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Article

# Premature deindustrialization in Malaysia: Implications for structural transformation and digital economy development

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**Abstract:** This study examines the extent and implications of premature deindustrialization in Malaysia by analyzing long-term trends in value-added, employment, and industry-specific competitiveness. Malaysia's manufacturing share began to decline in the early 2000s, when income levels were significantly lower than in developed countries, exhibiting a typical pattern of premature deindustrialization. With China emerging as a global manufacturing hub and Malaysia still relying on low-value-added segments of global value chains, competitiveness is declining in several key industries. As a result, employment is shifting to traditionally less productive service sectors, raising concerns about slower long-term productivity growth, wage stagnation, and widening social inequality, particularly among low-skilled and vulnerable groups. However, the rapid advancement of digitalization and the expansion of modern service industries such as ICT software, finance, and logistics are simultaneously reinterpreting the very concept of deindustrialization. As production processes become service-intensive and digitally integrated, a decline in the manufacturing share does not necessarily mean a weakening of the overall economy. The results of this study indicate that inclusive digital transformation is essential for Malaysia's transition to a service and knowledge economy, requiring equitable access to digital skills, infrastructure, and economic opportunities for all regional and social groups. A balanced strategy that simultaneously strengthens manufacturing capabilities and promotes inclusive and sustainable digital development is a prerequisite for achieving long-term social progress without creating new inequalities during a period of structural transformation.

**Keywords:** middle income trap; premature deindustrialization; structural transformation; digital economy; service-driven economy

## 1. Introduction

Since the 1970s, Malaysia has pursued an industrialization-led development strategy that transformed its economic structure from agriculture to manufacturing. However, beginning in the early 2000s, both the manufacturing value-added share and the manufacturing employment share declined—well before Malaysia reached the income levels at which advanced economies typically experienced deindustrialization (**Figure 1**). This pattern, widely characterized as premature deindustrialization [1], raises concerns about weakening growth drivers and the risk that Malaysia may fall into the middle-income trap. Assessing whether Malaysia is undergoing premature deindustrialization, and understanding its implications for long-term development, therefore constitutes an important academic and policy challenge.

Existing research offers valuable insights into Malaysia's structural transformation. Studies by Rasiah [2] and Tengku Asyraf et al. [3] reveal a downward trend in manufacturing value-added and employment since the 2000s, accompanied by a decline in competitiveness across key industrial sectors. This shift is primarily attributable to China's emergence as a global manufacturing hub. Concurrently, employment has shifted toward traditional service sectors—such as wholesale and retail trade, accommodation, and transportation—which generally exhibit lower productivity and wage levels. However, as emphasized in the broader literature on economic development, structural transformation entails more than just a decline in the manufacturing sector's share; it encompasses the reallocation of labor across sectors, trends in aggregate productivity, and long-term growth trajectories [4–6]. More recent empirical studies further suggest that changes in industrial composition are a critical determinant of regional development patterns [7] and influence labor market conditions through structural skill mismatches [8]. Viewed through this broader theoretical lens, Malaysia's experience should be reinterpreted not merely as industrial contraction, but as a complex process of reallocation accompanying the transition toward a service-led and increasingly digitalized economy.

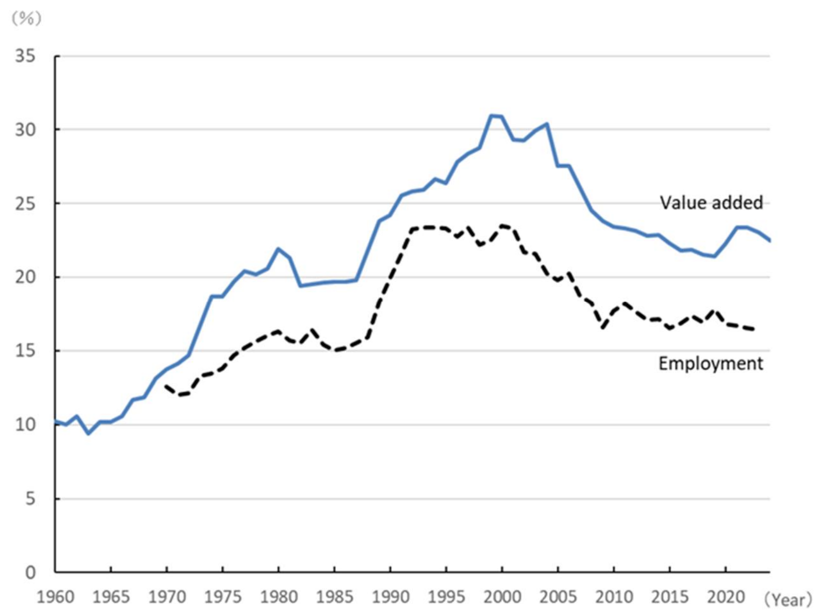



**Figure 1.** Manufacturing value-added and employment share in Malaysia (1960–2024).

However, the global economic environment has undergone profound transformation. Advances in digitalization, automation, and AI-driven processes are reshaping the relationship between manufacturing and services. Modern service sectors—including ICT, finance, logistics, and digital platforms—now play an increasingly central role in value creation and are closely integrated with manufacturing activities. As production processes become more fragmented and service-intensive, a decline in the statistical share of manufacturing does not necessarily indicate industrial weakness. This shift highlights the need to reinterpret deindustrialization within the broader context of digital transformation.

This study aims to re-evaluate the current state of deindustrialization in Malaysia and clarify its impact on sustainable social development. It emphasizes that the phenomenon of "premature deindustrialization" should be examined not merely in terms of industrial decline or shifts in economic structure, but also in relation to sustainable social development. During the transition to a digital economy, factors such as the expansion of low-productivity service sectors, labor market polarization, and unequal access to the benefits of digital technology can give rise to new forms of social inequality. Therefore, understanding how to achieve an inclusive and sustainable structural transformation—through industrial upgrading, digitalization, and human capital formation—is a critical issue from both policy and academic perspectives.

This paper does not attempt to conduct a rigorous empirical analysis based on newly developed econometric methods or identification strategies regarding Malaysia's premature deindustrialization. Instead, it presents a descriptive analysis that integrates existing domestic statistics and international datasets to provide a holistic view of the decline in manufacturing, the expansion of the service sector, and the progress of digitalization. Specifically, it comprehensively outlines long-term changes in industrial structure, sectoral competitiveness within manufacturing, and shifts in the composition of the service sector, while examining the implications of digitalization for the interpretation of deindustrialization. Furthermore, it highlights that deindustrialization is not merely an issue of industrial structure but is closely linked to widening social inequalities, such as labor market polarization and disparities in access to digital opportunities.

Thus, the contribution of this study lies in presenting a new interpretation and framework for understanding deindustrialization in Malaysia by integrating industrial structural changes with social sustainability, thereby illuminating the associated policy challenges.

The structure of this paper is as follows. Section 2 reviews the theoretical and empirical literature on industrialization, deindustrialization, and "premature deindustrialization," with a particular focus on the roles of global value chains and digitalization. Building on existing research, Section 3 outlines the framework, objectives, and methodology of this study. Section 4 examines long-term trends in Malaysia's industrial structure—specifically regarding manufacturing value-added, employment, sectoral competitiveness, and productivity—while Section 5 discusses how the trend of digitalization alters the interpretation of these trends. Section 6 presents a comprehensive public policy framework to support Malaysia's transition toward a digital and inclusive economy and identifies key strategic policy issues. Finally, the paper concludes by synthesizing the findings and outlining their implications for Malaysia's development strategy.

## 2. Literature review

### 2.1. Industrialization and deindustrialization in economic development

The concept of deindustrialization is situated within the broader framework of structural change. Structural change refers to the reallocation of economic activity across the primary, secondary, and tertiary sectors [5]. A substantial body of research underscores that this process of structural transformation is not merely defined by a reduction in manufacturing shares, but is intrinsically linked to the strategic reallocation of labor across sectors, aggregate and sector-specific productivity growth, and sustainable long-run economic development [4–6]. Extensive empirical evidence highlights the multi-dimensional impacts of these structural shifts, demonstrating how spatial changes in industrial composition dictate regional development trajectories and significantly reshape labor market outcomes through heightened structural skills mismatches [7,9,10]. By integrating these broader theoretical insights, this paper establishes a comprehensive analytical framework to reexamine Malaysia's deindustrialization—not as an isolated industrial decline, but as an evolving manifestation of structural transformation within a digitalizing middle-income economy. Tregenna [11] argues that structural change involves reallocating output and employment from low-productivity to high-productivity sectors, a process essential for sustained economic growth. Industrialization embodies this transition: labor moves from agriculture, characterized by diminishing returns, to manufacturing, which exhibits increasing returns to scale. Kaldor [12] famously described manufacturing as the "engine of growth," emphasizing that productivity in agriculture tends to stagnate or decline, whereas productivity in manufacturing typically rises.

Once industrialization reaches its peak, economies generally experience a gradual decline in the manufacturing share—a process known as deindustrialization. Bell [13], in his theory of the post-industrial society, viewed this transition positively, suggesting that information- and knowledge-based services would become central to economic activity.

