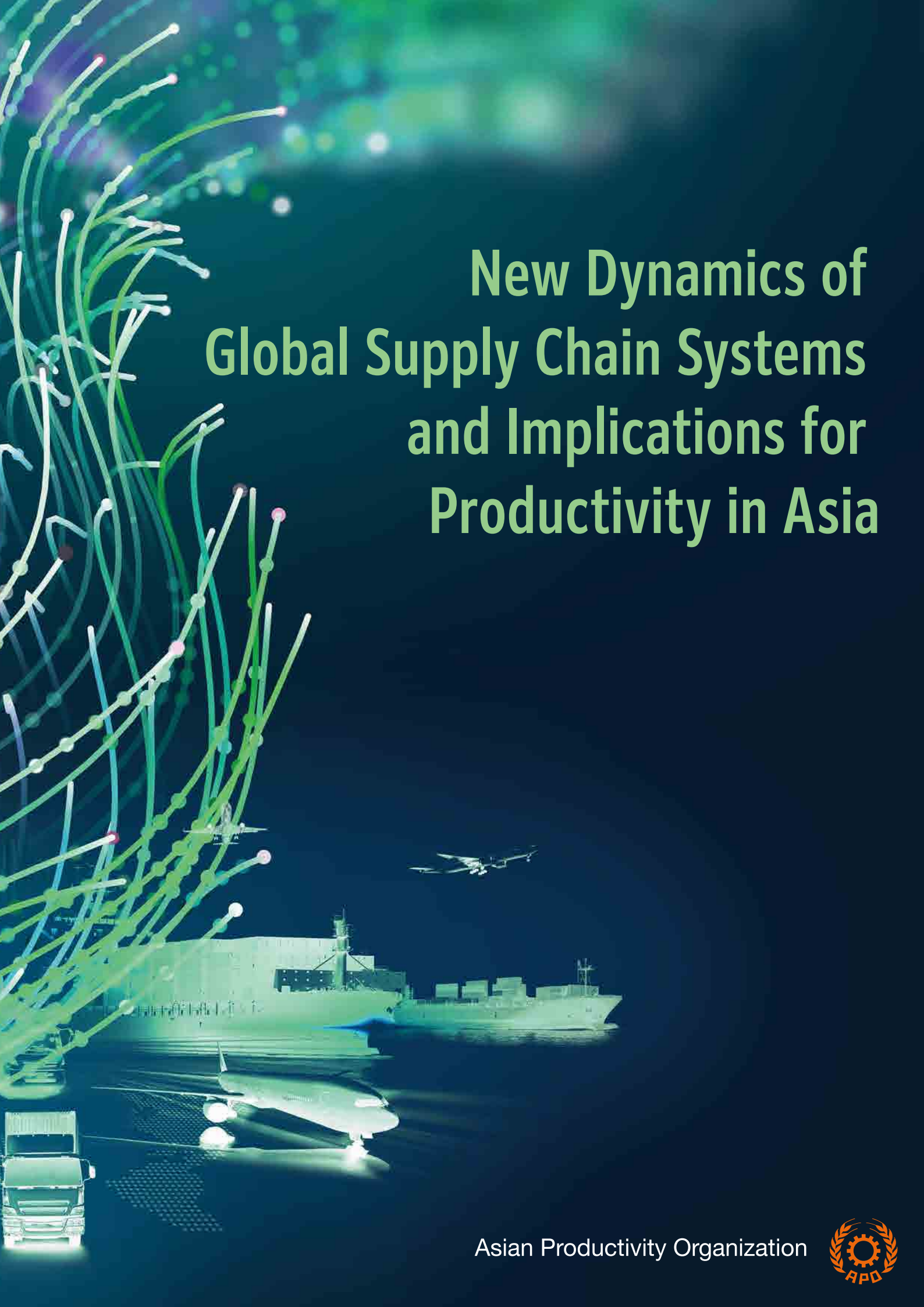


New Dynamics of Global Supply Chain Systems and Implications for Productivity in Asia



The Asian Productivity Organization (APO) is an intergovernmental organization that promotes productivity as a key enabler for socioeconomic development and organizational and enterprise growth. It promotes productivity improvement tools, techniques, and methodologies; supports the National Productivity Organizations of its members; conducts research on productivity trends; and disseminates productivity information, analyses, and data. The APO was established in 1961 and comprises 21 members.

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NEW DYNAMICS OF GLOBAL SUPPLY CHAIN SYSTEMS AND IMPLICATIONS FOR PRODUCTIVITY IN ASIA

New Dynamics of Global Supply Chain Systems and Implications for Productivity in Asia

Dr. Min-Ren Yan served as the chief expert and volume editor.

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FOREWORD

In the aftermath of the COVID-19 pandemic and increasing tensions in the geopolitical landscape, Global Supply Chains (GSCs) have been drastically reshaped. With multiple sourcing strategies and supply network relocations, global manufacturers have shifted their production sites. The trend of supply chain diversification and relocation could have positive impacts on productivity growth in APO member economies. The questions of whether this business strategy has positive impacts on company productivity, new GSC dynamics benefit new host countries, and new hosts have sufficient absorptive capacity to benefit from technological spillover effects are worth studying. This research explored these aspects by estimating the impact of new GSC dynamics on productivity, exploring case studies of GSC diversification and relocation, and drawing implications for business and policymaking.

This publication on *New Dynamics of Global Supply Chain Systems and Implications for Productivity in Asia* highlights government policies and international regulatory frameworks, which are among the critical success factors for facilitating collaborative efforts in global supply chain systems. It indicates that setting priorities for industry value chains and talent development should be considered as investments for competitiveness, as shown in the cases of the nine APO member economies covered in this research.

The recommendations of this study identify three directions for productivity improvement and competitive advantages: supply chain resilience; digital transformation; and sustainable supply chain system development. These recommendations take into consideration the new dynamics of evolving GSCs given their complexity and more associated risk factors such as economic dynamics with downturns and inflation, digitalization with information and cyber insecurity, extreme weather challenges and pollution, and social changes and market transformation.

The APO extends sincere gratitude to Chief Expert Professor Min-Ren Yan, Director, DIGI+ Sustainability Institute, National Chengchi University, the Republic of China, and the nine national experts from Bangladesh, Cambodia, India, Lao PDR, Malaysia, Pakistan, the Philippines, Thailand, and Turkiye who conducted the research and contributed to this publication. The case studies in each country addressed the implications for productivity of the supply chain system structure. They show that both productivity recovery strategies and growth strategies are essential for enterprises to contribute to meeting the SDGs reactively and proactively.

Dr. Indra Pradana Singawinata
Secretary-General
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Tokyo

EXECUTIVE SUMMARY

In the wake of the COVID-19 pandemic and escalating geopolitical tensions, GSCs have undergone significant transformation. The global economic system has experienced dramatic changes in recent years due to the unexpected pandemic. As GSCs have been restructured to accelerate digitalization and systemic change, the need to urgently reassess technological innovations and new business models in response to evolving market dynamics has never been more pressing. This is not just a matter of survival, but also a prerequisite for sustainable development in the post-pandemic era.

The new dynamics of GSCs are characterized by increased complexity and risk factors, including economic downturns, inflation, digitalization challenges like information and cybersecurity threats, extreme weather events, pollution, and social and market transformations. Additionally, the design of future supply chain systems and timely actions must account for impactful and long-term challenges such as climate change, critical shifts in Earth's systems, biodiversity loss, ecosystem collapse, natural resource shortages, adverse outcomes of AI or immature technology applications, and societal and political issues.

To navigate these complexities, a systems-thinking approach and sustainable system development practices are essential for designing and managing effective, resilient, and sustainable supply chain systems. Digitalization and sustainability initiatives are now critical drivers of transformation and productivity improvement.

In this context, nine supply chain case studies were selected from different APO members, providing comprehensive studies and references for understanding the new dynamics of GSCs and implications for productivity.

The analysis of these case studies covers a wide range of supply chain challenges and practical experiences, offering valuable lessons for readers from various countries. The key findings and lessons are summarized as follows:

1. The case studies evaluate firm-level and national-level performance from a systems perspective, highlighting the connections between government regulatory policies, the industry environment, and business operations. They visualize and evaluate the structures of the supply chain system in different cases, facilitating knowledge sharing and understanding.
2. All the case studies explore productivity implications within the supply chain structure. They do not present a single solution for the new dynamics of GSCs but offer multi-stage performance evaluations, from the pandemic to the new normal, allowing for a clearer understanding of systemic changes.
3. The case studies address both productivity recovery and growth strategies, offering companies the choice of pursuing sustaining or sustainable development, reactively or proactively.

4. Strategic planning and technological integration are crucial for navigating the new dynamics of the global supply chain. Companies should plan for operational and strategic initiatives with balanced short-term and long-term objectives. Appropriate technology utilization and digital transformation are essential for enhancing supply chain efficiency and performance.
5. Systems thinking and a growth mindset can support sustainable system development by fostering open innovation, industry clusters, partnerships, and Environmental, Social, and Governance or ESG-driven business transformation within the global supply chain system. The focus should be on sustainable system design and management that encourages continuous improvement and sustainable development.
6. Governmental policies and international regulatory frameworks are critical success factors in facilitating collaboration within GSCs. Prioritizing industry value chains and talent development should be considered an investment for competitiveness.

INTRODUCTION AND METHODOLOGY

Background

In the wake of the COVID-19 pandemic and escalating geopolitical tensions, the GSC landscape has undergone significant transformations. A survey by Ernst and Young (2023) revealed that the COVID-19 pandemic disrupted the GSCs of 47% of firms, underscoring the profound impact of the crisis. This upheaval has compelled companies to prioritize business continuity through the cultivation of resiliency and flexibility.

Manufacturers worldwide are reevaluating their reliance on existing providers and reconsidering sourcing strategies by diversifying supply chains or relocating manufacturing sites closer to suppliers. This shift has led to some global manufacturers moving production to new locations. The potential benefits of this business strategy on company productivity, the advantages that the new GSC dynamics could bring to new host countries, and the capacity of these new hosts to benefit from technological spillover effects are all areas of interest. For APO member economies, the trend of supply chain diversification and relocation could be a catalyst for productivity growth, presenting a promising outlook that warrants further investigation.

This research is crucial as it examines the impact of new GSC dynamics on productivity, explores case studies of GSC diversification and relocation, and draws implications for business and policymaking. The potential benefits of this research are significant, and the detailed objectives are as follows, each significantly contributing to the understanding of the topic.

- Analyze the new dynamics of GSCs in the post-COVID-19 era.
- Estimate the impact of the trend of supply chain diversification and relocation on productivity performance.
- Determine the level of critical resources to respond to the new GSC dynamics.
- Present case studies on manufacturing site shifts and their impacts.
- Draw supply chain systems and productivity policy implications for sustainable development.

Methodology

In this research, each case study uses a structured methodology for the evaluation by national experts from the APO member countries. The national experts are tasked with reviewing the document and collecting the data for analysis. Each country paper covers three key areas: (1) an overview of the new dynamics of GSCs post-pandemic, (2) an analysis of the impact of these new dynamics on productivity, and (3) a case study on firm-level productivity implications. The country papers, case studies, and final reports are reviewed and approved by the chief expert and national experts.

Framework to Analyze the New Dynamics of GSC and Its Impacts on Productivity

A. Post-pandemic Dynamics of Global Supply Chain

GSC Diversification and Relocation Strategies

The impacts of COVID-19, geopolitical competitions, and new industry standards have introduced new dynamics into the GSC post-pandemic. As a result, manufacturers worldwide are facing increasing political and competitive pressures to boost domestic production, create more jobs in their home countries, reduce or even eliminate their dependence on perceived high-risk sources, and rethink their use of lean manufacturing strategies that minimize the amount of inventory held with their GSCs.

GSC diversification and relocation strategies for business transformation are critical to developing a company's dynamic capabilities. The most effective way to address heavy dependence on one medium- or high-risk source is to add more sources in locations not vulnerable to the same risks. This is irrespective of a single factory, supplier, or region. For example, the US-China trade war has motivated some firms to adopt a “China plus one” strategy, distributing production between China and Southeast Asian countries such as Vietnam, Indonesia, or Thailand. Additionally, broader geographic diversification is recommended to avoid unexpected crises in specific regions.

Companies are incentivized to consider a regional strategy, producing a substantial proportion of key goods within the region where they are consumed. For example, North America could be served by shifting labor-intensive work from China to Mexico and Central America. Companies could increase their reliance on Eastern European countries such as Turkey to supply Western Europe with items used there. Chinese firms seeking to protect their global market share are also exploring diversified sources of labor-intensive production in countries such as Sri Lanka, Egypt, Ethiopia, Kenya, and Myanmar.

Impact of New GSC Dynamics on Aggregate and Firm-Level Productivity

Building a new supplier infrastructure in a different country or region takes considerable time and money. For example, shifting production from China to Southeast Asian countries will also require adjustments to logistics strategies. Unlike China, these new locations, being at an early stage of development, may lack efficient, high-capacity ports that can handle the largest container ships or offer direct marine liner services to major markets. That could lead to an increased reliance on transshipment through Singapore, Hong Kong, or others, resulting in longer transit times to reach key markets.

However, in the long run, China is expected to remain an unavoidable part of the post-pandemic global supply chain. Its deep supplier networks, flexible and skilled workforce, and large and efficient ports and transportation infrastructure ensure that it will continue to be a highly competitive source for years. Additionally, because China is among the largest economies in the world, firms must maintain their presence to access its markets and obtain competitive intelligence.

If alternate suppliers are not immediately available, a company should determine how much extra stock to hold in the interim, in what form, and at which point along the value chain.

A supply chain is the structure through which the inputs are acquired, transformed into an output, and delivered to a customer. The customer can be external or internal. The inputs and outputs can be tangible, such as an automobile and its parts and raw materials, or intangible, such as in product development, where the output is a completed design and the inputs include customer specifications.

Supply chains consist of a stock and flow structure for acquiring, storing, and converting inputs into outputs and the decision rules governing the flows. Therefore, systematic supply chain studies should evaluate the impact of new GSC dynamics on aggregate and firm-level productivity. Systems thinking is essential for identifying supply chain system structure, which is important for understanding and analyzing the dynamics of GSCs.

B. Impact of New Dynamics of GSC on Productivity

Multiple indicators at the aggregate level can be identified by using aggregate data to analyze the impact of new dynamics of GSC on productivity. This includes the concepts of labor productivity, human capital readiness, and technological spillovers. For example, some indicators such as GDP per capita (constant 2015 USD), GDP per capita growth (annual %), Research and Development (R&D) expenditure (% of GDP), and labor force (total) can be identified. There is open data from the World Bank's World Development Indicator (WDI), which can be used to analyze performance over time with specific indicators at the national level. Case studies from different APO member countries can use their own country's data for the analysis.

Research and development may produce different spillover effects depending on the technological, spatial, and other economic distances between firms. The two most common spillover effects have opposite outcomes. The first type is the knowledge spillover effect, which may increase the productivity of other firms. The second is the business-stealing effect, in which productivity gains in an innovating firm decrease the value of competing firms.

An organization's human capital can be measured based on the availability of employee skills, talent, and know-how to perform the internal processes critical to the strategy's success.

C. Case Study for Firm-Level Productivity Implications (1 case per country)

1. Introduction of the country and the company

2. GSC plans

Diversification and relocation strategies, digital transformation, ESG transformation, sustainable supply chain strategies, supply chain collaboration, and other plans responding to GSCs.

3. Potential impacts

The analysis framework at the firm level comprises two perspectives: global supply chain systems evaluation and multiple performance evaluation.

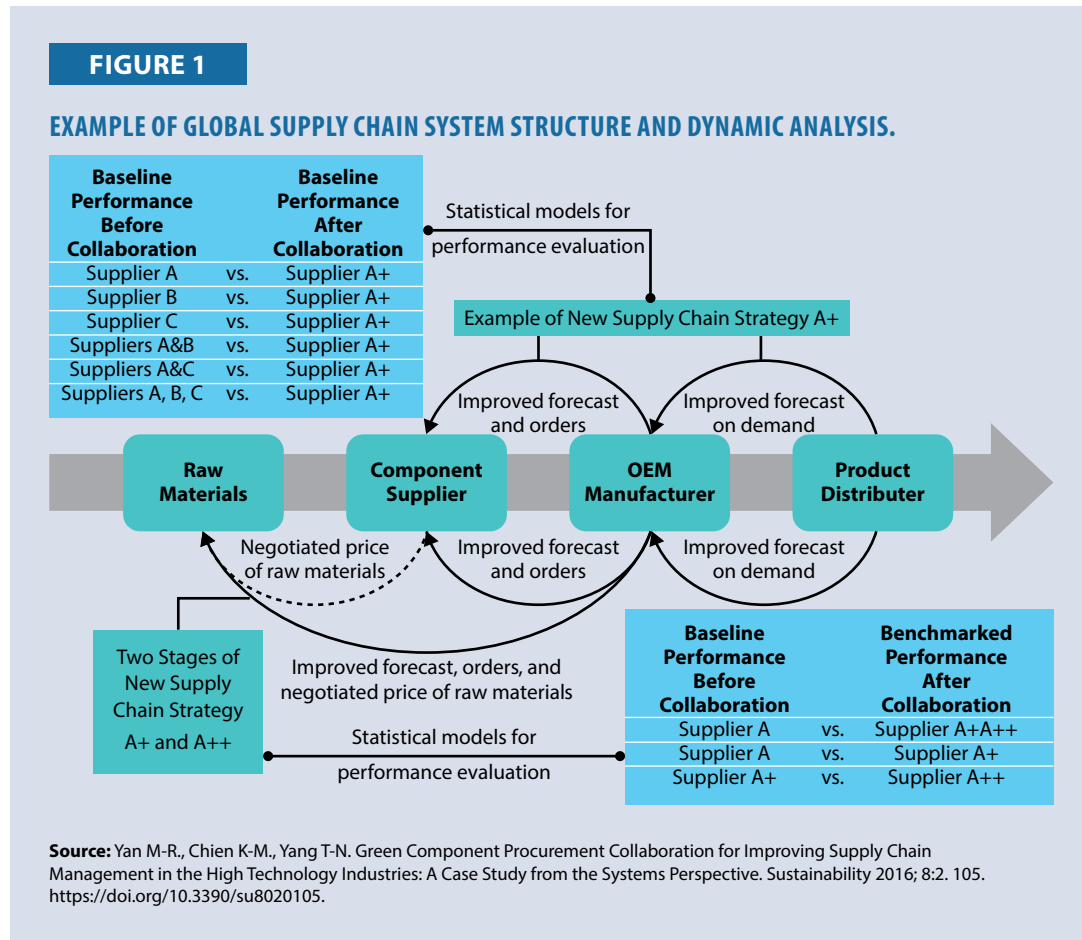
A generic global supply chain systems map is provided, and the company case can elaborate on the current status of the supply chain's operations management system and what has changed.

