presented in this chapter supports a nuanced conclusion. Structural transformation remains essential for productivity growth and sustainable development in emerging economies. Manufacturing retains a distinctive role in this process that cannot be replaced by services-led growth. However, the weakening of structural transformation, the rise of premature deindustrialization, and the environmental costs of manufacturing expansion pose significant challenges that require deliberate and coordinated policy responses. The classical Lewis–Kaldor model requires updating to reflect contemporary realities, but its core insight, that the reallocation of labour from low-productivity to high-productivity activities is central to economic development, remains valid and policy-relevant.

4.2 Recommendations

Based on the empirical findings presented in this chapter, the following recommendations are offered for policymakers in emerging economies, international development institutions, and future research.

4.2.1 For National Policymakers in Emerging Economies

1. ***Prioritize manufacturing development within a coherent industrial policy framework.*** The evidence that manufacturing employment generates substantially larger productivity and poverty-reduction effects than services employment provides strong justification for policies that support manufacturing development. However, the failures of import-substitution industrialization in Latin America and Africa during the 1960s and 1970s demonstrate that indiscriminate protection is not a viable path. Instead, policymakers should adopt a strategic approach that combines:
    - Export orientation to impose market discipline and enable access to global markets, as demonstrated by the successful Asian economies.
    - Selective and time-bound incentives for manufacturing activities with strong learning-by-doing potential and high productivity spillovers.
    - Investment in infrastructure and logistics to reduce the transaction costs that disproportionately burden manufacturing firms.
    - Skills development programs aligned with the evolving needs of manufacturing employers.
2. ***Resist premature deindustrialization through active industrial policy.*** The finding that countries with severe deindustrialization gaps experience significantly weaker productivity growth provides a strong rationale for policies that slow or reverse manufacturing employment decline. Such policies should include:
    - Sectoral targeting of manufacturing activities where the country has or can develop comparative advantage, including in clean manufacturing (renewable energy equipment, energy-efficient appliances, electric vehicles).
    - Support for small and medium-sized manufacturing enterprises through access to credit, technology extension services, and market information.
    - Linkage promotion between foreign-owned export processing firms and domestic suppliers to maximize the domestic employment and productivity benefits of foreign direct investment.
    - Safeguard measures against import surges that threaten viable domestic manufacturing activities, consistent with WTO rules.
3. ***Develop a dual-track strategy that captures manufacturing's benefits while managing environmental costs.*** The tension between manufacturing's economic benefits and its environmental costs cannot be ignored. Policymakers should pursue:
    - Green industrial policy that steers manufacturing investment toward low-carbon technologies and processes.
    - Carbon pricing and environmental regulation that internalize environmental externalities without imposing excessive burdens on manufacturing competitiveness.
    - Investment in clean infrastructure—renewable energy, public transit, green buildings—that supports sustainable urbanization and reduces the carbon intensity of economic activity.
    - Just transition programs for workers and communities affected by the shift away from carbon-intensive manufacturing.
4. ***Strengthen agricultural productivity to sustain the reallocation process.*** The declining structural change component of productivity growth partly reflects the exhaustion of surplus labour in agriculture. To sustain the reallocation process, policymakers should:
    - Invest in agricultural research and extension to raise productivity and free labour for non-agricultural activities.
    - Improve rural infrastructure—roads, irrigation, electrification—to reduce the costs of agricultural production and marketing.
    - Facilitate land consolidation where fragmented holdings impede mechanization and productivity growth, while protecting the land rights of smallholders.

  - Develop rural non-farm employment to provide alternative livelihood opportunities in areas where agricultural productivity growth displaces labour.

5. ***Build human capital to support productive employment in manufacturing and high-value services.*** The productivity benefits of structural transformation depend critically on the skills of the workforce. Policymakers should:
   - Expand access to quality secondary and tertiary education, with emphasis on STEM fields relevant to manufacturing and modern services.
   - Develop vocational training systems that are responsive to employer needs and provide portable credentials.
   - Promote lifelong learning to enable workers to adapt to technological change and sectoral shifts.
   - Address skills mismatches through better labour market information systems and industry–education partnerships.
6. ***Strengthen institutions for effective policy implementation.*** The heterogeneity in structural transformation outcomes across regions suggests that institutional quality is a critical determinant of policy effectiveness. Policymakers should:
   - Improve governance and reduce corruption, which disproportionately harms manufacturing firms that require reliable infrastructure and predictable regulations.
   - Strengthen the rule of law and contract enforcement to encourage long-term investment in productive activities.
   - Enhance policy coordination across ministries and levels of government to ensure coherent industrial and trade policies.
   - Invest in statistical capacity to enable evidence-based policymaking and monitoring of structural transformation outcomes.