Samaniego and Sun [14] provide a theoretical explanation for deindustrialization based on substitution patterns. When manufactured goods are highly substitutable (elasticity > 1), production shifts toward more productive industries, leading to specialization and the decline of less productive manufacturing activities. Conversely, when the elasticity of substitution between manufactured and non-manufactured goods is low, rapid productivity growth in manufacturing causes its employment share to peak and subsequently decline, even if output continues to rise. Singh [15] highlights another mechanism: Declining competitiveness in manufacturing can also trigger deindustrialization. Building on this insight, Rowthorn and Wells [16] distinguish between positive deindustrialization—driven by productivity-induced labor shedding—and negative deindustrialization, which arises when weak competitiveness leads to simultaneous declines in output and employment. This distinction is crucial for determining whether deindustrialization reflects healthy structural transformation or signals underlying economic weakness.

## 2.2. Premature deindustrialization in developing countries

Dasgupta and Singh [17] identified the phenomenon of premature deindustrialization in developing countries. Examining structural change in Latin America, Africa, East Asia, and India, they found that manufacturing shares peaked at significantly lower levels of income than in advanced economies. They termed this pattern "premature deindustrialization." This raises the question of what such early deindustrialization implies for economic development. While manufacturing remains an important driver of growth, their analysis shows that in India the service sector—particularly ICT-related services—has increasingly contributed to economic expansion, suggesting that services may assume a growth-enhancing role traditionally associated with manufacturing.

In contrast, Rodrik [1] argues that premature deindustrialization is largely driven by globalization and labor-saving technological change, and that it has adverse consequences for developing economies. He emphasizes that trade liberalization exposes developing countries' manufacturing sectors to relative price shifts originating in advanced economies. When technological progress in developed countries reduces the prices of manufactured goods, developing economies specializing in labor-intensive production may experience declines in both employment and output.

Since the 1990s, globalization has linked the technology and know-how of advanced economies with the labor force of developing countries, particularly in manufacturing, creating globally integrated production networks. This restructuring of production has increasingly been associated with premature deindustrialization. Nicoud and Robert [18] argue that offshoring allows developed countries to retain comparative advantage in complex and strategic functions, but makes it difficult for developing countries to move up the value chain, thereby slowing or even preventing industrial upgrading. Similarly, Tekay's [19] cross-country analysis of Turkey shows that liberalization reinforced the dominance of low-tech manufacturing activities, contributing to premature deindustrialization.

### 2.3. Structural changes in global supply chains and transformation of the manufacturing sector

The dynamics of global manufacturing have undergone profound transformation since the late twentieth century, driven by the expansion of global value chains (GVCs), the rapid rise of China as a dominant global manufacturing hub, and the increasing integration of digital technologies into industrial processes. These shifts have reshaped the competitive landscape for developing economies, altering both the opportunities for industrial upgrading and the risks of premature deindustrialization.

Felipe and Mehta [20] examined global trends in manufacturing employment and output from 1970 to 2010 and found that global manufacturing employment remained relatively stable over this period. While productivity gains contributed to declining manufacturing employment in advanced economies, supply-chain restructuring increased manufacturing employment in several Asian countries. As a result, manufacturing's share of global employment remained around 14 percent, and its share of global output around 17 percent. These findings suggest that while some economies experienced rapid industrialization, others faced declining manufacturing shares. Within this context, China's rise as a dominant global manufacturing hub has had a significant impact. Paus [21] describes this dynamic as the "Red Queen effect," whereby China's extensive presence across low-, medium-, and high-tech industries constrains industrialization efforts in other developing regions.

Sumner [22] further argues that premature deindustrialization is closely linked to GVCs through several mechanisms: (i) trade liberalization and the resulting decline in the relative prices of manufactured goods; (ii) the tendency for developing countries to become locked into low-value-added segments of GVCs; and (iii) the geographical dispersion and functional fragmentation of manufacturing activities across an increasing number of developing economies. He also emphasizes that weak institutional environments—such as limited contract enforcement, high administrative burdens, and unstable policy frameworks—can hinder effective GVC participation and contribute to premature deindustrialization.

Traditionally, development strategies in low- and middle-income countries have relied on catch-up industrialization. However, since the 2000s, advances in digitalization, robotics, and technologies such as 3D printing have begun to alter the traditional role of manufacturing. As production processes become more fragmented, with certain stages outsourced as service activities, the statistical share of manufacturing tends to decline. The link between digitalization and global value chains (GVCs) is redefining the nature of international trade, shifting the analytical focus from traditional, goods-centric industrialization to the cross-border flow of knowledge and services [23]. Indeed, industrial products increasingly incorporate digital services; IoT-enabled devices such as smartphones rely heavily on service consumption via the internet. In this context, the service sector has become essential in complementing and enhancing manufacturing. Consequently, the decline in manufacturing's share should not be interpreted solely as a sign of industrial weakness, as part of this trend reflects structural changes associated with the digital economy [24]. Recent studies therefore argue that the contribution of Is the word correct? modern services to national economic growth deserves greater recognition [25].

## 3. Research framework and method

### 3.1. Research gap and research questions

Despite these insights, three key research gaps remain in the existing literature on Malaysia's structural transformation.

First, although previous studies document the decline in manufacturing, few provide detailed sector-level analyses that distinguish between dynamic and stagnant subsectors. Such differentiation is essential for assessing whether Malaysia's deindustrialization is structural, cyclical, or premature.

Second, existing research does not sufficiently examine how digitalization, automation, and servitization are reshaping the interpretation of deindustrialization. As production processes become more fragmented and digitally integrated, a decline in the manufacturing share does not necessarily signal industrial weakening.

Third, there is limited research that analyzes the decline in Malaysia's manufacturing sector alongside the broader evolution of the service sector—particularly the distinction between low-productivity traditional services and high-productivity modern services such as ICT, finance, and logistics. Understanding these interactions is crucial for evaluating Malaysia's long-term development trajectory.

To address these gaps, this study pursues three research objectives:

(1) To analyze the long-term development of Malaysia's industrial structure, focusing on changes in value-added, employment, and industry-specific competitiveness within the manufacturing sector.

(2) To identify the structural factors underlying Malaysia's deindustrialization, including global competition, shifts in global value chains, and domestic capacity constraints.

(3) To reinterpret the meaning of deindustrialization in the context of digital transformation and the growing importance of the modern service sector.

From these objectives, the following research questions will be derived:

Research Question 1: Why has Malaysia's manufacturing share declined since the early 2000s, and which industries were most affected?

Research Question 2: Can Malaysia's experience be considered premature deindustrialization?

Research Question 3: How will digitalization and the rise of modern services change the interpretation and meaning of deindustrialization?

## 3.2. Research framework

To address these research issues, this study develops a conceptual framework that clarifies the dynamics of premature deindustrialization within the broader process of structural transformation. **Figure 2** presents this framework, illustrating how "early deindustrialization" and "structural transformation" are shaped by the interaction among global competitive pressures, domestic structural constraints, and the accelerating impact of digitalization. At the global level, China's rise as a dominant global manufacturing hub and the ongoing restructuring of global value chains have intensified competitive pressures on developing economies.

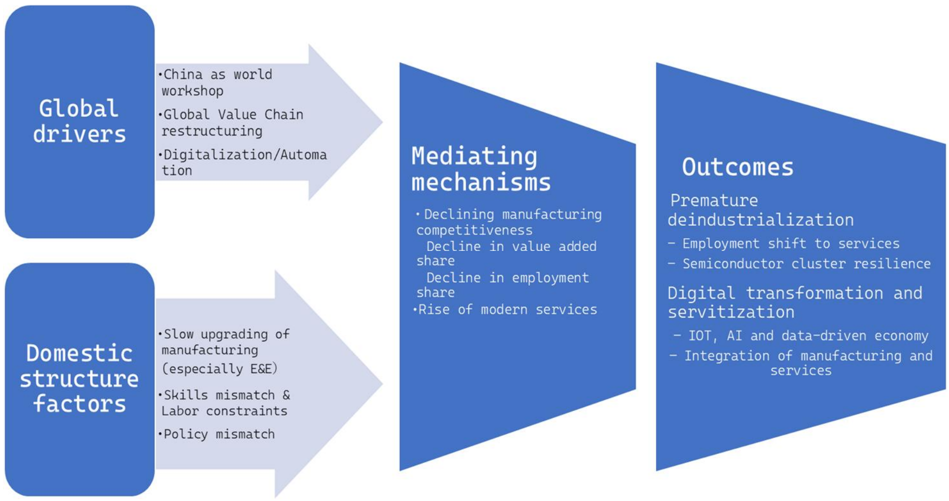



**Figure 2.** Research framework: Premature deindustrialization and structural transformation.

In this environment, labor-intensive and medium-technology manufacturing in Malaysia is likely to face declining competitiveness. At the same time, rapid digitalization and automation are transforming production processes, reducing the demand for routine labor and challenging the viability of traditional manufacturing-led growth strategies.