A framework for evaluating horizontal and vertical supply chain collaborations has been developed to assess shared risk, cost-effectiveness, and reduced variations in supply lines to improve shipping time efficiency under different supply chain strategies. The collaborations in the new supply chain strategy, Strategy A+, are primarily horizontal, involving multiple suppliers. Meanwhile, in one benchmark case, the company collaborated specifically with one supplier, although three suppliers competed to fulfill the ordered quantity.

The collaboration focused on the impacts of improved procurement forecasting and orders. In contrast, the collaborations for two-stage supply chain strategies are vertical, with the company

focusing on cooperation with a specific supplier and developing various stages of procurement collaborations, such as improved forecasts, orders, and negotiated prices of raw materials.

Figure 1 illustrates the supply chain system structures and statistical models that can be used for performance evaluation. The case study can use the proposed supply chain system to demonstrate the rationale behind the new supply chain strategy and how the dynamics system could reduce supply line risks and eventually improve supply chain performance. The system structure supports a holistic analysis of the research subject and serves as a systematic case for policy implication. Statistical validations using empirical data can be conducted to examine the real-world results of a supply chain system with these new dynamics.



Multiple performance indicators can be used to evaluate the case company and assess its dynamics and performance over time.

- **Business Performance:** This can be evaluated using financial and non-financial performance indicators to provide a comprehensive view of the changes and diversities in a company and new post-pandemic dynamics.

Suggested indicators include (but are not limited to) Total Sales (revenue), Sales Volume, R&D Investment (total amount or as a percentage of total sales), Human Resources Development (HRD) Investment (total amount or as a percentage of total sales), Number of Customers, Customer Satisfaction, and Operational Efficiency.

- **Labor Productivity:** The suggested indicators include (but are not limited to) Sales per Employee and Sales per Hour.

Dynamics in business performance and labor productivity are directly attributable to fluctuations in physical capital, new technology, and human capital. When labor productivity grows, it can typically be traced back to growth in one of these three areas.

There are several ways governments and companies can improve labor productivity. The company case study can apply the proposed framework of the supply chain structure to address dynamic developments across three stages: traditional approach (pre-pandemic), transitional approach (during the pandemic), and transformational approach (post-pandemic).

- **Investment in Physical Capital:** Increasing investment in capital goods, including infrastructure from governments and the private sector, can boost productivity while reducing the cost of doing business.
- **Quality of Education and Training (HRD Investment):** Providing workers with opportunities to upgrade their skills and offering affordable education and training helps enhance productivity for corporations and the economy as a whole.
- **Technological Progress (R&D investment):** Developing new technologies, including hard technologies like computerization or robotics and soft technologies like new modes of business organization or pro-free market reforms in government policy, can enhance worker productivity.

Data Analysis and Estimation Methodology

Data Analysis

- Secondary data, including those from the World Bank WDI, UNCTAD, and UN Comtrade, can be used at aggregate levels for sections A (Post-pandemic Dynamics of Global Supply Chain) and B (Impact of New Dynamics of GSC on Productivity).
- Firm-level case data should be collected and analyzed for section C, Case Study for Firm-level Productivity Implications (1 case per country).

Estimation Methodology

The case study should follow the methodology outlined in the section on Framework to Analyze the New Dynamics of GSCs and Its Impacts on Productivity. In general, there are two levels of estimation for the case study. The steps for estimation are as follows.

- Identify a set of multiple performance indicators at the national level, as suggested.
- Use World Bank open data to create a series of performance-over-time charts at the national level to serve as a baseline for the case company's productivity analysis.
- Identify multiple performance indicators at the firm level, as suggested.
- Identify supply chain strategies using the supply chain system structures and highlight qualitative differences between the traditional and post-pandemic approaches.

- Collect firm-level data to draw a set of performance over time charts for the case company.
- Compare the firm-level performance with the baseline national-level performance.
- Compare firm-level performance across three stages: traditional approach (pre-pandemic), transitional approach (during pandemic), and transformational approach (post-pandemic).
- The case study can apply the proposed supply chain system structure framework to address the dynamic developments (qualitatively) across these three different stages.

Guidelines for Country Papers

Supply Chains Introduction

- GSC diversification and relocation strategies
- Overview of government approaches in each country
- Overview of new GSC dynamics on aggregate and firm-level productivity

Impact of GSCs

Sectoral coverage: Analysis of the impact of new GSC trends on aggregate productivity and economic development. The analysis should follow the framework in section B, Impact of New Dynamics of GSC on Productivity.

Case Study Analysis

- Case coverage in each country (1 minimum)
- Company introduction, GSC plans
- Potential Impacts (analysis following a framework sketched in section C, Case Study for Firm-level Productivity Implications.)

Conclusion

Recommendations

BANGLADESH

Introduction

A supply chain is a network of facilities and distribution options that procure materials, transform them into intermediate and finished products, and distribute the finished products to customers.

GSC Diversification and Relocation Strategies

Global supply chain diversification and relocation strategies are critical considerations for businesses seeking to optimize operations, manage risks, and respond to various economic, geopolitical, and environmental challenges. These strategies involve distributing and, if necessary, shifting elements of the supply chain to minimize vulnerabilities and improve overall efficiency. Key concepts and strategies related to global supply chain diversification and relocation include the following:

Supplier Diversification: Collaborating with multiple suppliers for critical components or raw materials reduces dependency on a single source, helping to mitigate risks of disruptions due to natural disasters, political instability, or supply chain disruptions.

Geographic Diversification: Sourcing components or products from different countries can reduce the risk of regional or national disruptions, such as trade disputes or local crises.

Nearshoring and Offshoring: Companies may relocate production or sourcing closer to their primary markets (nearshoring) or to more cost-effective locations (offshoring) to diversify their manufacturing or sourcing locations.

Inventory Optimization

Buffer Stock: Maintaining buffer or safety stock at strategic locations in the supply chain can help mitigate delays caused by disruptions.

Just-in-Time (JIT): While JIT practices reduce inventory costs, they can also make a supply chain vulnerable to disruptions. Some companies may opt to keep a backup inventory available as a precaution.

Transportation and Logistics Diversification

Multiple Transportation Modes: Relying on multiple transportation modes, such as air, sea, rail, and truck, can provide flexibility and reduce supply chain risk.

Alternative Transportation Routes: Identifying and using alternative shipping routes or corridors can help avoid bottlenecks caused by disruptions.

Supplier Relationship Management

Supplier Auditing and Assessment: Regularly assess and audit suppliers to ensure they meet quality, ethical, and reliability standards. This helps in selecting dependable partners.

Collaboration: Build strong relationships with key suppliers to improve communication and responsiveness during times of crisis.

Resilience Planning

Risk Assessment: Identify potential risks and vulnerabilities in your supply chain and develop contingency plans to address them.

Business Continuity Planning: Develop strategies and plans to ensure business continuity in the face of disruptions. This might involve dual sourcing, redundant facilities, or alternative suppliers.

Technology and Data Analytics

Supply Chain Visibility: Implement real-time supply chain visibility solutions to monitor and track goods and information.

Data Analytics: Utilize data analytics and Artificial Intelligence (AI) to forecast demand, identify potential disruptions, and make informed decisions.

Regulatory and Compliance Considerations

Trade Agreements and Tariffs: Stay informed about international trade agreements and tariffs, as they can impact the cost and feasibility of global sourcing.

Environmental Regulations: Comply with environmental regulations, which may vary by location and affect the sustainability of the supply chain.

Scalability and Agility

Flexible Supply Chain: Design a supply chain that can adapt to changing market conditions, allowing for scaling up or down as needed.

Scenario Planning: Prepare for various positive and negative scenarios to ensure the supply chain can respond effectively to unexpected events.

Global supply chain diversification and relocation strategies combine sourcing, logistics, risk management, and technology adoption. Companies that invest in these strategies can enhance supply chain resilience, reduce vulnerabilities, and better position themselves to thrive in an increasingly complex and uncertain global business environment.

Supply Chain Approaches in Bangladesh

Bangladesh's supply chain management approach reflects its unique characteristics and challenges. Bangladesh is known for its vibrant textile and garment industry, which is crucial to its economy. Factors, including geographic location, economic structure, and socio-political dynamics, shape the country's supply chain approach. Here is an overview of key supply chain management approaches in Bangladesh.

Textile and Garment Industry Focus: Bangladesh's textile and garment industry dominates the economy, contributing significantly to exports and employment. Many international fashion brands source their products from Bangladeshi manufacturers.

Low-Cost Manufacturing: Bangladesh is renowned for its low-cost manufacturing, which makes it an attractive destination for companies seeking cost-effective production. Lower labor and overhead costs drive this.

Global Supply Chain Integration: The country is a key player in the global supply chain for the textile and apparel industry. It relies heavily on the efficient flow of raw materials, production processes, and finished goods to and from international markets.

Challenges in Infrastructure: Infrastructure challenges, including transportation and logistics, pose hurdles to the smooth operation of supply chains. The country is susceptible to natural disasters, which can disrupt transportation networks and industrial zones.

Labor-Intensive Production: Labor-intensive manufacturing is common in Bangladesh, contributing to low production costs. However, this also means labor strikes and disputes can impact supply chain stability.

Supplier and Manufacturer Networks: Bangladesh's supply chain is characterized by a vast network of suppliers, manufacturers, and subcontractors, which can sometimes lead to challenges related to transparency and accountability.

Trade Agreements and Export Markets: Bangladesh benefits from trade agreements, such as the Generalized System of Preferences, allowing for duty-free or reduced-duty exports to many countries. Access to these markets is critical for supply chain success.

Compliance and Sustainability: The industry has faced scrutiny for worker safety, labor conditions, and environmental sustainability issues. Efforts have been made to improve compliance and sustainability standards in the supply chain.

Government Initiatives: The Bangladeshi government has launched initiatives to improve infrastructure, ease of doing business, and manufacturing capacity to enhance the supply chain's competitiveness.

Technology Integration: Adopting technology, such as Enterprise Resource Planning (ERP) systems and digital platforms for order processing and inventory management, is becoming more common, driving improvements in supply chain efficiency.

Quality Control and Assurance: Quality control is crucial in the garment industry. Many international buyers require stringent quality standards to be met, leading to a focus on quality control and assurance measures in the supply chain.

Resilience and Risk Management: Bangladesh's supply chain is increasingly focused on building resilience and managing risks related to political stability, labor issues, and natural disasters.

In summary, Bangladesh's supply chain approach is shaped by its specialization in the textile and garment industry, cost competitiveness, and growing emphasis on compliance, sustainability, and technology adoption. The industry is working to overcome infrastructure challenges and improve its global standing in supply chain management while addressing social and environmental concerns.

New GSC Dynamics and Their Impact on Aggregate and Firm-Level Productivity

The dynamics of GSC can significantly influence both aggregate and firm-level productivity. Technological advancements, geopolitical developments, and shifts in global trade patterns shape these shifts. Here is an overview of how these dynamics impact productivity at both levels.

Aggregate Productivity

Positive Impact

Economies of Scale: An efficient GSC can lead to economies of scale, allowing for the production of more goods at a lower average cost. This can drive overall economic growth and increase aggregate productivity.

Access to Specialization: GSCs enable countries and regions to focus on their comparative advantages. Specialization can result in higher productivity as resources are allocated to areas where they are most productive.

Innovation and Technology Transfer: GSCs facilitate the transfer of technology and best practices across borders, leading to improved productivity as firms adopt innovative processes and technologies.

Negative Impact

Supply Chain Disruptions: Disruptions, such as natural disasters, trade disputes, and pandemics, can hinder the GSC, leading to production delays and reduced aggregate productivity.

Dependency Risks: Heavy reliance on specific regions or suppliers can lead to dependency risks. A key supplier or region's challenges can negatively impact the overall economy.

Firm-Level Productivity

Positive Impact

Access to Global Markets: Firms that are part of the GSC can access larger and more diverse markets, increasing sales and revenue and boosting firm-level productivity.

Cost Efficiency: Efficient supply chains can lower production costs, enhance competitiveness, and improve profit margins, contributing to higher firm-level productivity.

Innovation and Knowledge Transfer: Firms involved in GSCs often benefit from knowledge transfer, technology sharing, and innovation spillovers, leading to increased productivity.

Negative Impact

Supply Chain Risks: Firms face risks associated with supply chain disruptions, including delays in receiving essential inputs or finished goods, which can lead to lower productivity.

Compliance and Regulatory Challenges: Complying with different regulatory frameworks and standards across multiple countries can be challenging for firms, potentially reducing productivity due to administrative burdens.

Quality Control Issues: Managing quality control across different locations and suppliers can be complex and impact firm-level productivity if not managed effectively.

Vulnerability to External Shocks: Firms relying heavily on GSCs can be vulnerable to external shocks, such as trade disputes or geopolitical conflicts, which may disrupt their operations and productivity.

Adaptation and Resilience

Firms and economies that are adaptable and resilient to evolving GSC dynamics are better equipped to mitigate negative impacts and capitalize on positive opportunities. This includes diversifying suppliers, investing in technology, and implementing contingency plans.

GSC dynamics have a complex and multifaceted impact on aggregate and firm-level productivity. While GSCs offer opportunities for efficiency, growth, and innovation, they also introduce new risks and challenges. Proactive management and adaptation strategies are essential to ensure productivity gains and economic resilience.

Impact of GSC in Bangladesh

Sectoral Coverage

The COVID-19 pandemic has emerged as a significant global trade challenge, impacting nations worldwide, including Bangladesh. While necessary for public health, nationwide lockdown measures have had multifaceted repercussions on various sectors, disrupting supply chains and creating market anomalies. This disruption is particularly evident in the agricultural sector, where protective measures have hindered access to essential resources, affecting the supply chain for rice and pulses and increasing prices.

Interestingly, amidst the overall price surge, the cost of milk decreased significantly, with a 40% drop compared to January 2020 prices (Roy, 2020). Similarly, vegetables are being sold at 25–50% of their production costs. However, the poultry industry has suffered significant losses, with approximately 50% of eggs and 70% of broilers remaining unsold (FAO, 2020). Additionally, export bans on products such as crab, shrimp, and fish contributed to the decline in their prices.

The service sector also underwent a paradigm change, with a substantial shift towards online or IT-based service delivery across various domains, including education, healthcare, finance, and consultancy. The pharmaceutical industry faced challenges due to increased demand for specific products, leading to supply chain disruptions.

Small and Medium Enterprises (SMEs) were adversely affected, with 28% reporting a revenue drop of at least 50% (Light Castle Partners, 2020). The Ready-Made Garments (RMG) sector, a key component of Bangladesh's economy, was also hit hard due to the cancellation of orders totaling 900 million garments, amounting to USD2.9 billion (Bhattacharjee, 2020). This cancellation, attributed to a reduction in demand from European and the US markets, has led to garment factories shutting down, resulting in nearly USD6 billion in losses and significant job cuts.

Furthermore, the pandemic has influenced consumer behavior, reducing demand for luxury products, smartphones, and electronic goods. The study, incorporating both primary and secondary data, aims to comprehensively analyze the impact of COVID-19 on the supply chain of selected industries in Bangladesh. This analysis provides valuable insights into the sector-wise challenges and circumstances arising from the ongoing global health crisis.

Impact of New GSC Trends on Aggregate Productivity and Economic Development

Bangladesh's economic landscape is characterized by a developing market economy, where decisions regarding investment, production, and distribution guide economic policies. These are primarily influenced by price indicators determined by the interplay of supply and demand forces.

As a strong proponent of the free market, Bangladesh has emerged as a significant trading partner, exerting economic influence within the South Asian region.

Against this backdrop, the COVID-19 pandemic has placed Bangladesh in a precarious position, threatening its ability to sustain the economic growth achieved over the past decade, particularly during the 2020–21 financial year and beyond. The core strength of a market-based economy lies in its responsiveness to demand, making it particularly susceptible to disruptions caused by unforeseen events such as the global health crisis.