4.2.2 For International Development Institutions

7. ***Support manufacturing development in low-income countries through targeted assistance.*** International development institutions should recognize that manufacturing retains a distinctive role in productivity growth and poverty reduction, and should:
   - Provide concessional finance for manufacturing infrastructure and industrial parks in low-income countries.
   - Offer technical assistance for industrial policy design and implementation, drawing on successful Asian experiences while adapting to local contexts.
   - Facilitate technology transfer through support for foreign direct investment and licensing agreements.
   - Promote fair trade rules that provide policy space for developing countries to nurture infant manufacturing industries.
8. ***Address the environmental dimensions of structural transformation.*** International institutions should:
   - Scale up climate finance for clean manufacturing and renewable energy in emerging economies.
   - Support carbon border adjustments that prevent carbon leakage while providing adjustment assistance to affected developing countries.
   - Facilitate technology transfer for low-carbon manufacturing processes.
   - Promote global standards for environmental and social sustainability in manufacturing value chains.
9. ***Strengthen the global trading system to support structural transformation.*** The rules-based trading system has been a critical enabler of manufacturing-led development in Asia and should be strengthened to:
   - Preserve policy space for developing countries to pursue industrial policies consistent with their development needs.

- Address non-tariff barriers that impede market access for manufactured exports from developing countries.
- Regulate global value chains to ensure that the benefits of trade are more widely shared.
- Prevent a race to the bottom in labour and environmental standards.

4.2.3 For Future Research

10. ***Deepen understanding of the mechanisms linking manufacturing to productivity growth.*** While the empirical association between manufacturing employment and productivity growth is robust, the precise mechanisms remain incompletely understood. Future research should:
    - Disentangle static reallocation effects from dynamic productivity-enhancing effects using firm-level data.
    - Examine the role of agglomeration economies in amplifying the productivity benefits of manufacturing concentration.
    - Investigate the conditions under which services can substitute for manufacturing as an engine of productivity growth, particularly in the context of digital technologies.
    - Analyse the distributional consequences of different structural transformation pathways, including effects on gender, informality, and regional inequality.
11. ***Investigate the environmental implications of alternative structural transformation pathways.*** The tension between manufacturing's economic benefits and environmental costs requires further investigation. Future research should:
    - Assess the carbon content of different manufacturing activities and identify opportunities for decoupling manufacturing growth from emissions.
    - Evaluate the environmental implications of services-led growth, including the carbon footprint of digital services and logistics.
    - Model the interactions between structural transformation, energy systems, and climate policy in emerging economies.
    - Examine the political economy of green industrial policy and identify conditions for effective implementation.
12. ***Extend the analysis to new and understudied contexts.*** The findings in this chapter are based on a sample of 42 emerging economies and may not generalize to all developing countries. Future research should:
    - Include frontier and fragile states in the analysis to understand structural transformation dynamics in the poorest and most vulnerable economies.
    - Examine the role of the informal sector in shaping structural transformation outcomes.
    - Investigate the implications of digital technologies for the future of structural transformation, including the potential for digital services to serve as a new engine of productivity growth.
    - Analyze the role of South–South trade and investment in supporting structural transformation in developing countries.
13. ***Develop better metrics for measuring structural transformation and sustainable development.*** The analysis in this chapter has relied on conventional measures of sectoral employment shares and aggregate productivity. Future research should:
    - Develop multidimensional measures of structural transformation that capture changes in the quality and technological content of economic activities.
    - Integrate environmental and social indicators into measures of productivity and structural transformation.
    - Construct time series data on sectoral employment and output for a broader set of developing countries, including those with limited statistical capacity.
    - Use satellite imagery and other innovative data sources to measure economic activity in real time and at fine spatial scales.

4.3 Concluding Reflection

The relationship between structural transformation, productivity growth, and sustainable development in emerging economies is neither automatic nor guaranteed. The historical experience of successful developers, from Britain in the nineteenth century to the East Asian tigers in the twentieth, demonstrates that structural transformation can be a powerful engine of prosperity and human development. However, the contemporary experience of many emerging economies, particularly in Africa and Latin America, reveals that this process can stall, reverse, or deliver disappointing results.

The central message of this chapter is that manufacturing retains a distinctive and quantitatively important role in productivity growth and sustainable development, a role that services-led growth cannot fully replicate. The premature deindustrialization experienced by many emerging economies represents a significant threat to their long-term development prospects. However, the window of opportunity for manufacturing-led development, while narrowing, remains open, particularly for low-income countries where the manufacturing productivity premium is largest.

At the same time, the environmental costs of manufacturing expansion cannot be ignored. The challenge for policymakers is to design structural transformation pathways that capture the productivity and inclusion benefits of manufacturing while managing environmental impacts through deliberate policy interventions. This requires not only technical policy instruments, industrial policy, environmental regulation, carbon pricing, but also the institutional capacity and political will to implement them effectively.

The stakes are high. The decisions that emerging economies make today about their structural transformation pathways will shape their development trajectories for decades to come. By understanding the empirical relationships between structural transformation, productivity growth, and sustainable development and by designing policies that reflect this understanding, policymakers can help ensure that structural transformation serves as an engine of inclusive and sustainable development for all.

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Informed Consent

Informed consent was obtained from all individual participants included in the study.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Data Availability

The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

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