Consequently, the Malaysian economy has experienced premature deindustrialization, reflected in the decline of manufacturing value-added and employment shares and the accelerated shift of employment toward the service sector. At the same time, global digital transformation has introduced new dynamics, including the expansion of IoT, AI, and data-driven activities, the increasing integration of manufacturing and services, and the rise of the modern service sector.

Overall, Malaysia's premature deindustrialization is driven by the interaction of global competitive pressures and domestic structural weaknesses that limit the country's ability to upgrade within manufacturing. Simultaneously, the economy is shifting toward a more digital and service-oriented growth trajectory. This framework underscores the need for an integrated assessment of how these global and domestic forces jointly shape Malaysia's structural transformation.

## 3.3. Research method and data

To capture the multifaceted nature of structural transformation in Malaysia, this study adopts a multi-layered descriptive framework that integrates diverse indicators at both macro and sectoral levels. The fundamental reason for choosing this integrative approach—rather than relying on a single econometric specification method like regression analysis—is the need to reinterpret "premature deindustrialization" considering advancing digitalization. Assessing economic structures in the digital age entails specific statistical challenges; as Miyagawa [26] emphasizes, accurately quantifying the economic spillover effects of digitalization remains a significant methodological hurdle. Consequently, utilizing a descriptive synthesis based on multiple data sources offers a compelling alternative to circumvent these measurement barriers, enabling a more comprehensive and context-sensitive diagnosis of the digital transition in middle-income countries.

### 3.3.1. Analysis of long-term structural change

Determining whether deindustrialization is structural in nature or constitutes "premature deindustrialization" requires long-term, multi-sectoral criteria that track trends in both value-added and employment simultaneously. In this regard, data from the Department of Statistics Malaysia (DOSM) [27] provides the essential long-term sectoral data needed to examine Malaysia's structural transformation. Additionally, the Labor Force Survey (LFS) is used to analyze employment figures by industry, as well as trends in sectoral employment and labor reallocation across manufacturing, services, and other key sectors [28]. By integrating DOSM's long-term structural data with the LFS, this approach enables a systematic comparison between the absolute contraction of the manufacturing sector and the expansion of specific service sectors.

### 3.3.2. Sectoral decomposition and productivity analysis

To distinguish between the "positive" and "negative" aspects of deindustrialization, value-added growth is decomposed into labor productivity and labor input components. This method is based on the following standard growth accounting identity:

$$\Delta Y \approx \Delta(Y/L) + \Delta L \tag{1}$$

According to Rowthorn and Wells [16], positive deindustrialization is characterized by the release of labor resulting from internal productivity improvements, whereas negative deindustrialization is driven by a decline in competitiveness. This study analyzes productivity trends in the manufacturing and service sectors using the Asian Productivity Organization (APO) Productivity Database [29], distinguishing between changes driven by productivity improvements and those resulting from structural shifts. Furthermore, utilizing service sector statistics, it categorizes services into traditional, modern, and knowledge-intensive types to assess whether the workforce is shifting toward higher-productivity service activities.

#### 3.3.3. Analysis of competitiveness and positioning within global value chains (GVCs)

To link domestic structural changes with global trends, this study evaluates Malaysia's export competitiveness and examines changes in key export products over time. Specifically, by calculating Revealed Comparative Advantage (RCA) indices at the 4-digit HS code level using the UN Comtrade database, the study obtains direct, detailed evidence regarding industry-level trends. It also provides a qualitative assessment of Malaysia's position within Global Value Chains (GVCs), particularly in the electrical and electronics (E&E) sector.

Tracking the structural shift toward information and communication services within GVCs—using datasets such as the APO Productivity Database and OECD TiVA (Trade in Value Added) statistics [29,30] — will provide the necessary empirical grounding to validate subsequent interpretations regarding "digital servitization" (the process of adding value through services).

As outlined above, this study does not conduct a rigorous econometric analysis of "premature deindustrialization" in Malaysia using newly developed econometric methods or identification strategies. Instead, it employs a descriptive analysis integrating existing domestic statistics and international datasets (DOSM, LFS, APO, UN Comtrade) to examine the contraction of the manufacturing sector, the expansion of the service sector, and the progress of digitalization as interconnected phenomena. While the trends presented here do not necessarily pinpoint exact causal mechanisms, this study aims to provide a comprehensive overview of structural transformation in Malaysia by combining and integrating diverse empirical evidence.

## 4. The status of deindustrialization in Malaysia

### 4.1. Deindustrialization process in Malaysia: Changes in value-added

Numerous studies on Malaysia's structural transformation conclude that the country began to experience deindustrialization in the 2000s [2,3]. This assessment is typically based on declines in manufacturing value-added, employment shares, export competitiveness, and participation in global value chains. In Malaysia, both the manufacturing value-added share and the manufacturing employment share peaked around 2000 and subsequently declined (**Figure 1**). According to Asyraf et. al. [31], Malaysia's peak manufacturing employment share and corresponding per capita income level were significantly lower than those observed in advanced economies at the onset of their deindustrialization (**Table 1**). These comparisons indicate that Malaysia is experiencing premature deindustrialization.

To identify which sectors within the manufacturing sector, have experienced declines in value-added shares, **Table 2** presents industry-level trends from 1995 to 2023. Textiles, clothing, and leather products declined by 2.7 percentage points, while wood and related products fell by 4.0 percentage points. In contrast, refined petroleum and chemical products increased their combined share by 2.4 percentage points, and machinery and equipment expanded by 6.2 percentage points. A disaggregation of the machinery and equipment category shows that electrical machinery and transportation equipment increased their shares by 2.7 and 2.4 percentage points, respectively.

**Table 1.** Deindustrialization in developed and developing countries.

| | **Developed countries** | **Developing countries** |
|---|---|---|
| Main factor | Introducing labor-saving technologies | Weaking competitiveness in the manufacturing sector |
| Peak share of employees of manufacturing sector | ~30 % | ~15 % |
| GDP per capita as peak of employment share in manufacturing sector | US$18,000 | US$14,000 |
| Decline in employment and output share in the manufacturing sector | Manufacturing, value added share ＜ employment share | Manufacturing, value added share ＞ employment share |

Source: Asyraf et. al [31].

**Table 2.** Changes in value-added composition within Malaysia's manufacturing sector (1995–2023).

| | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** | **2023** | **1995–2023 (% PT)** |
|---|---|---|---|---|---|---|---|---|
| Food processing, vegetable and animal oils & fats, and tobacco | 12.3 | 11.7 | 12.8 | 14.3 | 14.0 | 13.1 | 13.2 | 0.9 |
| Textile and wearing apparel, leather and related products | 4.3 | 3.0 | 2.3 | 1.8 | 1.8 | 1.7 | 1.6 | ▲2.7 |
| Wood products, furniture, paper products and printing | 8.8 | 6.4 | 6.1 | 5.5 | 4.9 | 5.1 | 4.8 | ▲4.0 |
| Petroleum, chemicals, rubber and plastics | 31.3 | 30.3 | 33.2 | 35.0 | 33.3 | 30.7 | 30.8 | ▲0.5 |
| Non-metallic mineral and fabricated metal products | 7.5 | 5.9 | 5.7 | 6.9 | 6.8 | 8.7 | 8.4 | 0.9 |
| Machinery and equipment | 33.7 | 41.2 | 38.7 | 35.3 | 37.9 | 39.4 | 39.9 | 6.2 |
| Electrical, electronic products | 20.9 | 27.7 | 24.4 | 19.5 | 19.8 | 22.4 | 23.8 | 2.9 |
| Medical, precision & optical instrument, watches and clocks | 1.0 | 0.9 | 1.4 | 1.6 | 1.5 | 1.5 | 1.6 | 0.6 |
| Transport equipment | 5.3 | 6.5 | 7.7 | 7.8 | 8.8 | 10.1 | 9.7 | 4.4 |
| Other machinery and equipment | 6.5 | 6.1 | 5.2 | 6.4 | 7.8 | 5.4 | 4.9 | ▲1.6 |
| Other manufacturing products | 2.1 | 1.6 | 1.2 | 1.3 | 1.3 | 1.4 | 1.2 | ▲0.9 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| Share of manufacturing sector (% of total value added) | 26.4 | 30.9 | 27.5 | 23.4 | 22.3 | 22.2 | 23.0 | |

Note: The increase or decrease in 2023 and 1995.
Source: Department of Statistics, Malaysia [28].

These patterns are consistent with Malaysia's rising wage levels, which have reduced competitiveness in labor-intensive industries such as textiles, apparel, leather goods, and wood-based products. Notably, the trajectory of electrical machinery has fluctuated over time: after peaking at 27.7 percent in 2000, its share declined to 19.5 percent in 2010 before recovering to 23.6 percent in 2021, surpassing its 1995 level. By contrast, petroleum, chemical and fabricated metal products increased their value-added share to 35.0 percent by 2010, followed by a slight decline in subsequent years. The drivers of these divergent trends are examined in the next section.