The impact of COVID-19 on Bangladesh's industries is nuanced, varying in both type and size, depending on the nature of the products and sectors involved. The economic repercussions of the pandemic can be summarized through a detailed examination of its multifaceted implications across different industries.

Impact on the Agriculture Sector

Bangladesh is an agricultural nation that heavily relies on the revenue generated from its agricultural sector, which plays a pivotal role in the national economy. This sector has significantly contributed to the economy, with approximately 87% of the rural population deriving income from agricultural activities. However, numerous plagues and epidemics have afflicted humanity throughout the past century, with COVID-19 being one of the most pervasive diseases.

The agricultural sector in Bangladesh includes key products such as rice, jute, fish, and shrimp. The effects of the pandemic on these products are notable.

Access Constraint: The national lockdown strategy imposed preventive measures restricting access to agricultural products, inputs, markets, labor, and extension and advisory services. These constraints have disrupted the sector's operations.

Impact on Food Demand: COVID-19 impacted food demand in various ways. Reduced income and heightened uncertainty often lead to decreased spending, altering food preferences and affecting sales, while productivity remains relatively unchanged.

Changes in Consumption Patterns: During the lockdown, small food market customers modify their food preferences and consumption habits. Given the link between food demand and income, the decline in earnings, particularly among the impoverished, significantly affected consumption patterns.

Trade and Production Disruptions: Policy measures, such as stringent controls on cargo vessels to prevent the spread of COVID-19, impacted agricultural production and trade. Restrictions on the movement of goods, including food and feed imports, could severely disrupt trade and food production if shipments are halted across the country.

Procurement and Food Waste: The closure of transportation routes, the imposition of restrictions and segregation measures, staffing shortages, and fluctuations in commodity prices contribute to disruptions in the procurement process that lead to higher food waste rates. These disruptions can also result in a breakdown of the supply chain.

Given the diverse sub-sectors within agriculture, each with unique challenges, the following sections provide further insights into these specific areas.

Cereals, Pulses, Vegetables, and Fruits

The impact extends to both the manufacturing and consumer sectors, affecting delivery processes to retailers and farmers and the transportation of products to retailers. In March 2020, only 15% of trucks were in operation, with 40% of truck drivers abstaining from work (FAO, 2020). Farmers reported challenges related to transportation and irrigation, resulting in a diesel shortage.

To counter these issues, the private sector actively addressed specific challenges within the supply chains. Supermarkets like Shwapno and Meena Bazaar took proactive measures by directly transporting agricultural goods to farmers. Meanwhile, retailers capitalized on significant opportunities within the e-commerce market, responding to the closure by expanding food delivery services, particularly from rural areas to Dhaka.

The disruption in the sales process has significantly affected prices, as outlined.

Cereals: Before the lockdown, prices increased sharply due to heightened consumer demand. However, post-lockdown, the price surge was less pronounced than in the pre-lockdown period, except for a substantial increase in the cost of onions. Notably, the price of rice decreased during this period.

Vegetables: The pricing of vegetables is predominantly influenced by the time taken for product delivery, which is crucial for maintaining freshness. During the lockdown, there were significant fluctuations in vegetable prices. Farmers encountered challenges as they sold vegetables at 25–50% of their production costs due to minimal demand and transportation issues (FAO, 2020). The cultivation season for upcoming crops experienced disruptions in the supply of labor, seeds, and fertilizers. Notably, exports of mangoes, citrus fruits, and vegetables to Europe and America were affected by reduced demand during this period.

Poultry Sector: The poultry industry faced an unequal impact amid the crisis, primarily attributed to a prevalent misconception that the COVID-19 virus can be transmitted through poultry products. Approximately 50% of eggs and 70% of broilers remained unsold at farms (FAO, 2020).

Crab Industry: The crab cultivation and trading community in Bangladesh's coastal regions faced imminent collapse with the permanent suspension of exports due to the COVID-19 outbreak. The downturn in this sector predates the epidemic's impact on Bangladesh, originating from China, the primary market for crab, which imposed an import ban on 25 January 2020. China constituted approximately 85% of the total exports. Due to payment delays, losses in this sector amounted to BDT4 billion (USD46.90 million) (Roy, 2020).

Fish and Shrimp Industry: The global coronavirus pandemic significantly impacted Bangladeshi shrimp traders, leading to the cancellation of orders amounting to BDT600 crore. This setback is particularly challenging as it coincides with the local market's shrimp-buying season. According to industry insiders, the traders received only 50,000 tons of global production in 2019, compared to their annual capacity of four lakh tons. Although Bangladesh produced 1.6 lakh tons of shrimp that year, most were consumed domestically (Ahmed, 2020).

With the onset of COVID-19, both internal and external supply chains were disrupted, impacting the price. However, the movement of fishery products for domestic markets continued, thanks to private sector retailers like Shwapno, which have organized vehicles and refrigerated vans for

transporting fish and other agricultural commodities. While exporting fish and fishery products was still permissible, it happened on a limited scale. Fish, spawn, fingerling, shrimp, and post-larvae either remained unsold or were sold at significantly reduced prices due to the lockdown.

Dairy Firms: As per the Bangladesh Dairy Farmers Association, approximately 90% of the milk supply was not being sold due to low demand from dairy farmers, butchers, dairy processors, and others, likely influenced by transportation challenges and economic closures. Consequently, the price of milk went down by 17%, while consumer demand decreased by 21%. The Integrated Dairy Research Network estimates that by the end of March 2020, dairy farmers were incurring daily losses of BDT37 crore. Notably, most dairy farms in Bangladesh are small-scale producers, with 76% having five cows or fewer. Besides, the demand for processed meat declined by more than 50% (FAO, 2020).

Impact on the Service Industry Supply Chain

Service providers play a significant role in Bangladesh's GDP, contributing directly to various sectors. Services account for 10–20% of the production costs in both manufacturing and agriculture and are sometimes directly provided to consumers. The “time to provide and receive service” is critical in determining market demand and supply within the service sector (Tabassum, 2020).

The epidemic has substantially changed service conditions, particularly in the supply chain. Community-based recruitment and social distancing measures have resulted in the closure of face-to-face service delivery, affecting sectors like beauty parlors and healthcare services. Transportation now operates under strict rules and regulations, leading to a 60% cost increase. This rise has impacted both the supply and demand for services. Sectors such as news, print media, and banking are now governed by new operational conditions, prompting changes in behavior for both service providers and customers.

The effects of these disruptions vary depending on the type of service offered, as detailed in the subsequent section.

Healthcare Sector: Given overcrowding, limited healthcare capacity, resource constraints, and prevalent poverty, the rapid spread of COVID-19 in public transport became a complex issue. Over three lakh people got infected, causing heightened concern within the community. While the healthcare sector faced significant hurdles, notable changes in its service delivery model were made to address the challenge.

The pandemic accelerated the adoption of online healthcare services for various medical conditions, both urgent and non-urgent. Online psychiatric services for children have long been established in Bangladesh. For instance, the External Patient Department at Bangabandhu Sheikh Mujib Medical University allows individuals to consult a doctor via computer and receive free care. The National Institute of Mental Health provides both online and offline services.

Telemedicine became an essential tool, enabling experts to provide explanations, reassurance, and counseling for parents and children during the pandemic and offering comprehensive guidelines to help families navigate the challenges of the epidemic.

Many healthcare professionals contributed individually, publishing online articles, hosting live webinars, and sharing information on social media to address epidemic-related concerns. Platforms like Hello Doctor, MonerDaktar, Athena, Pulse Healthcare, and Olwel launched online video consulting

services with specialist doctors. Additionally, the government ensured that private hospitals provide access to COVID-19 medical care, enhancing the availability of critical health services.

Financial Institutions and Consulting Firms: Even before the onset of COVID-19, Dhaka's banking system was grappling with mismanagement issues. These challenges have been further intensified by the central bank's recent decision to raise interest rates by 9%. The primary impacts of these developments include an increased emphasis on providing online services within the consultancy and banking sectors.

A notable example of innovation in this area is the introduction of bKash loans, led by City Bank, offering opportunities to customers seeking financial flexibility.

Educational Institutions: The lockdown due to the pandemic forced educational institutions to adopt various online platforms, such as Zoom, to continue operations. With face-to-face service provision coming to a halt, the government reconsidered Bangladesh's educational plan.

Telecommunication and Transportation: The COVID-19 crisis induced widespread anxiety and economic challenges for consumers, businesses, and communities across the globe. In Bangladesh, the communications sector has been significantly affected by the pandemic. According to registration data released by the Bangladesh Telecommunication Regulatory Commission, mobile phone subscribers gradually declined from March to May 2020. However, the number of online subscribers remained stable, showing no significant fluctuations (Chakraborti, 2020).

During the same period, broadband connectivity witnessed a notable increase of 41%. The telecommunications sector, known for its high competitiveness, comprises skilled personnel within office groups, customer service stations, and retail outlets. The shift to remote or home-based work for such employees greatly affected their productivity and service quality (Chakraborti, 2020).

In the transportation sector, services are now offered with a focus on maintaining public distance, leading to increased costs and separate regulations for transporting goods and accommodating travelers. The transport sector faces a critical situation, with at least 40 lakh employees and 10 lakh participants in dire conditions. According to the General Secretary of the Bangladesh Road Transport Owners' Association, the transport sector incurs losses of at least BDT500 crore per day. This data highlights a sharp decline in demand, leaving suppliers in a precarious situation.

Online Transportation: Ride-sharing applications like Uber rapidly gained popularity in Dhaka, a city notorious for its heavy traffic and congestion. Other active ride-sharing firms in Bangladesh include Pathao, OBHAI, Pickme, Shohoz, and others. However, restrictions on non-essential outings made it challenging for people to visit markets for their daily necessities. Consequently, user demand decreased, leading to significant time loss for online transportation services and financial losses for the companies.

Operators, drivers, and users of ride-sharing services have accepted the ban as necessary to combat the spread of Coronavirus.

Impact on the Pharmaceutical Supply Chain

The pharmaceutical industry in Bangladesh is heavily influenced by China's global reach, which produces 40% of the Active Pharmaceutical Ingredients (APIs) required for drug

production worldwide. In Bangladesh, 95% of APIs are imported, primarily from China. While 98% of pharmaceutical demand in Bangladesh is met locally, only 2% is imported (Light Castle Partners, 2020).

Following the confirmation of the first COVID-19 cases in Bangladesh and the World Health Organization's declaration of health and safety concerns, there was an increase in demand for certain synthetic pharmaceutical products. However, the supply struggled to meet this demand. Items such as hand sanitizers and anti-infection soaps became scarce, and face masks and common medicines like Paracetamol, Vitamin C, and Zinc Tablets saw both shortages and price hikes (Paul, 2020).

On 13 June 2020, the health department issued guidelines for using Remdesivir, allowing its use for middle-aged COVID-19 patients. Remdesivir was registered in Bangladesh in May, and local companies began manufacturing it following approval. This ensured the timely supply of medicines previously imported from India, helping to prevent black marketing (WHO, 2020).

While pharmaceutical companies worked diligently to meet the demand for life-saving products, some sectors experienced severe disruptions due to the lockdown and the spread of COVID-19. Despite the high demand, the pharmaceutical industry faced challenges in growth due to a drop in the cost of surgeries in many areas. The inefficiency of distribution channels contributed to relatively low remuneration for pharmaceutical companies compared to other sectors.

Some companies, like Beximco Pharma, successfully navigated disruptions in distribution and marketing, preventing severe shortages. The lockdown reshaped both the demand and supply sides, altering the dynamics of the pharmaceutical industry. The country's top ten companies, including Square, Incepta, Beximco, Acme, Reneta, Healthcare, Opsonin, ACI, Exkayef, and Aristopharma, are increasingly embracing modern technology to maintain excellence in production and marketing, addressing disruptions caused by the pandemic.

In addition to serving the local market, the pharmaceutical sector is a key export sector for Bangladesh. However, the epidemic disrupted the procurement of goods and the import-export processes. Risks associated with imports, particularly those heavily reliant on China, South Korea, and India, have increased as these suppliers may only sometimes meet the required standards.

The government also banned the export of various pharmaceutical products amid the rising COVID-19 cases. These included medicines like Paracetamol and vitamins B1, B6, and B12, Tinidazole, Metronidazole, Acyclovir, Progesterone, Chloramphenicol, Erythromycin salt, Neomycin, Clindamycin salt, and Ornidazole. The ban contributed to a substantial price increase for APIs used in antibiotics and anti-inflammatory drugs.

The pharmaceutical industry has undergone a significant transformation due to the impacts of COVID-19. Whether the virus presents an opportunity or a curse for the pharmaceutical sector remains to be seen.

Impact on the Garments Industry Supply Chain

The RMG industry, crucial to Bangladesh's economic development, faced significant challenges during the COVID-19 pandemic. As the largest employer in the private sector, engaging approximately four million individuals, the RMG sector plays a vital role in the country's

economic landscape. Notably, two-thirds of this sector's workforce are women, significantly contributing to their empowerment. However, the purchasing dynamics within the clothing industry shifted considerably during the pandemic. The following points underscore the importance of these changes.

First Outcome: Industries operating globally, especially those dependent on Chinese imports for production, faced significant vulnerabilities during the initial disruption caused by COVID-19. This was particularly evident in precision instruments, machinery, automotive equipment, and communications sectors. The initial challenges stemmed from sourcing raw materials following the suspension of economic activities in China during the virus's spread in that region.

The RMG industry heavily relies on China for raw material imports, which also constitutes a substantial portion of Bangladesh's multi-billion dollar imports from China. The fragmentation of commodities and the resumption of economic activity in China have since alleviated concerns in these commodity categories.

Order Cancellation: Order cancellations were driven by diminished demand in the US and European markets, where numerous stores closed during the pandemic. In response, RMG vendors in Bangladesh urged international public support to safeguard the country's key industry and workforce. According to the Bangladesh Garment Manufacturers and Exporters Association (BGMEA), orders for over 900 million pieces of clothing valued at USD2.9 billion were canceled or withheld (Bhattacharjee, 2020).

The Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA) estimated a loss of over USD3 billion, as most orders through July 2020 were canceled or put on hold. BGMEA data indicates that exports from March to May 2020 fell short by USD4.9 billion, with unresolved debts amounting to USD1.96 billion (UNDP, 2020).

Unused Appliances: The government initiated the economic shutdown on 26 March 2020. Although export industries were exempt from closure, BGMEA and BKMEA, prioritizing the health and safety of their employees, advocated for the temporary closure of factories. Factory owners, however, could apply to the federation and related authorities to keep their operations running if they wished to compensate their employees. Some factories remained open, focusing on producing Personal Protective Equipment (PPE) for local hospitals. However, during this period, production disruptions led to purchasing challenges and the wastage of raw materials.

Impact on the SME Sector Supply Chain

SMEs in Bangladesh play a crucial role in the livelihoods of the middle-class population. However, these sectors struggled with market demand and supply challenges during the pandemic due to inadequate procurement management. Key outcomes include the following: 28% of SMEs experienced a revenue decrease of at least 50%, while 52% faced business closures with no revenue, especially during significant events such as Eid. Additionally, two-thirds of SMEs had less than four months of financial reserves, leaving them vulnerable to depletion of all savings during the crisis (Light Castle Partners, 2020).

Impact on Imported Products

During the initial phase of the COVID-19 outbreak in Bangladesh, imported products from China encountered challenges related to both price and quality. Several factors contributed to these

circumstances, including a significant drop in imports and exports through the Chattogram Port in March 2020, which declined by more than 12% and 26%, respectively, due to the widespread impact of the pandemic. Import figures saw a 16% decrease in February 2020 compared to January 2020. By March 2020, the country imported goods worth BDT31,617 crore, reflecting a traditional cost reduction of BDT4,500 crore from the previous month (Chowdhury, 2020).

Furthermore, prices dropped again on 26 March 2020 following the announcement of a nationwide lockdown due to the epidemic. The number of import bills also fell, with a 25% reduction in imports. Overall, 27,554 entry bills were submitted for customs clearance exports in March 2020, indicating a decline of 9,281 requests compared to the previous month. Importers refrained from exporting products as factories were closed amid concerns about the Coronavirus. All these factors, directly influenced by COVID-19, led to a delay in the arrival of imported goods, disrupting smooth transactions and affecting the market. This supply chain disruption misrepresented the consumer market's actual state during that period (Chowdhury, 2020).

Impact on Hardware and Electronics

During the pandemic, numerous factories in China halted production, resulting in the stagnation of products anticipated for export. This was a major concern since nearly 70% of all goods Bangladesh exports are sourced from China. With the suspension of these imports, the risk of substantial losses became a pressing issue. Another factor that exacerbated the situation was the delay in processing the Letters of Credit for consumer goods scheduled to be imported two months before the lockdown announcements. This caused further challenges in introducing existing products to the market.

While some containers of electronic and electrical imports from China did arrive, they were limited and essential goods. The scarcity of available goods led to a price surge. In the Khulna market, the prices for items such as TV and computer parts, remotes, and other electronic products increased by 10–20%. Similarly, prices for various products, such as door keys, locks, and other items, also experienced a notable increase.

Impact on Cosmetics and Beauty Products

The COVID-19 pandemic reshaped the beauty industry's landscape, affecting its financial performance and highlighting how different segments fared. On the demand side, the classification of cosmetic products as luxury items led to a significant drop in demand, influenced by declining incomes and restrictive conditions. Major consumers of these products, such as beauty establishments, experienced a steep decline in demand as services were suspended due to public health concerns. Additionally, with the closure of supermarkets, high-income consumers faced limitations in their shopping habits.