**Table 3** shows the trend in value-added share across major industries to understand how the decline in manufacturing share was offset. From 2000 to 2023, value-added share declined in agriculture, forestry and fisheries, mining, and manufacturing. These declines were mainly offset by the expansion of the services sector, which came to account for 54.5% of total value-added in 2023. While the breakdown of the services sector by category requires caution due to statistical discontinuities, significant growth is observed in the transport, postal services, and information and communication sectors. This change reflects the increasing importance of modern service activities in the evolving economic structure of Malaysia.

**Table 3.** Value-added by major economic sectors in Malaysia (1995–2023).

| | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2023 | 2000–2023 (% PT) |
|---|---|---|---|---|---|---|---|---|
| Agriculture | 12.7 | 8.3 | 8.4 | 10.2 | 8.4 | 8.2 | 7.8 | ▲0.5 |
| Industry | 40.5 | 48.4 | 46.9 | 41.6 | 38.9 | 37.0 | 37.7 | ▲10.8 |
| Mining | 6.1 | 10.2 | 13.4 | 11.0 | 8.9 | 6.8 | 8.6 | ▲1.7 |
| Manufacturing | 26.4 | 30.9 | 27.5 | 23.4 | 22.3 | 22.2 | 23.0 | ▲7.8 |
| Construction, electricity, and gas water | 8.0 | 7.4 | 5.9 | 7.1 | 7.8 | 6.9 | 6.1 | ▲1.3 |
| Service | 46.8 | 43.2 | 44.7 | 48.2 | 52.7 | 55.5 | 54.5 | 11.3 |
| Wholesale, and retail trade, and accommodation | 21.6 | 13.0 | 14.2 | 16.5 | 17.6 | 20.0 | 21.0 | 8.0 |
| Transportation, storage information and communication | | 6.8 | 6.5 | 8.4 | 9.3 | 9.6 | 9.6 | 2.8 |
| Finance, insurance, real estate, and business service | 15.4 | 13.1 | 12.3 | 15.4 | 11.2 | 11.3 | 12.8 | ▲0.3 |
| Public services | 9.8 | 10.3 | 11.7 | 10.4 | 14.5 | 14.1 | 11.1 | 0.8 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

Note: The increase or decrease in 2023 and 1995.
Source: Department of Statistics, Malaysia [28].

## 4.2. Deindustrialization process in Malaysia: Changes in employment

To examine changes in employment, **Table 4** presents trends in employment shares across major sectors. As with value-added, the agricultural sector has experienced a steady decline in its employment share. Manufacturing employment increased between 1990 and 2000 but subsequently declined, falling by 5.7 percentage points by 2010. Although the pace of decline slowed thereafter, the manufacturing share in 2022 remained 0.9 percentage points below its 2010 level. These patterns indicate that, following sustained industrialization through the early 2000s, Malaysia appears to have entered a phase of deindustrialization.

In contrast, the service sector has expanded its employment share, offsetting declines in agriculture, mining, and manufacturing. The service sector's share increased by 4.3 percentage points between 1990 and 2000, by 7.9 percentage points between 2000 and 2010, and by an additional 5.8 percentage points between 2010 and 2022, reaching 64.5 percent of total employment.

Within services, wholesale and retail trade, accommodation, and food and beverage services continued to expand, reaching 29.1 percent of total employment in

2022. Employment in transportation, postal services, and information and communications increased by 1.7 percentage points between 1990 and 2022, while finance, insurance, real estate, and leasing grew by 7.0 percentage points over the same period. These shifts highlight the increasing dominance of service-sector employment in Malaysia's economic structure.

**Table 4.** Employment Share by Sector in Malaysia (1990–2022).

| | 1990 | 2000 | 1990–2000 (% PT) | 2010 | 1990–2000 (% PT) | 2022 | 1990–2000 (% PT) |
|---|---|---|---|---|---|---|---|
| Agriculture, forestry and fisheries | 26.0 | 16.7 | ▲9.2 | 13.6 | ▲3.2 | 10.0 | ▲3.6 |
| Mining and manufacturing industries | 27.5 | 32.5 | 5.0 | 27.8 | ▲4.7 | 25.5 | ▲2.3 |
| Mining | 0.6 | 0.3 | ▲0.3 | 0.5 | 0.2 | 0.5 | 0.1 |
| Manufacturing | 19.9 | 23.5 | 3.5 | 17.7 | ▲5.7 | 16.8 | ▲0.9 |
| Electricity, gas and water supply | 0.7 | 0.5 | ▲0.2 | 0.5 | ▲0.1 | 0.5 | 0.0 |
| Construction | 6.3 | 8.2 | 1.9 | 9.1 | 0.9 | 7.6 | ▲1.5 |
| Services | 46.5 | 50.8 | 4.3 | 58.7 | 7.9 | 64.5 | 5.8 |
| Wholesale, retail, accommodation, food and beverage services | 18.2 | 19.3 | 1.1 | 23.1 | 3.8 | 29.1 | 6.0 |
| Transportation, postal services, information and communications | 4.5 | 4.7 | 0.2 | 6.2 | 1.5 | 6.2 | ▲0.0 |
| Finance, insurance, real estate, leasing | 3.9 | 5.1 | 1.3 | 8.6 | 3.5 | 11.1 | 2.5 |
| Medical care, welfare, and other daily life services | 19.9 | 21.7 | 1.8 | 20.8 | ▲0.9 | 18.1 | ▲2.7 |
| Total | 100 | 100 | | 100 | | 100 | |

Source: Department of statistics, Malaysia [28].

### 4.3. Deindustrialization in Malaysia: A study based on labor productivity

In Malaysia, the manufacturing sector's share of value-added and employment has declined since the 2000s, while the service sector has expanded correspondingly. Within services, transportation, postal services, and information and communications have increased their shares in both value-added and employment. In contrast, traditional services—such as wholesale and retail trade, accommodation, and food and beverage services—have experienced a slight decline in value-added share but a substantial increase in employment. These patterns raise the question of how Malaysia's deindustrialization should be interpreted.

Rowthorn and Wells [16] distinguish between positive and negative deindustrialization. Positive deindustrialization occurs when productivity gains in manufacturing reduce labor demand, allowing surplus labor to be absorbed by the service sector while output remains stable or increases. Negative deindustrialization arises when declining competitiveness reduces manufacturing output and employment simultaneously.

Labor productivity is defined as *Y/L*, where *Y* is output and Lis labor input. In the standard growth accounting formula, the change in value added can be expressed as the sum of the log differences of labor productivity and labor input:

$$\Delta lnY \approx \Delta ln(Y/L) + \Delta lnL \quad (2)$$

Using a linear approximation, this becomes as shown in Equation (1).

Thus, fluctuations in value added can be approximately decomposed into components representing labor productivity and labor input.

Using this decomposition, **Figure 3** analyzes the contributions of labor input and labor productivity to value-added growth in manufacturing and services. Manufacturing grew by nearly 10 percent in the 1990s, supported by increases in both labor input and productivity. In the 2000s, however, growth slowed to around 4 percent due to declining labor input, even as productivity continued to rise. This sustained productivity growth appears to have encouraged a shift of employment from manufacturing to other sectors.

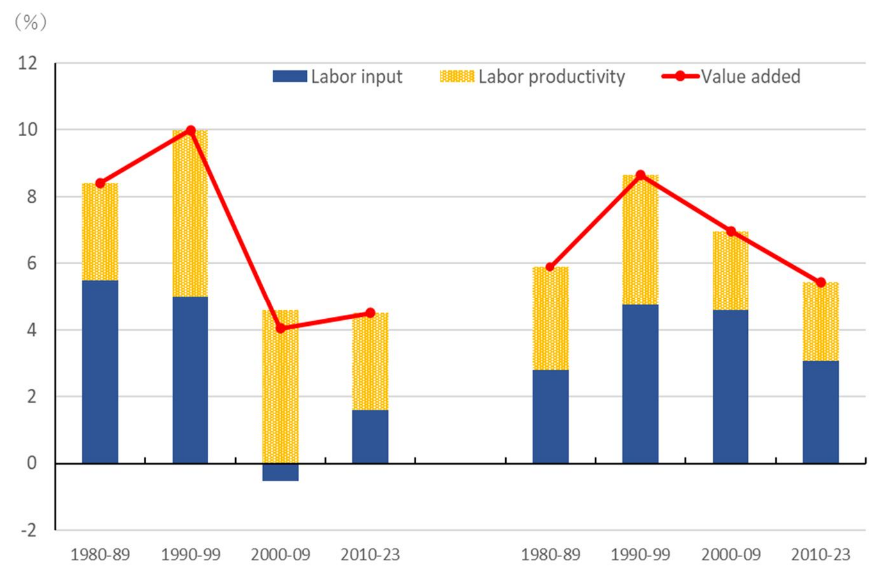



**Figure 3.** Decomposition of value-added growth in manufacturing and services.

Note: This decomposition is a standard log linear approximation of the growth accounting identity, allowing changes in output to be expressed as the sum of labor productivity growth and labor input growth.

Source: APO Productivity Database (2025) [29].

The service sector grew by around 8 percent in the 1990s, but productivity growth weakened thereafter, contributing to a downward trend in overall service sector growth. This pattern is often discussed in relation to Baumol's cost disease, which posits that when productivity grows more slowly in services than in manufacturing, the relative price of services rises, reducing aggregate growth [32]. Traditional services such as retail and food service exhibit low productivity, making this hypothesis plausible. However, recent advances in digital technologies have raised productivity in many modern services, suggesting that Baumol's mechanism is not inevitable.

To further clarify these dynamics, the service sector can be divided into three categories: (1) Traditional services (wholesale/retail, accommodation, food services)

(2) Business-related services (transportation, information and communications, finance, insurance, real estate, leasing) (3) Public services (healthcare, education, public administration).

**Figure 4** shows that traditional services have contributed significantly to service sector growth, driven primarily by increases in labor input. In contrast, business related services experienced strong growth only in the 1990s, and their contribution to labor productivity growth has remained limited since the 2000s—precisely during Malaysia's deindustrialization phase.

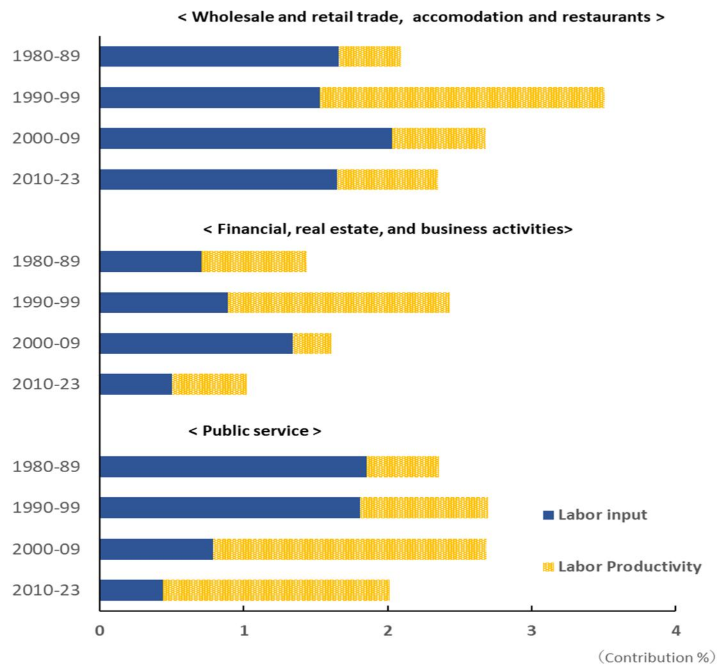



**Figure 4.** Contribution of service subsectors to overall service sector growth.
Note: Growth rates are calculated based on the contribution of each sector to the growth rate of the service.
Source: APO Productivity Database (2025) [29].

**Table 5** reports the number of employees and per-capita income by occupation, allowing an assessment of employment shifts within Malaysia's service sector. Between 2002 and 2017, nearly half of the increase in service-sector employment occurred in traditional services—wholesale and retail trade, accommodation, and food services. Because these occupations are characterized by relatively low per-capita income, the concentration of employment growth in these sectors raises concerns regarding Malaysia's long-term growth potential. Employment in business-related services has also expanded, but much of this increase has taken place in transportation and storage services, which similarly provide relatively low earnings. These patterns suggest that employment has shifted largely from labor-intensive manufacturing to traditional services or to transportation-related activities, both of which tend to offer limited wage growth. This appears to reflect the absorption of lower-skilled workers from manufacturing into service activities that require fewer specialized skills.

As employment becomes increasingly concentrated in low-productivity services, the risk of Baumol's cost disease rises, potentially constraining aggregate productivity growth. At the same time, **Table 5** shows that employment has also increased in higher-income service industries such as communications and computer-related services, reflecting rising demand associated with global ICT expansion. A larger shift of employment toward these modern, high-productivity services would contribute more strongly to Malaysia's long-term economic growth.

**Table 5.** Service sector employment and revenue.

| | Employment (person) | | | Per capita revenue (ringgit) | |
|---|---|---|---|---|---|
| | **2002** | **2017** | **2002–2017 (% PT)** | **2002** | **2017** |
| Wholesale & retail | 1,092,264 | 1,570,724 | 478,460 | 10,945 | 27,632 |
| wholesale | 301,061 | 479,566 | 178,505 | 15,840 | 38,432 |
| Retail | 791,203 | 1,091,158 | 299,955 | 9082 | 22,885 |
| Accommodation | 81,832 | 139,410 | 57,578 | 14,182 | 25,312 |
| Transportation & storage | 146,673 | 345,952 | 199,279 | 25,165 | 37,302 |
| Finance & real estate | 12,387 | 93,870 | 81,483 | 35,178 | 35,950 |
| Postal, communications | 63,451 | 225,417 | 161,966 | 40,796 | 59,297 |
| Postal and parcel delivery | 7767 | 32,213 | 24,446 | 19,293 | 29,614 |
| Telecommunications services | 34,392 | 58,163 | 23,771 | 39,507 | 81,419 |
| Computer services | 21,292 | 135,041 | 113,749 | 50,721 | 56,850 |
| Programming | 1081 | 6858 | 5777 | 61,190 | 90,836 |
| Information services | 5229 | 16,287 | 11,058 | 52,980 | 57,009 |
| Advertising & printing | 7865 | 50,130 | 42,265 | 39,582 | 40,158 |
| Education & healthcare | 106,540 | 255,812 | 149,272 | 20,042 | 34,588 |

Notes: 1. Wholesale and retail data are for 2005 and 2019. The change in employment is a comparison of 2017 to 2002. (Wholesale and retail data are a comparison of 2019 to 2005.)
2. Per capita revenue is calculated by dividing the total wage payments by employment.
Source: Department of Statistics, Malaysia [28], Principal statistics of service industries.

## 5. Discussion: Background and factors of the deindustrialization process

### 5.1 Decline in export competitiveness in the E&E sector

As shown in **Table 2**, Malaysia's overall manufacturing value-added share has declined since the mid-1990s. Labor-intensive industries—such as textiles, apparel, leather products, and wood-based products—have experienced notable reductions in their shares. In contrast, electrical machinery and resource-related industries, including refined petroleum and chemical products, have followed divergent trajectories. Refined petroleum and chemical products increased their value-added share until 2010 before experiencing a modest decline, likely reflecting the end of the global commodity boom following the global financial crisis. Electrical machinery, by contrast, declined through 2010 but subsequently recovered, surpassing its 1995 level by 2021.

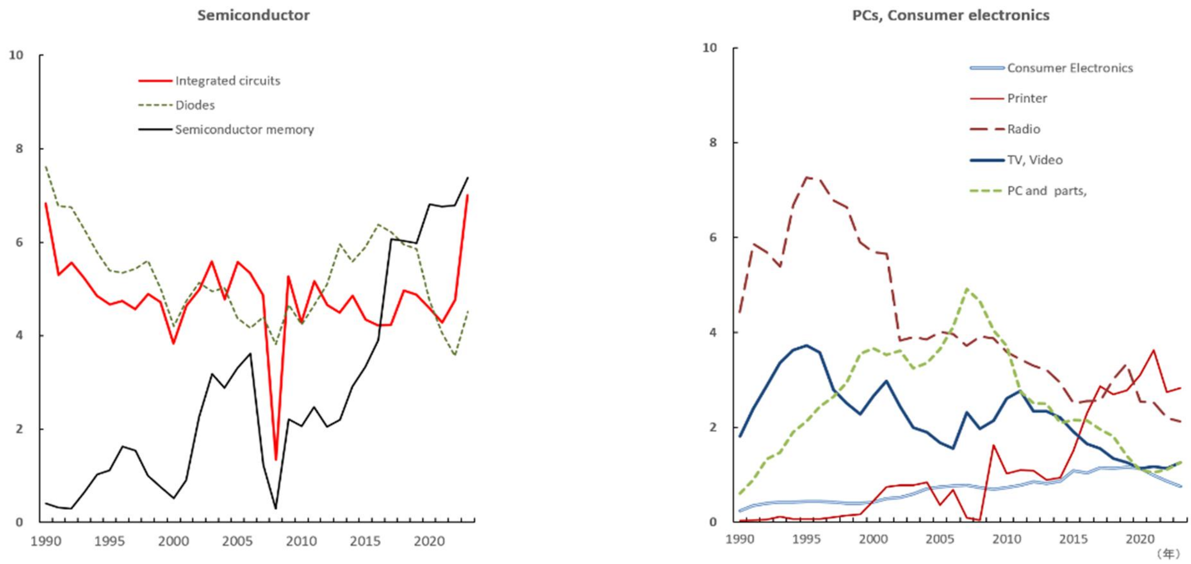
**Table 6** presents Malaysia's major export items (HS 4-digit level) by decade. Throughout the period, integrated circuits (HS8542) and semiconductor devices (HS8541) have remained among Malaysia's top export categories, with semiconductor memory (HS8523) rising significantly in prominence since the 2010s. Resource-based exports—including crude oil (HS2709), palm oil (HS1511), and petroleum and gas products (HS2711)—have also maintained strong positions. In contrast, consumer electronics products such as monitors and televisions (HS8528), radios (HS8527), and video tuners (HS8521), which ranked highly in the 1990s, have seen their export shares decline. Similarly, wood products (HS4407, HS4403) and plywood/veneer have lost competitiveness. Automatic data-processing machines (HS8471) and their parts (HS8473) have also experienced declining shares since the 2010s.