On the supply side, the cosmetics market in Bangladesh relies heavily on imports from China and Korea. Import restrictions caused product shortages, exacerbated by the accumulation of outdated products. While online platforms provided a crucial channel for delivering such products to customers, transportation and delivery challenges worsened during the pandemic. Both sides of the market witnessed significant disruptions, leading to a shift in the market dynamics. The interruption in transactions was a direct consequence of import regulations and shifting customer behavior. These factors collectively contributed to poor sales, representing a unique case in the supply of consumer goods and luxury products in Bangladesh's market economy.

Analysis of National-Level Data

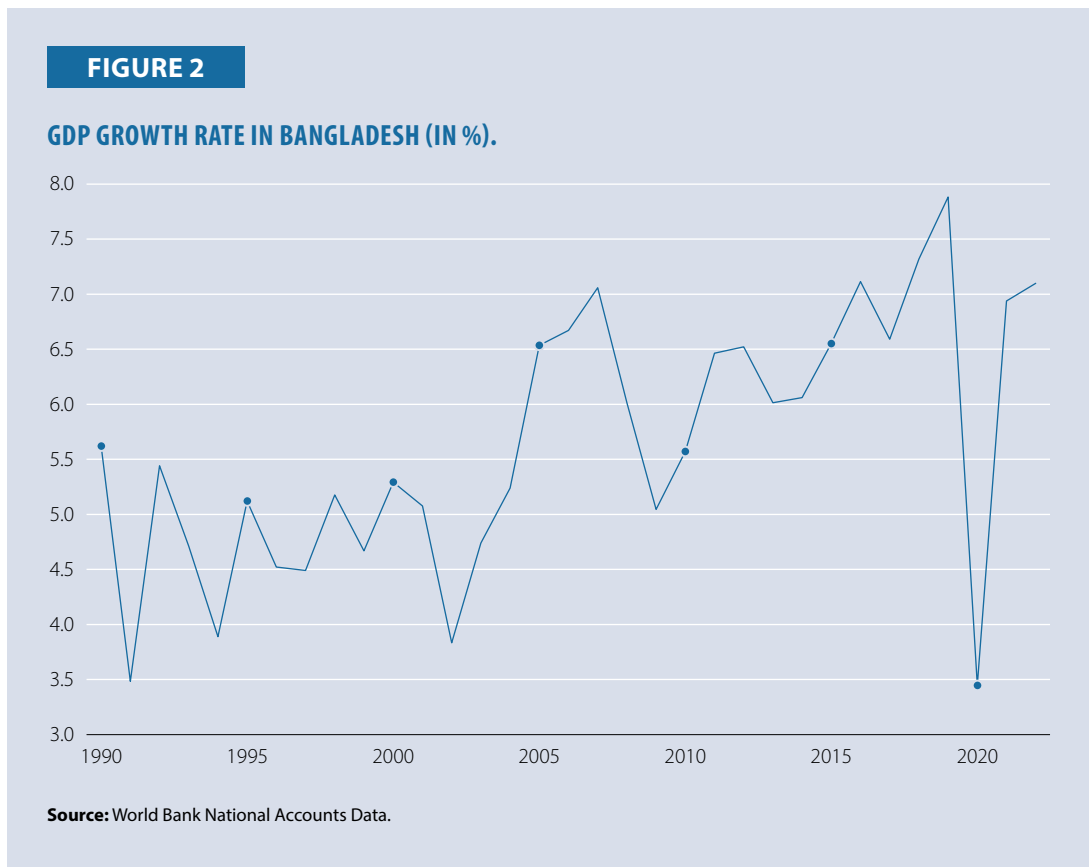
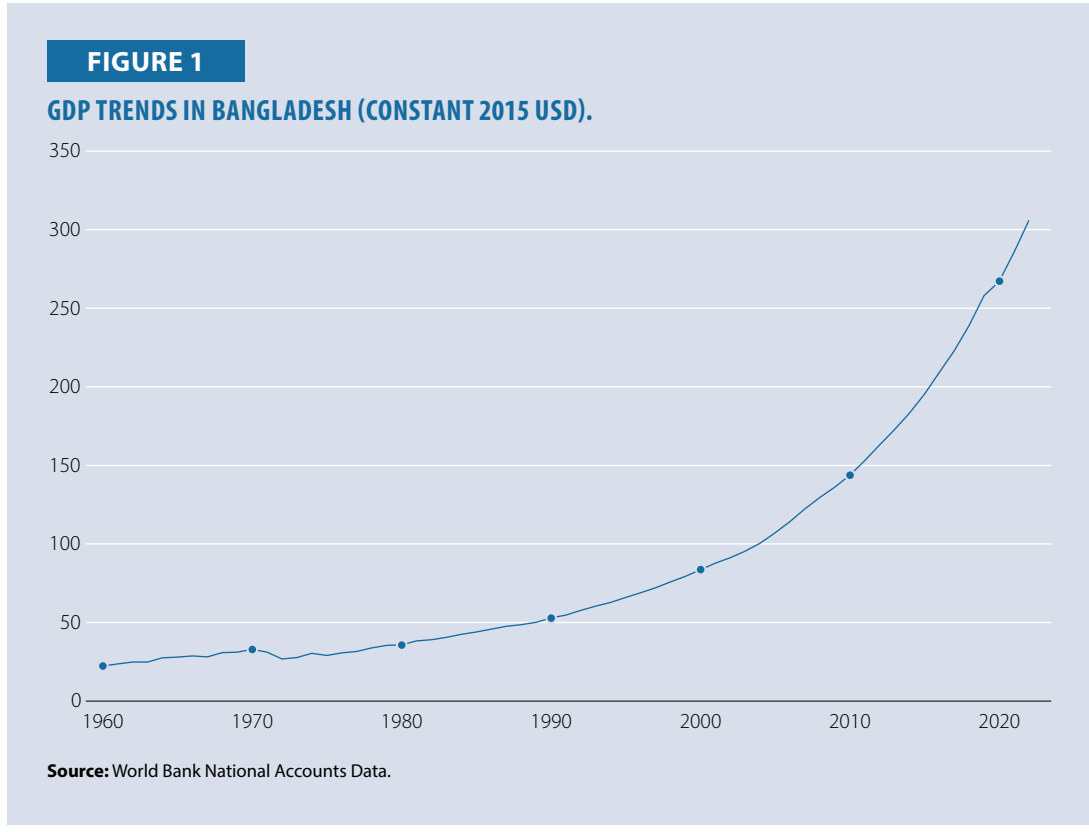


Figure 1 highlights that Bangladesh’s GDP has shown an incremental upward trend over the past few decades, with annual GDP growth following a similar upward trajectory, except in 2020. In 2020, Bangladesh’s GDP growth was 3.45%, which was 4.45% lower than the GDP growth in 2019. This decline was primarily due to the global lockdown and disruptions in the supply chain caused by the COVID-19 pandemic.

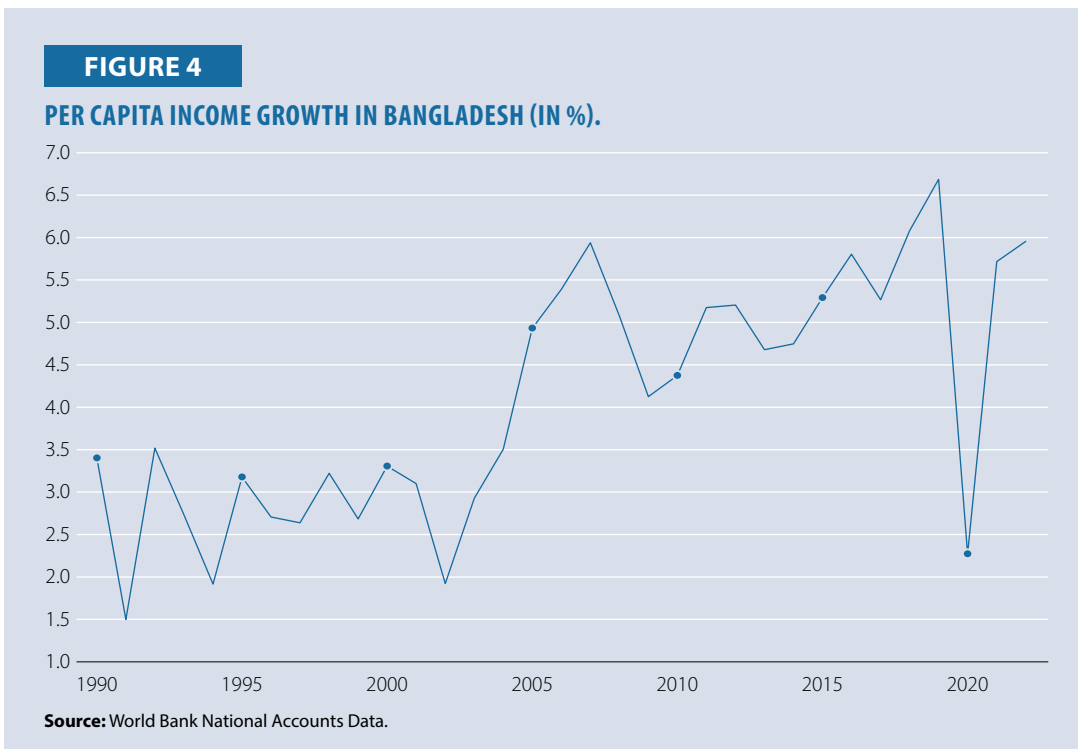
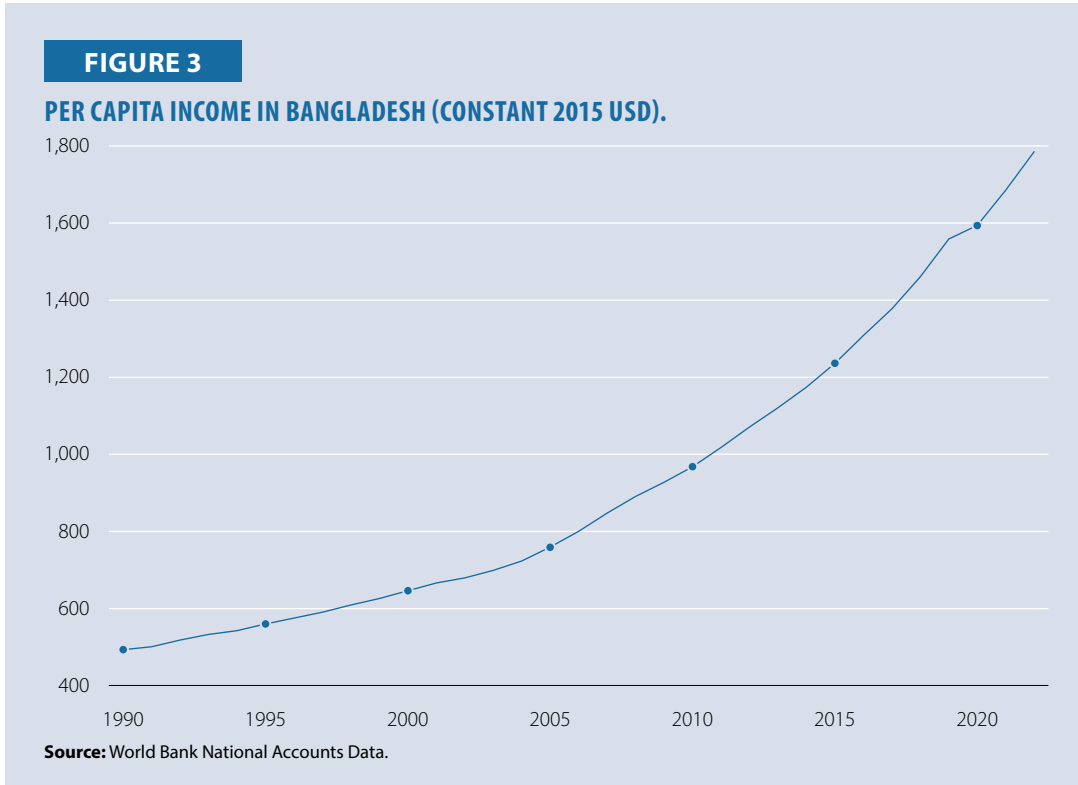


Figure 3 illustrates the upward growth trend of GDP per capita in Bangladesh, while Figure 4 shows the year-to-year changes in per capita growth. According to World Bank data, during the COVID-19 period 2020, Bangladesh’s per capita growth fell to 2.23%, significantly lower than the average of 4.67% from 2000 to 2022. This indicates that people faced difficulties maintaining their living standards during the pandemic, with lower-middle-income and lower-income populations being the most vulnerable.

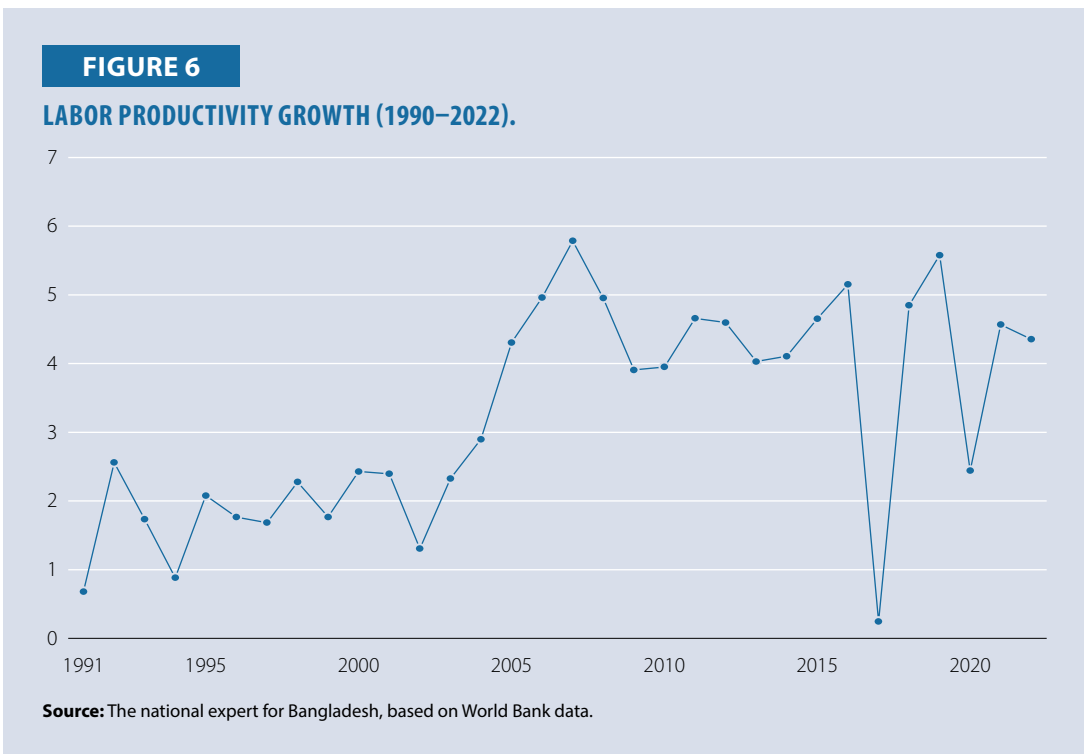
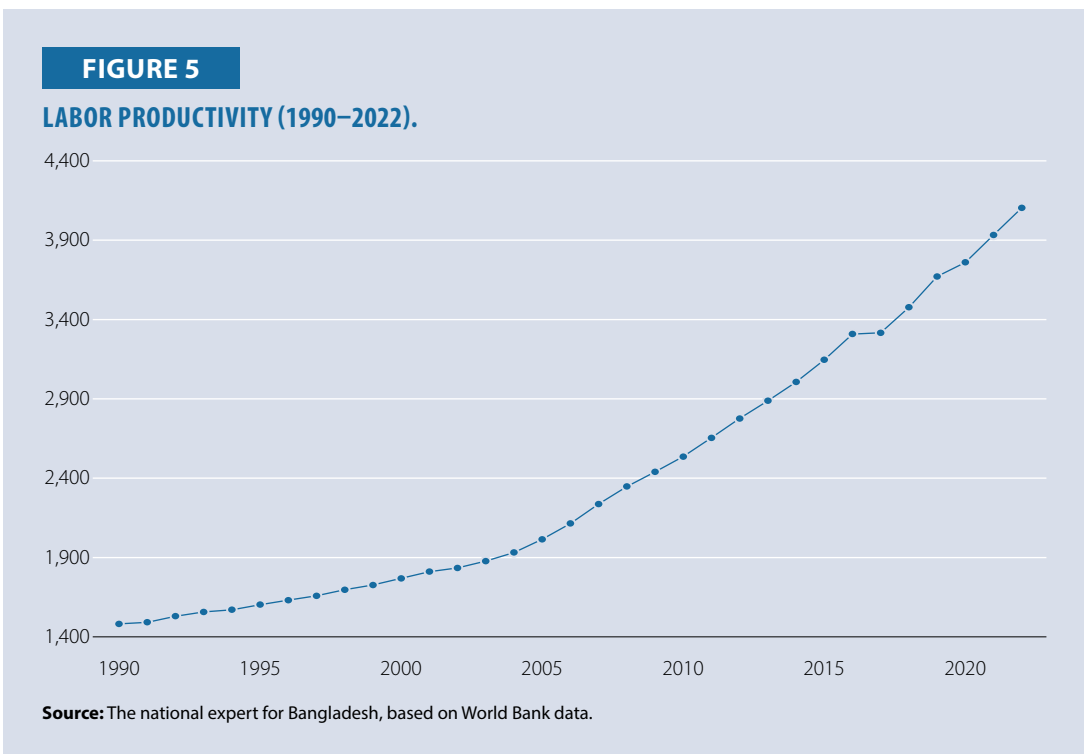


Figure 5 and Figure 6 represent the trends in Bangladesh’s labor productivity and labor productivity growth from 1990 to 2022. Labor productivity increased incrementally during this period, though growth was occasionally interrupted. During the COVID-19 pandemic, labor productivity growth experienced a downturn because most SMEs were shut down. Since the contribution of SMEs to GDP is significant in Bangladesh, their shutdown led to a decrease in labor productivity growth during the pandemic.