**Table 6**. Export in Malaysia: HS 4-digit code.

| | | | **1990–1999 average** | | | **2000–2009 average** | | | **2010–2024 average** |
|---|---|---|---|---|---|---|---|---|---|
| **Rank** | **HS code** | **Export total (Bil. US $)** | **59.9** | **HS code** | **Export total (Bil. US $)** | **134.5** | **HS code** | **Export total (Bil. US $)** | **227.4** |
| 1 | 8542 | Integrated circuits | 13.7 | 8542 | Integrated circuits | 12.8 | 8542 | Integrated circuits | 43.4 |
| 2 | 8473 | PC parts | 7.0 | 8471 | PC | 8.6 | 2710 | Petroleum | 17.4 |
| 3 | 2709 | Crude oil | 5.1 | 8473 | PC parts | 7.2 | 2711 | Natural gas | 14.0 |
| 4 | 1511 | Palm oil | 4.6 | 2711 | Natural gas | 5.1 | 1511 | Palm oil | 12.1 |
| 5 | 8471 | PC | 4.3 | 2709 | Crude oil | 5.0 | 8471 | PC | 8.2 |
| 6 | 8527 | Radio receivers | 3.9 | 1511 | Palm oil | 4.3 | 8541 | Semiconductor | 8.2 |
| 7 | 2711 | Natural gas | 2.6 | 2710 | Petroleum | 3.0 | 2709 | Crude oil | 7.9 |
| 8 | 8541 | Semiconductor | 2.5 | 8541 | Semiconductor | 2.5 | 8517 | Cell phones | 4.6 |
| 9 | 8528 | Monitors and televisions | 2.3 | 8525 | Television and video recorders | 2.2 | 4015 | Gloves | 4.5 |
| 10 | 4407 | Lumber | 2.1 | 8528 | Monitors and televisions | 1.4 | 8473 | PC parts | 3.9 |
| 11 | 4403 | Wood | 1.8 | 8527 | Radio receives | 1.4 | 8523 | Semiconductor memory | 3.9 |
| 12 | 4412 | Plywood and veneer | 1.7 | 8529 | Television antennas | 1.1 | 9030 | Voltage and measuring instruments | 3.7 |
| 13 | 4001 | Natural rubber | 1.7 | 8517 | Cell phones | 1.1 | 8528 | Monitors and televisions | 2.7 |
| 14 | 8521 | Video tuners | 1.7 | 9403 | Furniture and accessories | 1.1 | 8443 | Printers | 2.6 |
| 15 | 8517 | Cell phones | 1.4 | 4412 | Plywood and veneer | 1.0 | 7601 | Oils and fats | 2.3 |
| 16 | 8529 | Television antennas | 1.3 | 8534 | Printed circuits | 1.0 | 3823 | Aluminum | 2.3 |
| 17 | 4015 | Gloves | 1.3 | 4001 | Natural rubber | 1.0 | 9403 | Fumiture and accessories | 2.1 |
| 18 | 8540 | Thermionic tubes | 1.3 | 4015 | Gloves | 1.0 | 1516 | Processed fats and oils | 2.0 |
| 19 | 8534 | Printed circuits | 1.2 | 8537 | Electrical control or distribution panels | 0.9 | 9018 | Instruments used in medical, surgical | 1.6 |
| 20 | 2710 | Petroleum | 1.2 | 1516 | Processed fats and oils | 0.7 | 8536 | Switches, connectors | 1.5 |

Note: Share (%) of the total export value.
Source: United Nations Statistics Division [33].

These patterns become clearer when examining revealed comparative advantage (RCA) indicators. **Figure 5a, b** shows that semiconductor-related products—particularly integrated circuits and diodes—have consistently maintained RCA values above the competitiveness threshold of 1. The RCA for semiconductor memory also rose sharply in the 2010s. By contrast, the RCA values for consumer electronics such as televisions, video recorders, and radios increased through the 1990s but declined substantially in the 2000s, reflecting Malaysia's loss of competitiveness in these segments.




**(a)** **(b)**

**Figure 5.** Malaysia's export: RCA index. **(a)** Semiconductor; **(b)** PCs, Consumer electronics.

Source: United Nations Statistics Division [33].

The RCA index for PCs and related components increased until around 2010 but has since declined sharply. This decline reflects the rapid commoditization of personal computers and peripheral devices after 2000, which encouraged multinational firms to relocate production to lower-cost locations—first to China and subsequently to Vietnam. As Malaysia's income levels have risen toward those of higher-income economies, the relocation of labor-intensive assembly processes to countries with lower labor costs represents an economically rational reallocation within global value chains. However, a key concern is that, outside the semiconductor segment, Malaysia has struggled to develop competitive capabilities in emerging electronics fields such as in-vehicle electronic systems (including EV components) and cloud-computing-related hardware.

The broader decline in Malaysia's electrical and electronics (E&E) sector is also linked to strategic shifts among Japanese electronics firms. Japanese manufacturers historically played a central role in Malaysia's consumer-electronics production networks. Yet many failed to adapt to the digitalization wave of the 2000s and were unable to sustain competitiveness in new product categories. This erosion of international competitiveness contributed to the downsizing of Japanese overseas production bases, including those in Malaysia. **Table 7** illustrates this shift: Japan's foreign value-added contribution to Malaysia's exports fell from 10.0 percent in 2000 to 2.4 percent in 2022, while China's contribution rose from 1.3 percent to 7.3 percent over the same period.

**Table 7.** Foreign value-added share of Malaysian exports.

| | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2022 |
|---|---|---|---|---|---|---|---|
| Japan | 11.4 | 8.4 | 5.9 | 4.8 | 3.0 | 3.2 | 2.4 |
| United states | 7.4 | 7.3 | 5.9 | 4.8 | 3.9 | 4.0 | 34 |
| ASEAN | 4.5 | 5.1 | 5.9 | 6.9 | 5.9 | 5.6 | 6.0 |
| Singapore | 2.5 | 2.5 | 2.2 | 2.3 | 2.5 | 2.5 | 2.3 |
| Other ASEAN | 2.0 | 2.6 | 3.7 | 4.6 | 3.5 | 3.1 | 3.7 |
| China | 0.9 | 1.3 | 3.2 | 3.8 | 6.1 | 7.0 | 6.4 |
| South Korea / Taiwan | 3.7 | 3.4 | 3.4 | 3.0 | 3.1 | 3.1 | 2.4 |
| Other | 15.7 | 13.5 | 15.9 | 14.8 | 13.2 | 12.7 | 13.6 |
| Total | 43.6 | 39.0 | 40.1 | 38.2 | 35.3 | 35.7 | 34.2 |

Source: OECD TiVA [30].

Taken together, these trends indicate that although Malaysia has maintained strong competitiveness in semiconductor-related products, the loss of competitiveness in other electronics—particularly consumer electronics and PC-related products—has been a major driver of the country's deindustrialization since the 2000s.

### 5.2. Deindustrialization since the 2010s: Slowdown of deindustrialization due to strengthened competitiveness in the semiconductor sector

During Malaysia's deindustrialization process, global production networks were reorganized around efficiency, yet the manufacturing sector struggled to upgrade within the value chain. An important exception is the semiconductor industry. Since Intel established operations in Penang in 1972, Malaysia has developed a robust semiconductor cluster, and today five of the world's fifteen largest semiconductor firms maintain production bases in the country.

Since the late 2010s, the rapid global diffusion of AI, 5G technologies, and smart devices have sharply increased semiconductor demand, boosting Malaysia's semiconductor exports. At the same time, the restructuring of global supply chains—driven by the U.S.–China strategic rivalry and firms' efforts to diversify and digitalize production networks—has encouraged new investment and production relocation to Malaysia. In 2021, Intel announced a USD 7 billion investment to construct an advanced 3D semiconductor packaging facility in Penang. These developments have helped stabilize the manufacturing sector's value-added and employment shares, slowing the pace of deindustrialization since the late 2010s.

However, Malaysia's semiconductor industry remains concentrated in back-end operations—outsourced semiconductor assembly and testing (OSAT)—including packaging, assembly, and testing. Foreign multinationals such as Intel, Infineon, and Texas Instruments continue to dominate the sector, while domestic firms such as Inari Amerton, Unisem, and Carsem play complementary but smaller roles and lack the technological depth and scale of global leaders.

Malaysia's proximity to Singapore, which hosts several wafer-fabrication facilities, provides a locational advantage for sustaining back-end operations in the near term. Nevertheless, continued reliance on foreign multinationals means that Malaysia's semiconductor ecosystem—and the broader economy—remains vulnerable to strategic decisions made by global firms. Without strengthening domestic technological capabilities and moving into higher-value segments of the semiconductor value chain, Malaysia's long-term industrial upgrading will remain constrained.

### 5.3. The need for a development strategy predicated on the integration of manufacturing and service industries

Deindustrialization in Malaysia reflects a complex interplay between domestic structural constraints and intensifying global competitive pressures. While the decline in the manufacturing sector's share since the 2000s aligns with the pattern of "premature deindustrialization," the underlying mechanisms vary by industry. The loss of competitiveness in medium-tech industries—such as consumer electronics and personal computers—represents a form of "negative deindustrialization" driven primarily by external competition, particularly the rapid rise of China in technology-intensive manufacturing; this aligns with the "Red Queen effect" identified by Paus [21]. However, Malaysia's robust position in the semiconductor sector demonstrates that industrial upgrading is indeed possible.

Although structural bottlenecks hindering Malaysia's industrial upgrading once drew significant attention from researchers, the evolution of global value chains (GVCs) necessitates a re-examination of conventional interpretations of deindustrialization. Indeed, amidst the growing convergence of manufacturing and services, activities such as R&D, design, engineering, and marketing—which were once internalized within manufacturing firms—are increasingly being outsourced or offshored. Consequently, statistical value-added is shifting from manufacturing to services; thus, a decline in the manufacturing sector's share of value-added does not necessarily signify an absolute industrial decline but rather reflects a deeper structural transformation.

Consistent with this conceptual shift, recent analysis by Lee indicates that Malaysia's structural transformation has entered a critical phase of "consolidation" [34]. Lee further argues that enhancing economic resilience requires the qualitative deepening of knowledge-intensive service activities, rather than relying merely on the expansion of traditional manufacturing [35]. Therefore, the expansion of the service sector in Malaysia should be viewed as an essential catalyst for maintaining long-term industrial competitiveness. The rise of IoT-enabled products exemplifies this transformation. Modern manufactured goods are closely linked to digital services, and the value consumers derive stems not merely from the hardware itself but from the surrounding service ecosystem. Trade analysis based on OECD TiVA (Trade in Value Added) [30] data reveals a gradual increase in the share of domestic value added derived from information services, rising from 11.4 % in 1995 to 13.0 % in 2020 (**Figure 6**). This expansion of domestic value-added in information services aligns with broader global trends where digital platforms act as critical catalysts for productivity enhancement within the service sector [36]. Furthermore, empirical insights from the OECD [37,38] substantiate that the digital transformation of services not only drives intra-sectoral efficiency but also generates extensive productivity spillovers that revitalize interconnected manufacturing nodes within global value chains. The advanced integration of manufacturing and service functions—typified by software embedded in products—is expected to drive further growth in the digital sector. It can be said that Malaysia's structural transformation is progressing within the digital and knowledge-intensive service sectors as well. Given this situation, development strategies that rely solely on traditional industrialization are insufficient. The new evidence revealed in this study shows that modern services, particularly ICT, logistics, and finance, can be drivers of growth. The challenge facing Malaysia is not simply to revive manufacturing, but to redefine a development strategy that integrates manufacturing with modern services. For Malaysia to shift towards higher value-added activities in both sectors, improvements in digital infrastructure, human capital, and institutional quality will be essential.

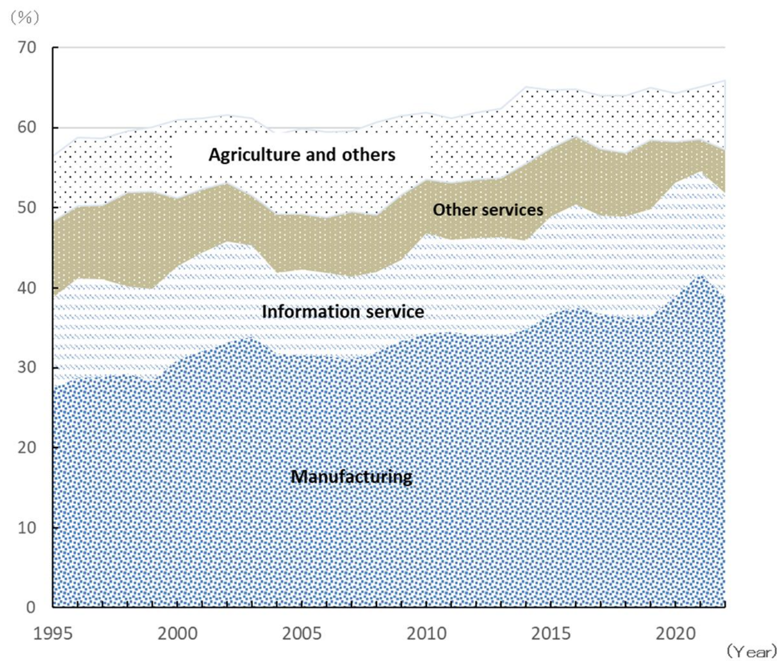



**Figure 6.** Malaysia Exports: Value-added by industry.

Source): OECD TiVA [30].

## 5.4. Methodological constraints and limitations of scope

While this study captures Malaysia's structural transformation comprehensively and from a macro perspective by integrating datasets at the macro and sectoral levels, it is necessary to critically examine certain methodological constraints and limitations regarding its scope. First, reliance on aggregated secondary data precludes the exploration of firm-level heterogeneity or the identification of causal relationships. Consequently, although the study's findings capture broad sectoral shifts, they cannot distinguish differences in adaptive capacity between large multinational corporations (MNCs) and domestic small and medium-sized enterprises (SMEs) within the electrical and electronics (E&E) and services industries. Moreover, it has been pointed out that the macroeconomic impact of digital transformation varies significantly across sectors, potentially altering the domestic labor share and giving rise to industrial heterogeneity [39].

Second, there is a lack of sub-national (regional/local) data. Economic activity in Malaysia is highly geographically concentrated. The high-tech manufacturing cluster in Penang and the digital services ecosystem in the Klang Valley operate under structural dynamics vastly different from the resource-dependent or agricultural economies found in regions such as Sabah, Sarawak, or the East Coast states. Formulating a uniform national strategy without accounting for these regional imbalances risks widening spatial economic disparities, as less developed regions may lack the foundational digital infrastructure required to implement advanced policy mechanisms.

Third, as this paper does not conduct a rigorous analysis of distributional impacts, it cannot empirically assess how premature deindustrialization or delays in transitioning to modern services affect different income groups. If the shift from routine manufacturing to traditional services primarily depresses wages for low-income earners, the digital policies proposed herein could inadvertently exacerbate digital and socioeconomic inequalities. Assessing such detailed spatial and distributional nuances requires research utilizing longitudinal micro-data on workers.

It should be noted that this study relies heavily on aggregated data at the macro and sectoral levels, which inevitably hinders the systematic tracking of localized inter-regional disparities across different segments of the workforce and broader distributional impacts. Therefore, caution must be exercised when attempting to apply the proposed policy framework uniformly on a national scale. One-size-fits-all policy interventions risk inadvertently masking underlying spatial inequalities among Malaysian states or overlooking uneven socio-economic welfare outcomes affecting vulnerable worker groups.

## 6. Policy implications for sustainable social development

### 6.1. Main findings

The empirical findings of this study offer several concrete implications for Malaysia’s development strategy. First, sectoral analysis reveals that the decline in manufacturing value-added is concentrated in labor-intensive industries, whereas sub-sectors characterized by medium- to high-level technology demonstrate relative resilience. This trend suggests that skill development programs should not be applied uniformly across the entire manufacturing sector; instead, they should be tailored to support industrial upgrading within high-growth sub-sectors such as electrical machinery, transport equipment, and digitally intensive manufacturing.

Second, employment analysis indicates that many workers leaving the manufacturing sector are being absorbed into traditional, low-productivity service industries. Strengthening the digital skills of low- and medium-skilled workers is essential to facilitate labor mobility toward high-productivity sectors.

Third, RCA (Revealed Comparative Advantage) analysis shows that the decline in competitiveness for certain export products aligns with Malaysia’s current inability to fully penetrate the high-value-added segments of global value chains (GVCs). This highlights the need to establish governance frameworks that foster industrial upgrading—such as coordination mechanisms among digital, industrial, and social policies—and to support firms in adopting digital technologies that boost productivity and export competitiveness.

To navigate the structural dilemmas of the digital transition, Malaysia's institutional framework must evolve toward a synchronized policy paradigm. While the Malaysia Digital Economy Corporation notes that strategic blueprints have successfully established the foundational infrastructure for network readiness, significant gaps remain in aligning cross-sectoral industrial agendas with localized technology absorption [40]. UNCTAD argues that addressing this misalignment—and bridging the "digital divide"—requires shifting the policy focus from mere network connectivity to the construction of a governance ecosystem synchronized with comprehensive domestic value capture [41]. Drawing on the empirical findings of this study, this section proposes an innovative public policy framework designed to directly address that very gap. Directly addressing these gaps based on the empirical findings, this section proposes an innovative public policy framework structured around three interconnected priorities: (1) implementing an outcome-based digital skills development program geared toward vulnerable labor segments, (2) expanding accessible digital infrastructure to mitigate urban-rural disparities, and (3) establishing an integrated governance body that synchronizes industrial, digital, and social welfare policies.