Government Initiatives to Promote Productivity and Supply Chain

The Government of Bangladesh has launched several initiatives to promote productivity, quality, and efficiency and strengthen the supply chain to achieve its vision of becoming a developed country by 2041. Some of its initiatives are listed:

The Smart Bangladesh Roadmap, designed to implement the Smart Bangladesh Vision 2041, aims to build a better and more modern Bangladesh. This roadmap is built on four pillars: Smart Citizen, Smart Society, Smart Economy, and Smart Governance.

Smart Citizen

- **Goal:** Empowering citizens with a digital-first mindset.
- **Strategies:** Implement campaigns and digital literacy programs to integrate digital practices into daily life.
- **Collaboration:** Foster collaboration between citizens, the government, and industry to co-create services and policy-making.

Smart Government, 2041

- **Goal:** Achieve “invisible governance” through 100% paperless offices and hyper-personalized service platforms.
- **Focus Areas:** Healthcare, education, agriculture, revenue management, and public security.
- **Approach:** Proactive and collaborative policymaking to drive the adoption of frontier technologies.

Smart Society

- **Characteristics:** Inclusive communities with a focus on sustainable living.
- **Values:** Digital tolerance, ethics, and values ingrained among citizens.
- **Inclusivity:** Enabled through interoperable cashless payment systems and easy access to credit.
- **Sustainability:** Smart cities with resilient infrastructure powered by smart grids and integrated technology platforms.

Smart Economy

- **Goal:** Create an innovation-driven economy to position Bangladesh at the forefront of the industrial technology revolution.
- **Priority Segments:** RMG and textiles, light engineering, and agriculture.
- **Initiatives:** Develop a USD50 billion ICT industry and foster a robust startup ecosystem.
- **Outcome:** Position Bangladesh as a technology leader, building on existing industrial strengths.

The forward-looking plan emphasizes the importance of digital literacy, governance transformation, inclusive societies, and an innovation-driven economy. It recognizes the need for collaboration between citizens, government, and industry to drive the country's evolution through frontier technologies. Focusing on key sectors like healthcare, education, and agriculture, the plan takes a targeted approach to addressing challenges and seizing opportunities, aiming to position Bangladesh as a technologically advanced and innovative nation.

Matarbari Deep Sea Port Project

- **Purpose:** The deep-sea port project is designed to facilitate international trade, boost economic activities, and support the region's industrialization.
- **Integrated Development:** The Matarbari area is planned for integrated development, including the construction of the coal-fired Matarbari Ultra Super Critical Thermal Power Project to meet the country's growing energy demands.
- **Strategic Importance:** The deep-sea port is strategically important for Bangladesh, providing access to the Bay of Bengal and international maritime routes. It is expected to play a vital role in the nation's trade and commerce.

Case Study

Kahn Bakelite Products

Company Introduction and GSC Plans

Khan Bakelite Products is a manufacturer of electrical Bakelites. The company, located in the center of Dhaka, is one of the largest electrical industries among approximately 400 electrical goods manufacturers in Bangladesh. The company's proprietor, Khan Ali Ahmed, was born into a noble Muslim family in Bagerhat district Sadar Thana. Although he did not pursue higher education, he nurtured a deep desire to establish himself. In 1991, he began his career at Fashion Electronics as an industrial worker. Within a short period, he became the company's sales manager, and less than a decade later, he became an industrial business owner.

The company was founded in 1999 at 81/1 Juginagor, Wari, Dhaka-1203, with a shop floor area of 1,000 square feet and a workforce of four people. In its first year, the company's sales turnover was BTD1,200,000. Despite the challenges of the start-up phase, the company successfully managed its operations and steadily increased its market share. In 2007, the company expanded its operation by

setting up a new factory near Dhaka in the Pater Bag area, with a workspace of 3,600 square feet and 50 employees. This expansion further increased the company’s market share, reaching five divisions and numerous districts, ultimately becoming a well-known brand in Bangladesh.

As a result of its efforts, the Ministry of Industries awarded the company the National Quality and Productivity Excellence Award for 2013. The company continued its focus on productivity and quality improvement, and in 2017, it was again honored with the National Quality and Productivity Excellence Award. Khan Bakelite Products maintained its growth using semi-auto machinery, continuously striving to improve product quality and create a better working environment.

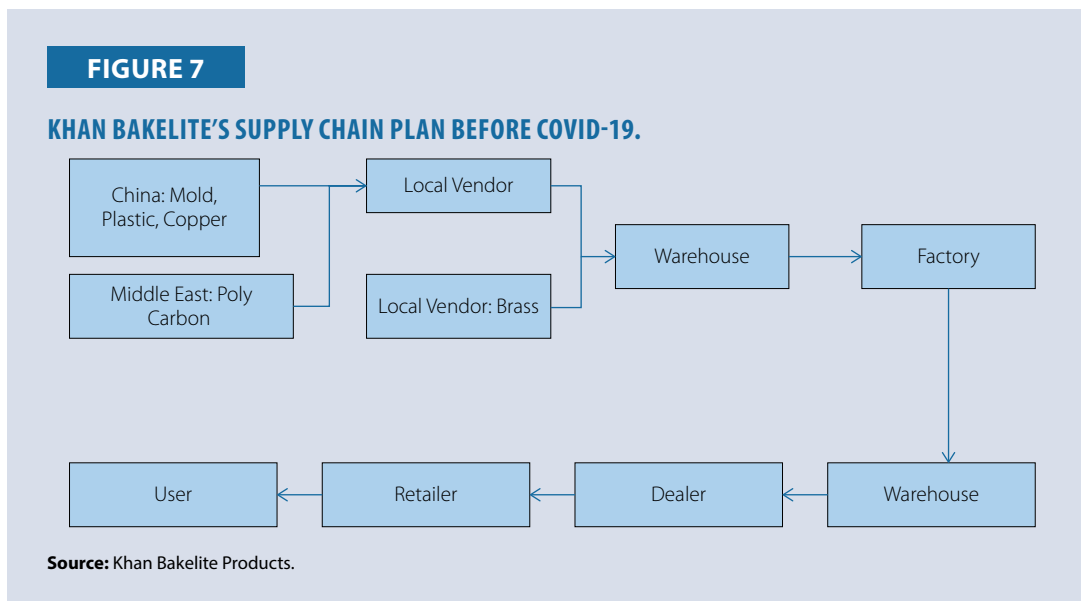
Employee skill development, particularly on the shop floor and in sales, has been a core focus, with the company providing various on-the-job and off-the-job training. This commitment to training and development has helped the company build a strong brand in the local market. In recognition of its efforts to set up industries in the private sector and contributions to employment creation and the country’s economy, the company was conferred the President’s Award for Industrial Development in 2019.

The COVID-19 pandemic brought about drastic changes in the business environment, making it necessary for the company to change its policies and structure of business processes. To modernize its operations, the company established a new factory in southern Bangladesh, near Mongla Sea Port, where it began production in 2022. This strategic move has allowed the company to revise its supply chain system and better position itself for future growth.

Supply Chain Plan of the Company Before COVID-19

The company manufactures electrical Bakelite products and relies on raw materials such as molds, plastic, copper, and polycarbonate, primarily sourced from China and the Middle East. However, the company had to source these from local vendors since it could not import them directly.

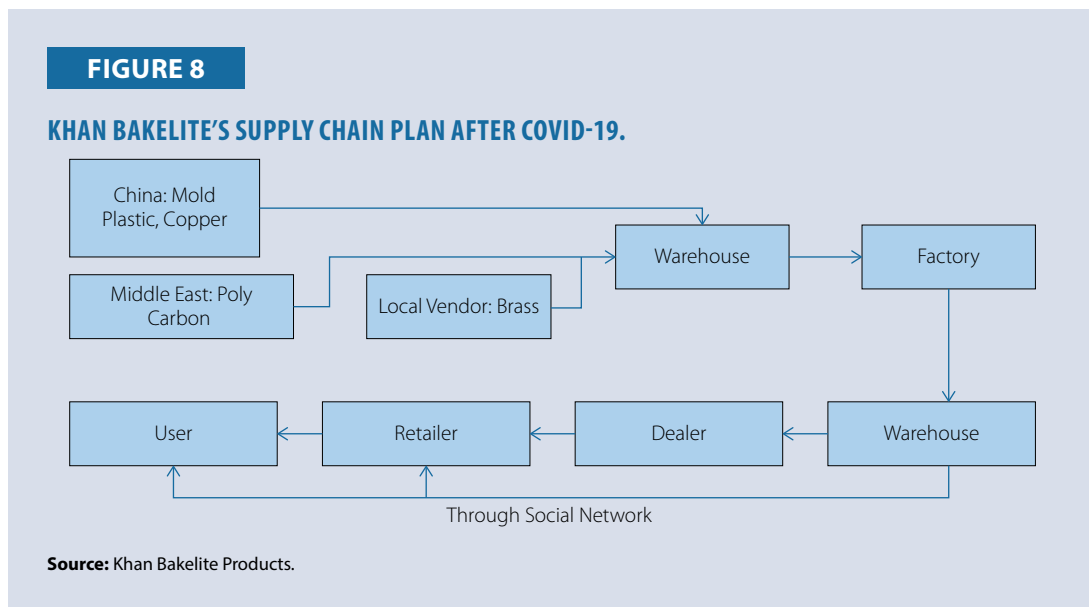
The supply chain process before COVID-19 operated as follows: the raw materials were first sent to the warehouse and then moved to the factory for production. Once the manufacturing process was completed, the final products were stored in the finished products warehouse. From there, the products were distributed through dealers, reaching retailers and end users.



Supply Chain Plan of the Company After COVID-19

During the pandemic, the global supply chain experienced significant disruptions, leading to a shortage of supplies and a hike in prices by local vendors. As a result, the company’s production cost increased, and its profit margin declined. To address this issue, Khan Bakelite Products revised its procurement strategy to reduce production costs.

The company now directly imports raw materials such as molds, plastic, copper, and polycarbonate from China and the Middle East, bypassing local vendors. Once imported, the materials are stored in the warehouse and moved to the factory for production. The final products are later sent to the finished products warehouse. Additionally, the company has modified its distribution channel. Along with the old distribution system, the company now uses social media networks to distribute products to retailers and consumers.



Impact of Global Supply Chain on the Company

During the COVID-19 pandemic, the company was completely shut down from April to July 2020 due to government restrictions. Later, the company resumed its operations partially as it faced a shortage of raw materials and decreased demand. The price hike of raw materials was particularly challenging because the company sourced them from local vendors. Since 90% of the raw materials used in the production process came from China and the Middle East via local vendors, the company faced increased risks and higher costs.

As outlined, the company made several changes to its supply system to address these challenges and remain competitive.

Global Sourcing: Before the pandemic, the company sourced 100% of its raw materials from local suppliers. During the pandemic, price hikes and the availability of raw materials impacted the company’s productivity. As a result, the company changed its procurement policy and now imports raw materials directly from China and Middle Eastern countries.

Multiple Suppliers Strategy: The company has established connections with multiple suppliers, which has proven beneficial for bargaining and ensuring the quality of raw materials.

Nearshoring: The company set up a new factory near the seaport to streamline operations and facilitate easy access to raw materials.

Buffer Stock: The company now maintains a buffer or safety stock to ensure continuous production without interruption.

Social Network: After the pandemic, the company began using social media networks to receive orders and distribute products across Bangladesh alongside the traditional supply system.

Analysis of the Company Data

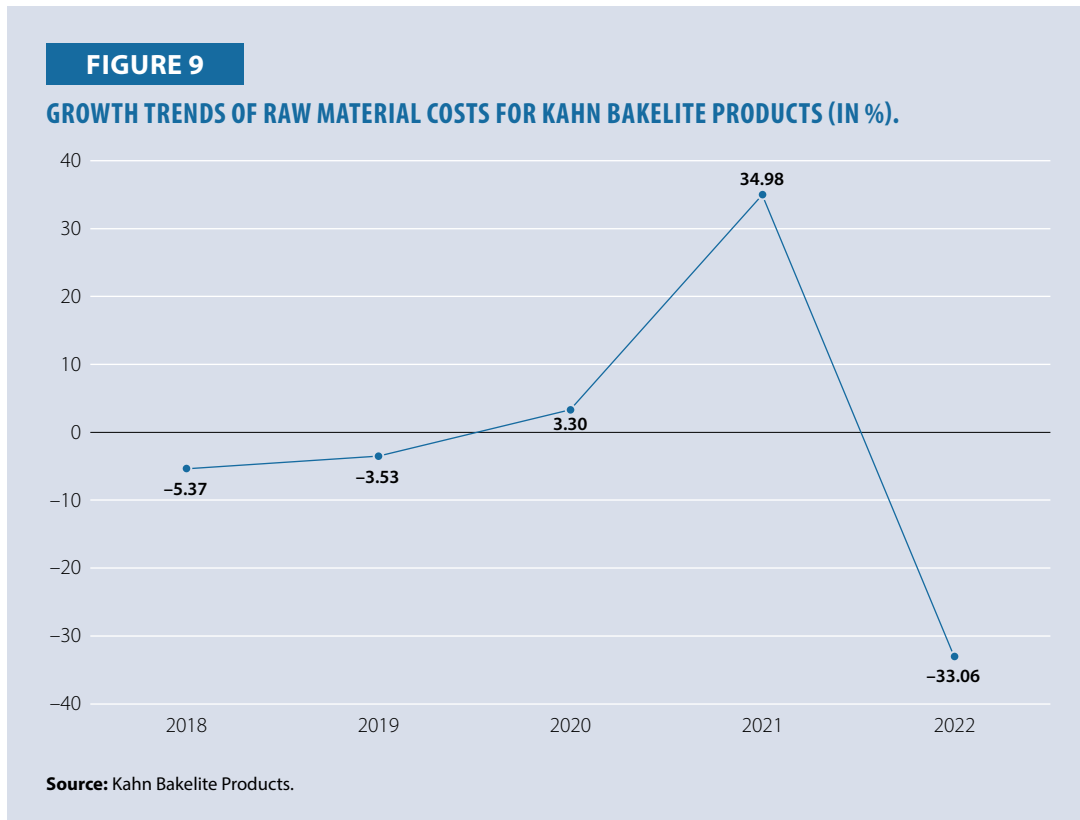


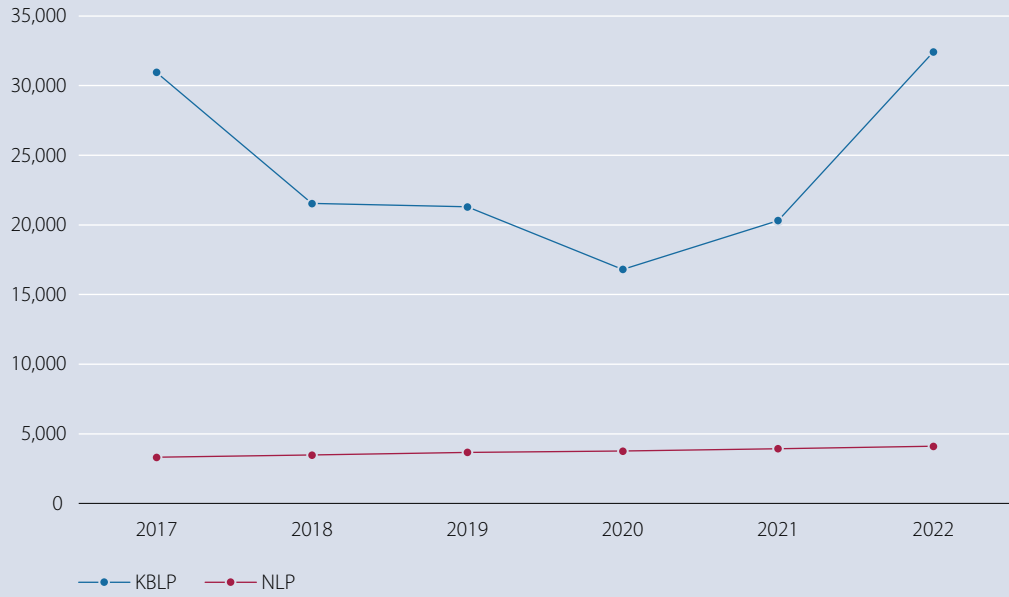
Figure 9 illustrates changes in the company’s raw material costs between 2017 and 2022. During 2018 and 2019, raw material costs were slightly lower, but they began to rise sharply during the pandemic, registering a 34.98% increase in 2021 compared to the previous year. After the company shifted to directly importing raw materials from China and the Middle East, it managed to lower the cost of raw materials compared to the previous year.

Figure 10 shows that labor productivity at Kahn Bakelite Products has consistently been higher than the national labor productivity levels. However, in 2020, the company’s labor productivity declined due to supply chain disruptions and reduced market demand caused by the pandemic. By 2022, the company’s labor productivity increased once again, driven by the company’s investments in technology.

Figure 11 illustrates that the company’s salary per worker is generally higher than the GNI per capita, except for 2020 and 2021. During these years, production and revenue generation declined

FIGURE 10

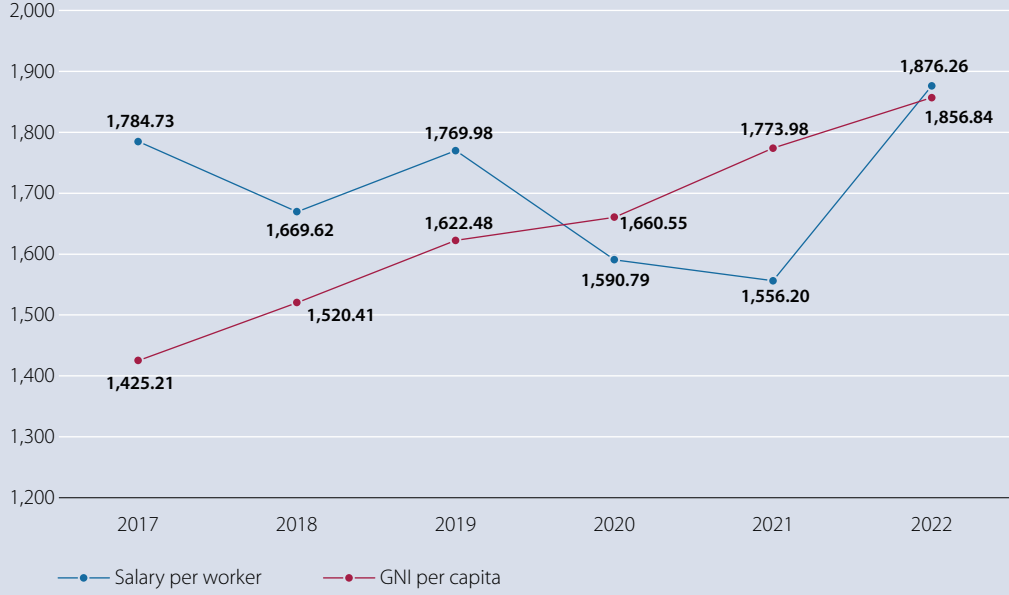
LABOR PRODUCTIVITY: KAHN BAKELITE PRODUCTS VS. NATIONAL LEVEL.



Source: Kahn Bakelite Products and the World Bank data.

FIGURE 11

ANNUAL GNI PER CAPITA VS. SALARY PER WORKER (2017–22).



Source: Kahn Bakelite Products and World Bank data.

due to unfavorable circumstances and a reduction in market share. From Figure 11, it can be concluded that supply chain disruptions negatively impacted the standard of living due to decreased salary and wages.

Conclusion

Like the global economy that grappled with the severe economic downturn known as the 'Great Lockdown' caused by the COVID-19 pandemic, Bangladesh also faced significant impacts from disruptions in the global supply chain. The country found itself in a precarious situation dealing with the economic consequences of the virus, which are reflected in various aspects of its economy, including declining national growth, reduced per capita income, and decreased labor productivity.

To curb the spread of the virus, the Government of Bangladesh implemented measures such as public laws, business closures, transportation restrictions, import limitations, and changes to daily life. These actions significantly influenced supply chain management and the overall market economy. This led to disruptions in prices or inflation, increased emphasis on product quality, heightened risks and retention in production, and evolving B2B and B2C supplier relationships as the market rapidly adapted to changing conditions.

Around 87% of rural Bangladeshis derive their income from agriculture, a sector heavily impacted by COVID-19. Issues like transportation challenges and mismatches in demand and delivery exacerbated the situation. On the other hand, telecommunications companies in Bangladesh thrived, meeting the increased demand for healthcare services through video and audio calls, which became essential during this period.

The pharmaceutical industry in Bangladesh experienced growth despite shortages in imported raw materials. The RMG sector, although severely challenged by factory closures, is trying to adapt. While service delivery management has faced setbacks in terms of losses, layoffs, and disruptions, the sector is making a turnaround by shifting focus to the production of PPE, with government support contributing to its recovery.

This study relies on secondary data, especially in areas where information may be insufficient due to the confidentiality of many organizations and limited data sources. While COVID-19 has been a global catastrophe, its effects have been particularly acute in developing countries like Bangladesh, highlighting their vulnerability to such disruptions.

Recommendations

Conduct Comprehensive Risk Assessments: During the initial lockdown, the Government of Bangladesh had limited insight into the situation, resulting in short-term plans and instructions. In the future, the government should establish a system to conduct thorough risk assessments to identify potential disruptions and their impact on the supply chain. Risks should be categorized based on likelihood and severity, and mitigation efforts should be prioritized accordingly.

Diversify Supply Sources: The COVID-19 pandemic and subsequent Russia-Ukraine war severely disrupted the global supply chain, particularly in the energy sector, as Bangladesh relies on oil from Russia for energy production. To avoid reliance on a single supplier for critical components, materials, and supplies, the government and companies should identify alternative suppliers and establish relationships with them to ensure a diversified and resilient supply chain.

Leverage Advanced Technologies: Companies should introduce advanced technologies such as blockchain, IoT, and AI to enhance supply chain visibility and traceability. Technology can also automate processes, reduce lead time, and improve efficiency.

Maintain Strategic Stockpiles: Companies should maintain strategic stockpiles of essential components to act as a buffer during disruptions. JIT inventory practices should be implemented carefully, taking associated risks into account.

Collaborate with Stakeholders: Collaboration with government agencies, industry associations, and other stakeholders is crucial for sharing information and best practices for managing supply chain disruptions.

Invest in Training and Development: Companies should invest in training and development programs for supply chain professionals to enhance their risk management and crisis response skills.

Develop Alternative Logistics Solutions: Companies should explore and develop alternative transportation routes and logistics solutions to reduce the impact of disruptions on the movement of goods.

Stay Compliant with Regulations: Companies should stay informed about local and international regulations that may impact the supply chain. Proactively addressing compliance issues will help avoid disruptions and ensure smoother operations.

By adopting a holistic and proactive approach that incorporates these strategies, companies in Bangladesh can strengthen their supply chain resilience and navigate disruptions more efficiently. It is important to note that the specific strategy may vary depending on the industry, scale of operations, and the nature of the supply chain.

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CAMBODIA

Introduction

GSC Diversification and Relocation Strategies

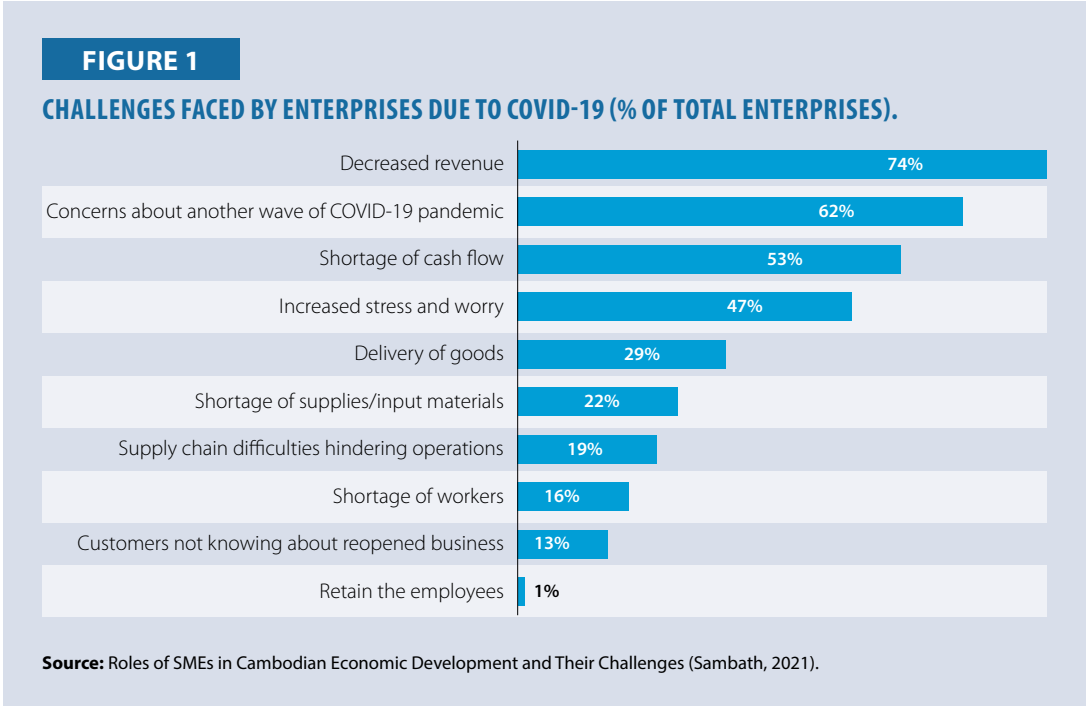
Global supply chains have come under increased scrutiny due to vulnerabilities exposed by recent developments, including supply-chain disruptions driven by the COVID-19 pandemic, geoeconomic and geopolitical tensions between the USA and China, semiconductor shortages, and reliance on critical raw materials needed for the transition to green and digital economies. Initially, companies faced a supply shock, followed by a demand shock due to widespread containment measures. The crisis highlighted the risks inherent in GSCs that relied heavily on lean manufacturing principles and a narrow network of suppliers. These developments have raised concerns about excessive dependence on foreign suppliers, prompting calls for greater national self-sufficiency in essential goods and strategic sectors. Proposed solutions include reshoring production, diversifying supply chains, and implementing relocation strategies.

The pandemic's repercussions were multifaceted. Inefficient logistics led to order backlogs, extended delivery times, and hindered the full resumption of business operations. Transport restrictions and lockdowns disrupted the supply chain, and industrial facilities struggled to procure raw materials and equipment. Labor-intensive sectors, including factories, construction sites, refineries, and ports, faced workforce shortages due to stringent containment protocols, further complicating production capacities.

The pandemic also had a significant financial impact on businesses. New orders declined, and settling invoices became prolonged due to supply chain uncertainties, workflow disruptions, and workforce shortages. This trend marked a reversal from the faster payments observed before the pandemic. Additionally, 29% of SMEs faced difficulties delivering their goods, 22% of them experienced a shortage of input material, and 19% dealt with supply chain issues that affected operations, as illustrated in Figure 1.

The labor market was significantly affected as economic activities stopped, with governments in the ASEAN region imposing lockdowns and restricting movement. Job losses continued to escalate during the pandemic, with vulnerable workers, such as those in informal sectors, self-employed workers, gig workers, migrant workers, and those employed by Micro, Small, and Medium Enterprises (MSMEs), facing a tough labor market and the risk of losing livelihood due to the lockdowns.

Post-COVID-19, the ASEAN region, especially Cambodia, recognizes the need for collective action to build the economy by leveraging technology and digital trade. The pandemic also reshaped the digital landscape in ASEAN and Cambodia's labor market, especially in terms of how work will be conducted in the future (Jingyi et al., 2021). Also, demand for essential products surged while the supply of raw materials dwindled, leading to dual disruptions. Cambodian enterprises faced production challenges, making a recovery model crucial for informed decision-making regarding revised production plans.



In response to such disruptions, the narrative around supply chain diversification evolved, encompassing concepts such as multi-sourcing and multi-shoring. This broader reconfiguration aimed to increase supply chain resilience, agility, and competitiveness.

A key lesson from these challenges was the importance of adopting a diversification and relocation strategy. This approach advocates for geographical diversification and vertical integration to mitigate the potential impact of future disruptions and enhance overall supply chain resilience. The challenge underscored the necessity for businesses to rethink their supply chain models and implement strategies that foster adaptability and robustness in the face of unforeseen challenges.

Structural Change

China has long been the world’s manufacturing hub, benefiting from a large workforce, well-developed infrastructure, and cost advantages. However, in recent years, factors such as rising labor costs, trade tensions—particularly between China and the US—and supply chain disruptions due to events like the COVID-19 pandemic have prompted businesses to reconsider their heavy reliance on China. Rather than relocating entire operations outside China, companies increasingly adopt the ‘China Plus One’ strategy to diversify supply chains and reduce over-dependence by shifting part of their operations to other countries (Yu & Li, 2020). South Korea and its companies began reevaluating supply chain risks and vulnerabilities, with Cambodia’s manufacturing sector playing a crucial role in supporting companies like Hyundai Motor during the crisis. The Cambodia-Korea Free Trade Agreement, signed in January 2022, reflects the strategic collaboration between the two nations.

Geographically, Cambodia, along with Vietnam and Thailand, stands to benefit significantly from the ongoing reconfiguration of GSCs. While China will maintain its status as a global manufacturing hub, there may be a shift in the location of industrial facilities, particularly at the SME level. The China Plus One strategy, where China-based companies establish production hubs in other countries, including Southeast Asia, is gaining attention as a safeguard against potential geopolitical conflicts (Ravindran, 2023).

To encourage companies to adopt the ‘Thailand, Vietnam, or China Plus One’ business approach, the Cambodian government is committed to enhancing administrative procedures to integrate the country seamlessly into regional and global supply chains. These efforts align with government-led initiatives to foster deeper integration into these supply chains, ensuring sustained economic growth and global competitiveness.

Where Should Businesses Relocate?

The growing trend of supply chain diversification has incentivized governments to offer preferential policies to attract businesses as part of their post-COVID-19 recovery plans. For example, Japan, Korea, and the USA provide financial assistance to firms relocating from China. In response, Cambodia has introduced preferential tax policies through the New Investment Law and the Public-Private Partnership Law to attract foreign investors.

Overview of the Government Approach

With the new Royal Government of Cambodia (RGC), the Rectangular Strategy Phase IV has been replaced by the Pentagonal Strategy – Phase I (PS-I), launched by the Prime Minister in August 2023. This strategy is focused on Growth, Employment, Equity, Efficiency, and Sustainability. It aims to protect, preserve, and build on national achievements, promote national prestige, enhance economic growth, and lay the foundation for Cambodia’s ambition to become an upper-middle-income country by 2030 and a high-income nation by 2050.

The Pentagonal Strategy outlines five strategic objectives.

1. **Achieving Crisis-Resilient Economic Growth:** Ensure an average of 7% annual economic growth.
2. **Job Creation:** Create more employment opportunities across sectors.
3. **Poverty Alleviation:** Reduce the poverty rate to below 10% and keep it at a minimum level.
4. **Strengthening Public Institutions:** Enhance governance, capacity, and the quality of public institutions.
5. **Sustainable Socioeconomic Development:** Promote sustainable development while building resilience to climate change.

The five pillars of the Pentagonal Strategy include the following:

PS-1: Human Capital Development

PS-2: Economic Diversification and Competitiveness Enhancement

PS-3: Development of the Private Sector and Employment

PS-4: Resilient, Sustainable, and Inclusive Development

PS-5: Development of a Digital Economy and Society

The Cambodian government’s Industrial Development Policy 2015–25 (IDP 2015–25) outlines the goals of transitioning the industrial sector from labor-intensive to skill-driven operations by 2025. The IDP aims to increase the industrial sector’s share of GDP to 30% and diversify exports of non-textile goods to 15% of all exports by 2025. It also aims to encourage formal registration of 80% of small and 95% of medium enterprises. The government has adopted four key strategies to support these objectives.

1. Attracting Foreign and Domestic Investments
2. Modernizing SMEs
3. Revisiting the Regulatory Environment
4. Coordinating Supportive Policies (such as HRD, infrastructure improvement, and service enhancement)

The IDP also advocates for developing the manufacturing and agro-processing industries, establishing strategic industrial zones, developing economic corridors, and streamlining procedures within Special Economic Zones (SEZs). The IDP’s priorities include fostering innovative and highly competitive new industries, promoting SMEs, diversifying exports, expanding agricultural production, encouraging support industries across various sectors, and nurturing future industries.

The National Strategic Development Plan (NSDP) outlines the Cambodian government’s vision for key policy areas, including economic development, education, health, agriculture, and land planning over five years. The goal is to achieve political and socioeconomic development in Cambodia. The NSDP 2019–23 focuses on overcoming obstacles in productivity and competitiveness, sustaining economic growth, leveraging Cambodia’s strategic location in Southeast Asia, and mitigating risks from regional and global economic uncertainties. One of the key initiatives is the formulation of a Masterplan for Multimodal Transport and Logistics, aimed at accelerating regional integration, boosting the investment budget, and securing financing for the rehabilitation, construction, and development of physical infrastructure—covering roads, expressways, bridges, railways, waterways, and airways.

In line with the NSDP 2019–23, the Ministry of Public Work and Transport (MPWT) has initiated the implementation of the Transport and Logistics Master Plan 2022–30, based on an intermodal transport master plan supported by Chinese development partners. This master plan is currently in progress and is expected to involve a substantial investment of USD50 billion in capital asset formation, covering approximately 330 infrastructure projects. These projects include establishing logistics centers, modernizing high-speed rail, constructing and improving roads, upgrades to the road network, and enhancements to supporting infrastructure at international border checkpoints, among other initiatives.