## 6.2. Comprehensive digital skills development programs

To cultivate and strengthen human resources capable of responding to rapid digital transformation, educational institutions need to develop programs that progressively improve skills, from basic IT literacy to advanced skills such as data analysis, AI utilization, and cybersecurity. Industry also needs to actively promote activities such as internships and joint training programs. Furthermore, to ensure broad participation, training voucher schemes through talent development taxes and employment insurance are effective in supporting the unemployed, low-income individuals, and mid-career employees at a career transition. Additionally, establishing a standardized skills certification system will contribute to increasing the recognition of newly skilled workers in the business world and promote labor mobility.

However, significant challenges remain in smoothly implementing these measures. Low-skilled workers and non-regular employees may face barriers in terms of time, money, and information. Complementary measures such as paid training leave, allowances, and hybrid learning models may be necessary. Furthermore, outsourcing certification work to the private sector could lead to a proliferation of certification systems and a decline in quality; therefore, a robust certification system and third-party evaluation mechanism are required.

To respond to rapid digital transformation, building an ecosystem of collaboration between government, industry, and educational institutions is essential. Establishing an organization that can unify monitoring of aspects such as the alignment of digital skills standards, the accreditation of training institutions, participation rates, completion rates, employment outcomes, and wage impacts will enable iterative policy adjustments and contribute to enhanced accountability.

### 6.3. Expanding digital infrastructure

The second pillar is expanding digital infrastructure as a foundation for equitable access to digital opportunities. Policy innovation should strengthen universal service obligations and accelerate broadband deployment in rural and underserved areas by combining regulatory obligations, targeted subsidies, and public-private partnerships. Public facilities such as schools, libraries, and community centers can be transformed into "digital commons" offering free Wi-Fi, shared devices, and digital learning support. At the institutional level, accelerating cloud adoption and expanding open APIs within governments will foster government tech innovation and enable the delivery of more efficient public services.

In developing infrastructure, the Malaysian Communications and Multimedia Commission (MCMC) and the Ministry of Digital Affairs should take the lead in promoting cooperation between state and local governments. However, there are many challenges to implementation, such as the lack of commercial viability in rural areas. With these challenges in mind, efforts are needed to align infrastructure investment with regional development priorities. Furthermore, a governance system is required to regularly monitor and track progress in communications coverage, speed, pricing, and service quality. It should be noted that disparities in digital literacy, language barriers, and limited access to equipment can prevent socially marginalized people from fully benefiting from these advancements. Therefore, infrastructure policy must be integrated with human capital and social inclusion strategies.

Based on these considerations, I propose the introduction of "outcome-linked digital transformation (DX) incentives" as a concrete element of fiscal policy design. Historically, the government has tended to provide subsidies to companies regardless of actual results, without securing long-term investment commitments. The implementation of tax incentives and direct financial aid should be strictly tied to the achievement of verifiable milestones. Accordingly, evaluation criteria would likely include statistically demonstrable, dramatic improvements in productivity, indicators of the adoption of advanced digital technologies (such as AI and IoT) at the corporate level, and verifiable technology spillover effects within the domestic supply chain.

### 6.4. Inclusive digital policy: Integration of industrial, digital, and social policies

If the structural transformation to a digital economy is driven solely by market principles, there is a possibility that it may proceed in an undesirable direction from a sustainable and inclusive perspective. The government needs to actively participate in the formulation and promotion of digital policies, working comprehensively with educational institutions and the business community. Specifically, the following policy responses can be considered:

First, to strengthen industrial competitiveness, it is essential to simultaneously advance the manufacturing sector and digitize the service sector through strategic tax incentives and subsidies. A key priority is ensuring that all citizens acquire basic digital skills. Measures are needed to bridge the digital divide between urban and rural areas—such as providing connectivity subsidies and device-lending programs for low-income individuals and rural residents. To fund these initiatives, it may be logical to introduce a "Pay-As-You-Gain" levy on major tech platforms that derive direct profits from state-developed infrastructure like 5G networks and data centers.

Furthermore, the government needs to move away from the rigid, conventional subsidy framework—which risks causing market distortions and a lack of accountability—and instead pursue an overhaul of its policies to make them agile and forward-looking. For instance, authorities could consider an outcome-based subsidy system: if a worker transitions to a high-skill role following digital reskilling, the government would pay subsidies to private training providers only after verifying the worker's sustained employment over a set period. This shifts the policy evaluation metric from "budget input" to "verifiable labor market outcomes and productivity gains," thereby encouraging the acquisition of skills that align with market needs. Simultaneously, a data-integrated social security system should be established to aggregate workers' skill histories, employment records, and income data in real time. This digital ecosystem would modernize the safety net by automatically triggering personalized retraining vouchers or immediate financial compensation upon job loss, thereby mitigating the friction caused by rapid, market-driven automation. Moreover, while ensuring data security, easing or eliminating regulations and rigid labor classifications would foster collaboration between major manufacturers and AI startups, driving the joint development of new service models and active talent exchange.

Implementing such integrated policies, however, requires a sophisticated governance framework. To align and integrate cross-ministerial priorities, budgets, and KPIs, it is crucial to establish a "transformation command center" led by the Prime Minister that utilizes a rigorous monitoring framework—akin to Malaysia's PEMANDU (Performance Management and Delivery Unit). Such a mission-oriented approach will likely be the key to fostering the digitalization of SMEs and accelerating structural transformation in major sectors like manufacturing, logistics, and healthcare. Furthermore, the government will need to assess the economic and social impacts of its digitalization policies. This ensures that new technology-related policies undergo ex-ante evaluations regarding their effects on income, regional, and gender disparities. By identifying structural risks early, the government can simultaneously implement targeted, complementary support measures to protect vulnerable communities and promote economic growth that fosters social inclusion.

As discussed above, by comprehensively coordinating industrial, educational, and social policies, Malaysia can proactively manage its transition to an inclusive and sustainable digital economy while simultaneously strengthening the competitiveness of its manufacturing sector and expanding modern services.

## 7. Conclusion

This study has successfully addressed its core research objectives by providing a comprehensive, updated evaluation of Malaysia's long-term structural changes, identifying the global and domestic factors driving premature deindustrialization, and offering a critical reinterpretation of structural transformation within the context of the emerging digital economy.

It is important to note that this paper does not introduce a new empirical identification strategy or methodological innovation; rather, its primary academic contribution lies in its integrative analytical perspective. By synthesizing multiple sources of evidence—including long-term value-added and employment trends, sector-level competitiveness indicators, global value-chain (GVC) dynamics, and contemporary digitalization metrics—this study offers a comprehensive assessment of Malaysia's structural trajectory. The novelty of this research thus stems from its capacity to contextualize and reinterpret the phenomenon of premature deindustrialization considering modern digital transformation.

The synthesized findings demonstrate that Malaysia's premature deindustrialization reflects a combination of intense global competitive pressures and binding domestic structural constraints, which have collectively limited the country's ability to upgrade within the manufacturing sector. The contraction of labor-intensive and medium-technology industries, coupled with the expansion of low-productivity traditional services, has not only weakened long-term aggregate productivity growth but also exacerbated the risk of labor market polarization. These structural shifts carry profound implications for sustainable social development, directly affecting wage dynamics, employment quality, and the equitable distribution of opportunities across different socio-economic groups.

Concurrently, the rise of modern service sectors—particularly information and communication technology (ICT), finance, logistics, and digital platform-based activities—presents novel avenues for productivity enhancement and economic diversification. However, the benefits of this digital transformation are not inherently inclusive. Without targeted policy interventions, digitalization risks reinforcing existing structural inequalities by concentrating high-value, high-wage opportunities among highly skilled, digitally connected demographics while further marginalizing vulnerable populations.

Consequently, Malaysia's long-term development trajectory depends on its capacity to systematically integrate industrial upgrading, digital innovation, and social inclusion into a coherent, unified policy framework. To ensure that structural transformation fosters sustainable and equitable social development, the state must pursue a balanced strategy that simultaneously strengthens domestic manufacturing capabilities and promotes inclusive digital transformation. This approach demands highly coordinated policies capable of expanding robust digital infrastructure, accelerating human capital accumulation through industry-aligned upskilling and reskilling, and facilitating the creation of high-quality jobs across both advanced manufacturing and modern service sectors. By aligning industrial upgrading with explicit mechanisms for social equity, Malaysia can effectively mitigate the socio-economic risks of premature deindustrialization and build a more resilient, equitable, and sustainable development path in the digital age.

While this integrative analysis provides critical macroscopic insights, it is subject to certain limitations. The empirical framework is primarily descriptive and relies on aggregate, sector-level data; hence, it does not directly test specific causal mechanisms or account for firm-level heterogeneity. To deepen the understanding of how structural transformation interacts with broader social development, future research must transcend these limitations by incorporating micro-level enterprise data, examining regional disparities, and rigorously quantifying the distributive impacts of digitalization across diverse social strata.

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