Major projects mentioned in the Transport and Logistics Master Plan include the following (PwC, 2022):

- Phase I of the new container terminal at the Sihanoukville Port is expected to be completed by 2025.
- Development of the Phnom Penh Logistics Centre.

- Improvements in waterway transport, including a link from the capital to the Kep Coastal Port via the Tonle Bassac River.

Cambodia enacted the Public-Private Partnership Law in 2021 to replace the 2007 Law on Concession. The new Public and Private Partnership Law applies to qualified infrastructure projects across transportation, digital, telecommunications, and energy sectors. It allows the government to support through various means, including subsidized packages to address viability gaps, availability payments, state debt obligations, property contributions, favorable tax arrangements, security rights over properties, and specific government guarantees. Drawing on international best practices, the Law offers flexibility for the private sector to either carry out the work directly or engage third-party contractors. The law is designed to facilitate partnerships between the public and private sectors in developing critical infrastructure projects.

On 15 October 2021, the Government of Cambodia adopted a new Law on Investment, replacing the 1993 Law on Investment of 1993, as revised in 2003. The new law aims to create an open and transparent legal framework for investment, attract and promote quality investments, and support socioeconomic development. It establishes a transparent, predictable, non-discriminatory, competitive investment incentive regime. Incentives are offered across 19 sectors, focusing on high-tech industries involving innovation, and R&D. These incentives include various tax-related basic, additional, and special incentives.

New GSC Dynamics and Their Impact on Aggregate and Firm-Level Productivity

The pandemic prompted a reevaluation of GSCs, leading to a shift in the strategic positioning of emerging economies within the ASEAN region, including Cambodia. Along with Vietnam and Thailand, Cambodia is expected to be a major beneficiary of the ongoing reconfiguration of GSCs. The country strategically positions itself within the evolving economic landscape by making substantial investments in critical infrastructure.

Key infrastructure developments include the Phnom Penh Autonomous Port, Sihanoukville Autonomous Port, Koh Kong Port, and Kompot Seaport, which serve as pivotal gateways for international trade and ensure efficient maritime connectivity (MPWT, n.d.; International Ports in Cambodia, n.d.). In addition, Cambodia is developing four new greenfield airports, including Techo International Airport in Phnom Penh and Siem Reap-Angkor International Airport, at strategic locations near the ports to facilitate seamless air transportation and support the country's growing tourism sector. Other projects, such as Darasakor International Airport in Koh Kong and Koh Rong International Eco-Tourism Airport, underscore Cambodia's commitment to expanding economic activities in key regions while promoting sustainable tourism.

Furthermore, the 190 km-long Phnom Penh-Sihanoukville Expressway is set to provide an efficient link between the capital city, Phnom Penh, and the coastal city of Sihanoukville (Phnom Penh-Sihanoukville Expressway, n.d.). Construction has also begun on the Phnom Penh-Bavet Expressway, which will span 135.10 km and will complement ASEAN Highway No.1, enhancing transportation connectivity within the country and across ASEAN. This will further integrate Cambodia within the Greater Mekong Subregion, strengthening its market potential, competitiveness, and socioeconomic resilience through improved coordination and connectivity (Khmer Times, 2023). Additionally, a feasibility study is underway for the Phnom Penh-Siem Reap Expressway, which is expected to link the capital city to the cultural province of Siem Reap.

These infrastructure initiatives reflect Cambodia's foresight in enhancing its role within the global economic framework and positioning itself as a key player in global supply chain dynamics.

These investments are vital for trade and commerce and contribute to Cambodia's attractiveness as a tourism destination. The expansion of airport facilities, mainly focusing on eco-tourism in locations such as Koh Rong and Siem Reap, aligns with Cambodia's efforts to diversify its economic portfolio. By strengthening its connectivity through inland, air, and sea routes, Cambodia is well-positioned to harness the opportunities presented by the changing dynamics of the global economy. In doing so, Cambodia is enhancing its economic resilience and fostering a conducive environment for international collaboration and investment.

Cambodia's infrastructure developments drive economic growth, trade, and tourism. The development of ports, airports, and expressways in the logistics sector gives the country a strategic advantage, positioning it within the evolving global supply chain network.

The country has also entered into bilateral Free Trade Agreements (FTAs) with China and South Korea and participates in the Regional Comprehensive Economic Partnership (RCEP). As a member of ASEAN, Cambodia has endorsed the ASEAN Framework Agreement on Mutual Recognition Arrangements. Additionally, the USA-Cambodia Trade and Investment Framework Agreement (TIFA), signed in 2006, aims to enhance trade and investment collaboration between the two countries. This agreement serves as a platform for addressing mutual concerns related to trade and investment, with ongoing discussions to advance the TIFA agenda.

Cambodia's proactive approach to reevaluating and enhancing infrastructure and strategic investments in critical sectors positions the country as a major beneficiary of the evolving global supply chain dynamics. The emphasis on expanding and modernizing ports, airports, and expressways reflects Cambodia's commitment to facilitate efficient trade and commerce and boost its attractiveness as a tourism destination. As a result of these initiatives, Cambodia is well-positioned to harness the opportunities arising from the reconfiguration of GSCs.

At the aggregate level, these infrastructure developments contribute to Cambodia's economic resilience and competitiveness within the ASEAN region and the Greater Mekong Subregion. Establishing crucial transportation links, such as the Phnom Penh-Sihanoukville Expressway, enhances connectivity and market potential, strengthening Cambodia's role in the global economic framework. Moreover, the country's participation in regional and bilateral FTAs including RCEP, China, South Korea, and the USA-Cambodia TIFA, underlines its commitment to fostering international collaboration and attracting foreign investment.

At the firm level, the enhanced infrastructure and connectivity offer businesses improved logistical efficiency, reducing costs and increasing productivity. Cambodia's strategic positioning within the global supply chain network creates new opportunities for businesses to expand and diversify their operations, taking advantage of the seamless connectivity to international markets. The evolving economic landscape, combined with Cambodia's focus on sustainable tourism and diversified economic activities, provides a favorable environment for both domestic and foreign enterprises to thrive.

In essence, Cambodia's forward-looking approach to infrastructure development, along with its active participation in regional and global trade agreements, not only positions the country as a

critical player in the changing dynamics of the global supply chain but also fosters an environment conducive to sustained economic growth, increased trade, and enhanced productivity at both the aggregate and firm levels.

Impact of GSC on Cambodia

Sectoral Coverage

Cambodia's supply chain encompasses diverse sectors that contribute to the country's economic growth and development. The garments and textiles sector plays a pivotal role, with numerous factories producing and exporting clothing, footwear, and textiles (Care, 2020; Nith, 2019). Agriculture and agribusiness form another significant sector involving the cultivation, processing, and distribution of rice, rubber, and other agricultural products (US Embassy, n.d.; Suy et al., 2018).

The logistics and transportation sector ensures the seamless flow of goods, connecting suppliers, manufacturers, and retailers across the country (OECD, 2021). The construction and building materials sector supports infrastructure development by sourcing and supplying cement, steel, and bricks. The energy and utilities sector ensures the availability and efficient distribution of electricity, water, and other essential resources. The tourism and hospitality industry relies on a well-established supply chain to procure goods and services. These sectors collectively form the backbone of Cambodia's supply chain, driving economic activity and contributing to the country's overall development (World Bank, 2020).

The COVID-19 pandemic has significantly impacted Cambodia's global supply chain, affecting key sectors that are the engine of the Cambodian economy. For instance, the tourism sector experienced a significant decline, with a 25.1% decrease in tourists compared to 2019. Similarly, sectors such as exports (including clothing, footwear, travel goods, and rice) and the construction sector, which rely on Foreign Direct Investment (FDI) were also severely affected. In particular, approved investment projects in the construction sector decreased significantly (World Bank, 2020; Neak & Sok, 2021).

Before COVID-19, Cambodia achieved lower-middle-income status in 2015 and aimed to attain upper-middle-income status by 2030, driven by garment exports and tourism. Between 1998 and 2019, Cambodia's average annual growth rate was 7.7%, making it one of the world's fastest-growing economies (World Bank, n.d.). However, during the pandemic, lockdown measures (RGC, 2021) and reduced consumer demand led to widespread disruptions in the supply chain, including closures of factories, supply chain breakdowns, and decreased export orders. Over 400 factories in the garments, footwear, and travel goods sectors suspend operations, leaving over 150,000 workers jobless due to COVID-19 (Xinhua, 2020).

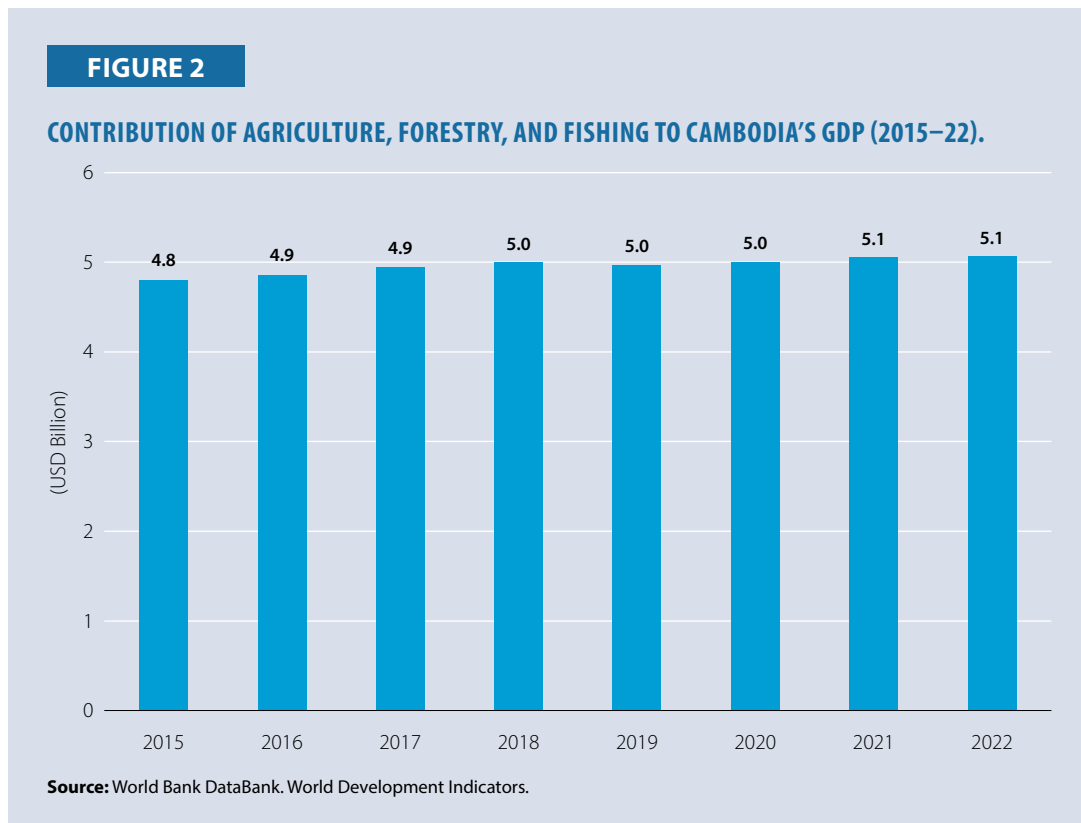
These challenges highlighted the vulnerabilities of Cambodia's overdependence on specific sectors and the need for diversification and resilience. In the postpandemic era, Cambodia has been focusing on rebuilding and recovering its GSCs. Efforts are being made to diversify supply chains, reduce dependence on a single market (Neak & Sok, 2021), and embrace digitalization and technological advancements (World Bank, 2020; UNIDO, 2020). Emphasis is also being placed on sustainable practices and regional economic integration initiatives.

By addressing the challenges and leveraging chances, Cambodia seeks to create a more adaptable and sustainable framework for its GSCs contributing to economic growth and development in the

postpandemic era. The country also aims to enhance efficiency, productivity, and competitiveness in the global supply chain while ensuring long-term viability and resilience.

Agriculture and Agri-Processing

Agriculture is central to Cambodia’s economic landscape, serving as the primary sector for production and employment. From 2015 to 2022, the sector contributed significantly to the country’s GDP, rising from USD4.8 billion to USD5.1 billion. Throughout this period, the agricultural sector consistently accounted for an average of 39.3% of employment, as illustrated in Figure 2.



Despite its pivotal role, Cambodia’s agro-processing sector still needs to be developed, with only 10% of agricultural outputs processed domestically. Processed exports account for just 8% of the total exports by value. The manufacturing value of agricultural-based products represents only 3.4% of Cambodia’s overall GDP, primarily due to insufficient private sector investment. Large-scale investments in agriculture and agro-industry remain below 10%, with less than 2% of total investments in the food processing sector. Notably, agricultural exports heavily rely on raw materials, with rice and rubber serving as the primary export products, while Cassava is becoming an increasingly significant contributor to the country’s agricultural export portfolio (ADB, 2021).

Six prioritized commodities in Cambodia—mango, cashew, maize, cabbage, pig, and chicken—are crucial for food security, nutrition, and economic development to reduce rural poverty. Private investment is imperative for enhancing postharvest handling and processing. Challenges include unreliable electricity, high costs, informal payments, skill gaps, lack of information, difficulty securing capital, and limited access to technology. Overcoming these obstacles is pivotal for the sector’s growth and unlocking economic opportunities through the value addition of agricultural products (ADB, 2021; FAO, 2021).

The limited development in the agro-processing sector, evidenced by only 10% of agricultural outputs being processed domestically, has repercussions for Cambodia's position in the global market. The low percentage of processed exports, 8% of total exports by value, indicates a missed opportunity for the country to actively participate in the higher-value segments of the global supply chain. This underdevelopment poses challenges to competitiveness and impedes the sector's ability to meet evolving global demands for processed agricultural products.

Cambodia's heavy reliance on raw material exports, especially rice and rubber, exposes its agricultural sector to global commodity price fluctuations. Changes in global demand, disruptions in the supply chain, or economic shifts can directly impact the country's export revenues and overall economic stability. To mitigate these risks and enhance resilience, Cambodia must explore opportunities for value addition within its agricultural supply chain.

The outlined challenges, such as unreliable electricity, high costs, and limited technological access, hinder effective integration into the global supply chain. Addressing these challenges is critical for attracting FDI and encouraging private sector involvement. Improving postharvest handling and processing, which requires essential private investment, is vital for economic growth, meeting global quality standards, and gaining better market access.

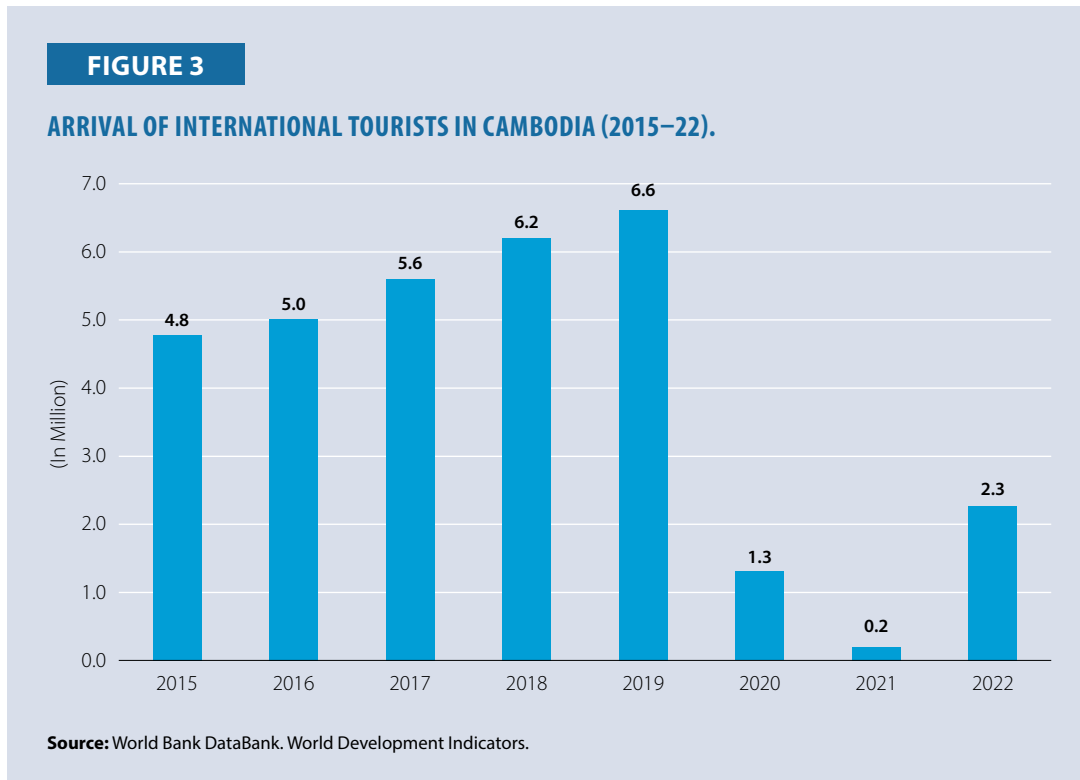
The impact of the global supply chain on Cambodia's agricultural sector is evident in the missed opportunities for value addition, susceptibility to commodity price fluctuations, and challenges hindering effective participation in the global market. Overcoming these challenges is essential for Cambodia to unlock its full potential, enhance its competitiveness, and contribute more robustly to the global agricultural supply chain.

Tourism and Hospitality

The tourism industry stands out as a critical driver of Cambodia's economic development and poverty alleviation, pivotal in bolstering the country's GDP. In 2019, Cambodia's tourism sector made a substantial contribution, accounting for 12.1% of the country's GDP and providing direct employment to 630,000 individuals (Sambath, 2021). During 2015–19, there was a massive surge in the number of foreign tourists visiting Cambodia. As illustrated in Figure 3, the number of international tourists jumped from 4,775,231 to 6,610,592, reflecting a notable growth of 38.4%. However, 2020 brought about a significant downturn in foreign tourist arrivals, with only 1,306,143 visitors, a staggering 80.2% decrease compared to the previous year (Ministry of Tourism, n.d.).

The onset of the COVID-19 pandemic resulted in approximately 100,000 workers losing their jobs, while an additional 100,000 individuals experienced reduced working hours or shifts. Indirectly, around 300,000 people were impacted. Beyond the immediate employment challenges, Cambodia grappled with structural issues such as limited physical infrastructure, the imperative for diversification in tourism products and services, and economic value-added loss due to the absence of industry and support services (Ministry of Economy and Finance, 2021).

The links within the tourism industry extend to global travel networks, and disruptions in other countries directly impacted Cambodia's ability to attract visitors. Travel restrictions and health concerns triggered disruptions in the global tourism supply chain, ultimately affecting Cambodia's GDP and employment.



Garment

During the past three decades, Cambodia’s garment sector, including footwear and bag manufacturing, has demonstrated steady growth and has become a key player, contributing to 80% of the country’s total exports. This sector has been a driving force behind significant socioeconomic achievements, contributing to economic growth, increased exports, higher investment, poverty reduction, and job creation (Ministry of Economy and Finance, 2021). In 2019, before the COVID-19 pandemic, Cambodia’s garment and footwear sector employed 800,000 workers. However, during the crisis, the sector encountered challenges, including an inadequate supply of raw materials, 60% imported from China, and extended delivery delays, increasing from 30 to 90 days. These delays were due to China’s stringent COVID-19 measures, which made it difficult for some factories to meet orders from international brands (Arnold, 2021; Vida, 2020).

In October 2020, approximately 35,000 to 40,000 workers, or nearly 4.4–5% of the total workforce, lost their jobs. The impact of the COVID-19 outbreak led to more than 150,000 workers, or nearly 15% of the total workforce, either losing their jobs or reducing working hours (Xinhua, 2020; Arnold, 2021). The garment sector in Cambodia faces a significant shortage of local skilled labor, both in terms of quality and quantity and encounters challenges in providing clear career paths for workers (Ministry of Economy and Finance, 2021).

The impact of the global supply chain on Cambodia during COVID-19 was immense.

- **Dependency on Raw Materials:** Cambodia’s garment sector heavily relies on the global supply chain for raw materials, with 60% imported from China. Disruptions related to COVID-19 in China, such as factory closures and shipping delays, created challenges in the supply of raw materials, impacting production timelines and causing delivery delays.

- **Global Market Demand:** The garment industry's dependence on international brands and markets makes it vulnerable to fluctuations in global demand. The decrease in consumer spending and shifts in purchasing patterns during the pandemic affected orders, contributing to job losses in the sector.
- **Challenges in Labor Migration:** The global supply chain poses labor-related challenges, including shortages of skilled local workers. The labor movement and the ability to attract and retain a skilled workforce within the global context influence the sector's growth and stability.

Non-Garment Manufacturing Sector

Cambodia's non-garment manufacturing sector has experienced remarkable growth in recent years, as evidenced by increasing export figures and product diversification. Even during the challenging COVID-19 crisis, this sector demonstrated resilience by maintaining robust growth by exporting various non-garment products such as bicycles, boards, furniture, solar panels, electronic components, and accessories.

However, challenges within the non-garment industry persist, limiting its full potential and the ability to capitalize on emerging opportunities. These challenges include a shortage of local raw materials, limited availability of skilled workers, the absence of medium-sized businesses (the 'missing middles'), and restricted access to regional and Global Value Chains (GVCs) (Ministry of Economy and Finance, 2021).

Resilience During COVID-19

- **Diversification of Exports:** The non-garment manufacturing sector showcased resilience during the pandemic by adopting a diversification strategy in its exports. Products like bicycles, boards, furniture, solar panels, electronic components, and accessories allowed the sector to navigate challenges and maintain robust growth, contrasting the disruptions faced by the garment sector.

Challenges in the Non-Garment Manufacturing Sector

- **Dependency for Raw Material:** Similar to the garment sector, the non-garment industry grapples with challenges related to the supply of local raw materials. Dependence on GSCs introduces vulnerabilities, as observed in disruptions caused by the pandemic.
- **Shortage of Skilled Labor:** The sector contends with a limited supply of skilled workers. Global competition for skilled labor can impact the industry's ability to attract and retain qualified personnel, affecting productivity and growth.
- **Missing Middles and Access to Value Chain:** The non-garment industry faces challenges associated with the absence of medium-sized businesses (missing middles) and restricted access to regional and global value chains. These obstacles hinder the sector from fully capitalizing on emerging opportunities, limiting its potential for further expansion and development.

Energy and Renewable Resources

Cambodia's energy landscape traditionally relies on various sources, including diesel power plants, biomass (derived from agriculture and firewood), thermal power plants (coal), hydropower plants, and

various Renewable Energy Sources (RES). A notable shift in energy consumption occurred between 2010 and 2017, as detailed in the Electricity Authority of Cambodia’s annual report for 2015–17.

In 2010, diesel accounted for 91%, and coal accounted for 3.2%, but by 2017, diesel usage had significantly decreased to 10.69%. During this period, Cambodia increasingly embraced hydropower (60.67%), coal (53.8%), and biomass (0.89%) as its primary energy sources (MISTI, n.d.).

The country’s access to electricity has experienced substantial growth, rising from less than 1% in 1991 to 56% in 2014 and surpassing 90% in 2019. Domestically generated energy makes up approximately 73.45%, while the remaining 26.55% is imported from neighboring countries such as Thailand, Lao People’s Democratic Republic (Lao PDR), and Vietnam. This import includes both nonrenewable energy (48.83%) and renewable energy (51.17%) from local sources, with coal (41.20%) and fuel oil (7.63%) representing non-renewable energy and hydropower (44.17%), solar power (6.36%), and biomass power (0.64%) contributing to renewable energy as of 2019 (MISTI, n.d.).

Cambodia’s power generation is derived from various sources, including hydropower, coal, oil, bagasse, and solar. Total electricity generation increased significantly from 478 GWh in 2000 to 8,675 GWh in 2019. Oil dominated the energy mix until 2013, after which hydropower and coal became more prevalent. By 2019, oil’s share had dropped to 8%, while hydropower and coal accounted for 46% and 43%, respectively. Bagasse and solar contributed 1% to the overall generation (MISTI, n.d.).

Annual power generation in Cambodia reached 9,255 GWh, with 3,345 GWh imported from neighboring countries such as Vietnam, Thailand, and the Lao PDR. The distribution of electricity across sectors shows allocations of 31% to the electricity sales sector, 28% to the commercial sector, 23% to the residential sector, 16% to the industrial sector, and 4% to the government sector. This emphasizes the critical need for Cambodia to enhance its supply to meet the growing demands across these key sectors (MISTI, n.d.).

Cambodia’s shift in energy consumption during 2010–17, characterized by decreased reliance on diesel and increased emphasis on hydropower, coal, and biomass, reflects global energy production and availability trends.

- **Global Collaboration:** By 2019, over 90% of Cambodia’s population had access to electricity, with a significant portion imported from neighboring countries. This underscores the interconnectedness of Cambodia’s energy networks with its neighbors. Global cooperation and infrastructure connectivity ensure a stable and diversified energy supply.
- **Impact of Global Trends:** Cambodia’s energy generation has diversified with global trends, focusing on cleaner and more sustainable sources like hydropower, solar power, and biomass.
- **Regional Collaboration:** Cambodia imports substantial electricity (26.55% of total supply) from neighboring countries, making regional collaboration essential for maintaining a stable power supply. The distribution of electricity across sectors highlights the need for efficient supply chain management to meet diverse demands in the sales, commercial, residential, industrial, and government sectors.

Logistics and Transportation

RGC's prioritization of the transport and logistics sector is evident through substantial direct investments and active collaboration with the private sector. Despite the challenges posed by the COVID-19 crisis, significant public and private investment projects have continued. These initiatives include the construction of the Phnom Penh-Sihanoukville Expressway, the rehabilitation and expansion of National Roads 5, 2, and 3, the launch of a new airport project in Phnom Penh, the ongoing deep-sea port construction at Sihanoukville Autonomous Port, and the implementation of the Phnom Penh Logistics Center project, among others.

These ongoing investments drive positive and far-reaching transformations within Cambodia's transport and logistics sectors (Ministry of Economy and Finance, 2021).

Strategic Infrastructure Projects: Cambodia's emphasis on developing the transport and logistics sector underscores its dedication to enhancing connectivity within the global supply chain. Key projects, such as the construction of the Phnom Penh-Sihanoukville Expressway, the expansion of vital National Roads 5, 2, and 3, and the deep-sea port development at Sihanoukville Autonomous Port, significantly contribute to fortifying the country's trade routes and facilitating more seamless connections with global markets.

Continued Investments Despite COVID-19: The persistence of substantial investment projects amidst the challenges posed by the COVID-19 crisis underscores Cambodia's steadfast commitment to developing its transport and logistics sector. Despite the hurdles, the sustained focus on ongoing public and private investments highlights the sector's strategic significance in upholding and improving supply chain efficiency.

Active Private Sector Participation: The active involvement of the private sector in the development of transport and logistics infrastructure exemplifies the collaborative approach adopted by the Royal Government. This collaboration is essential for optimizing supply chain efficiency, reducing transportation costs, and fostering economic growth through enhanced trade facilitation.

Strategic Infrastructure Development: Initiatives such as the construction of the Phnom Penh-Sihanoukville Expressway, the rehabilitation of National Roads, the new airport project in Phnom Penh, the deep-sea port construction, and the Phnom Penh Logistics Center collectively contribute to the establishment of a robust and modern infrastructure network. This, in turn, supports the efficient movement of goods, enhances logistics capabilities, and positions Cambodia as an attractive participant in regional and global supply chains.

Impact of New GSC Trends on Aggregate Productivity and Economic Development

In the aftermath of the pandemic, disruptions in the supply chain, stemming from uncertain shipping delays, fixed order costs, and storage expenses, had considerable adverse effects on global productivity. Companies manage their inventories strategically based on the reliability of supply sources. Longer shipping times lead to economic contraction, price increases, and more frequent stockouts, particularly for goods heavily reliant on delayed inputs. These impacts are more pronounced when inventories are already at minimal levels. The increase in output from reducing delays is expected to be less than the economic contraction triggered by the diminishing effects of stimulus measures (Alessandria et al., 2023).

Effective supply chains are crucial in enhancing countries' productivity and economic development. Despite the recognition of their importance, especially highlighted by the challenges of the COVID-19 crisis, there is a notable scarcity of formal research on the contribution of supply chain logistics. It is also important to note that the growth effects of logistics performance differ among nations with distinct growth rates (Goel et al., 2021).

Technological spillovers occur when knowledge or technological advancements benefit other firms or industries and affect productivity and economic development (Kim & Woon, 2020). GSC trends can facilitate knowledge sharing, collaboration, and the adoption of new technologies, leading to productivity gains and innovation diffusion across sectors (Ebinger & Omondi, 2020). Monitoring indicators like R&D expenditure as a percentage of GDP can provide insights into the level of technological activities and potential spillover effects in Cambodia. Analyzing these indicators and their trends over time makes it possible to assess the impact of new GSC trends on Cambodia's aggregate productivity and economic development. However, conducting a comprehensive analysis would require access to detailed data on Cambodia's economy and industry performance and specific national indicators.

Figure 4 reveals a consistent positive trend in the trade balance from 2019–22 across various Harmonized System (HS) code sections, highlighting the nation's strength in exporting key categories such as vegetable products, raw hides and skins, leather, fur skin, textiles, footwear, headgear, umbrellas, sun umbrellas, and miscellaneous manufactured articles. This positive performance indicates a robust export-oriented economy in these sectors, potentially fostering job creation and contributing to overall economic growth.

The nation demonstrates an export surplus in specific categories like vegetable products, including fruits and processed plant-based products. A similar surplus is observed in raw hides, skins, leather, and related articles, showcasing competitiveness in these markets. The positive trade balance extends to textiles and textile articles, signifying a global competitive edge in fabrics and clothing exports. The nation also exhibits strength in exporting footwear, headgear, umbrellas, and miscellaneous manufactured articles, further solidifying its economic position.

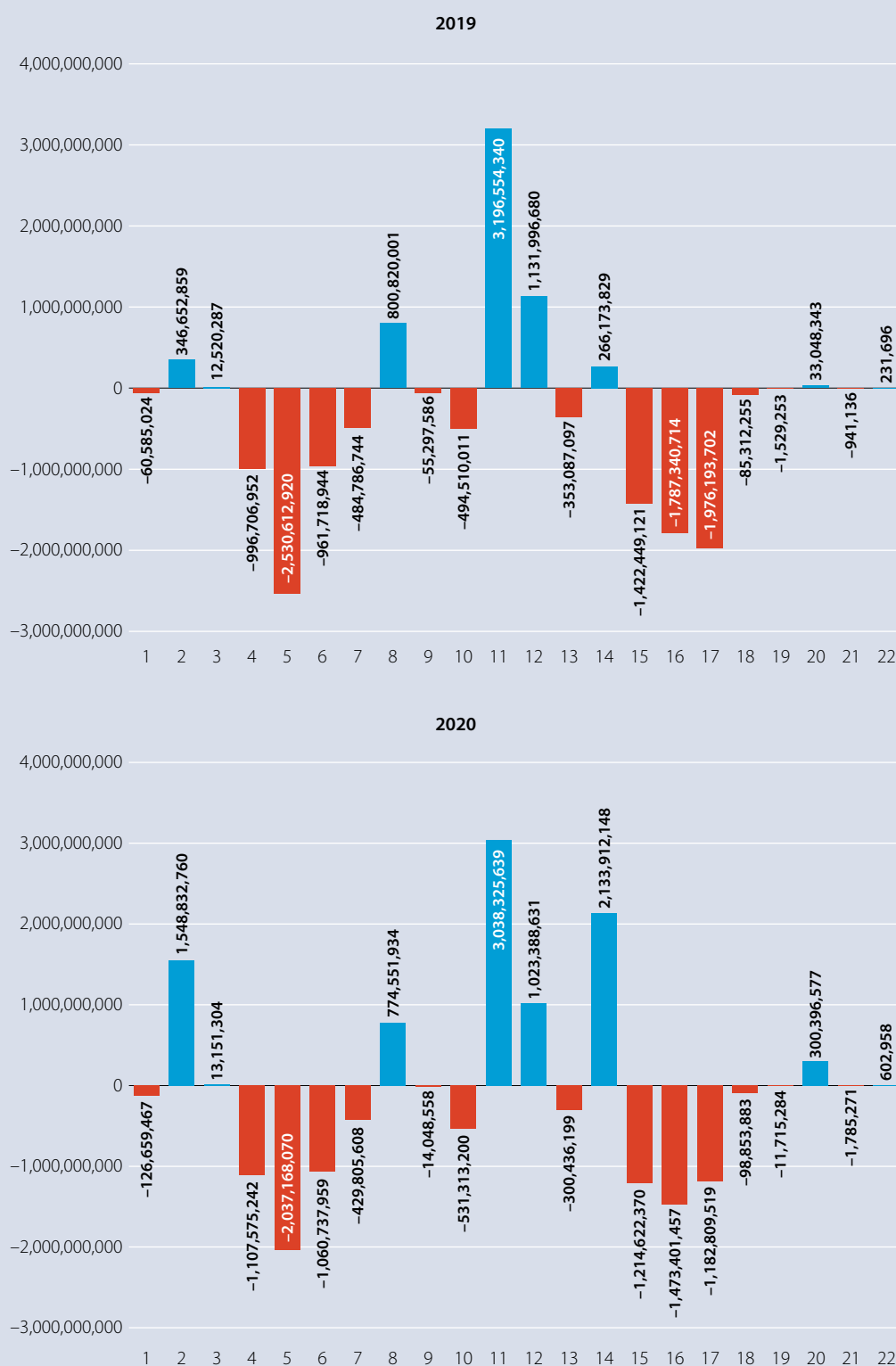
However, a contrasting scenario emerges in specific categories where a negative trade balance is observed. These include prepared foodstuffs, beverages, spirits, and vinegar; tobacco and manufactured tobacco substitutes; mineral products; products of the chemical or allied industries; plastics and articles thereof; rubber and articles thereof; pulp of wood or other fibrous cellulosic material; natural or cultured pearls; precious or semi-precious stones; base metals and articles of base metal; and machinery and medical appliances.

This negative trade balance suggests a reliance on foreign sources for various products in these sectors, such as prepared foods, beverages, minerals, chemicals, plastics, rubber, and machinery. The dependence on international markets for a substantial portion of the nation's food and beverage consumption highlights a potential vulnerability. Similarly, challenges or limitations in domestic production capacity for minerals, chemicals, plastics, and machinery may necessitate strategic interventions to enhance local capabilities.

Recognizing the importance of assessing domestic capabilities and competitiveness, policymakers are urged to explore initiatives that promote domestic production, technological advancements, and innovation. Addressing these trade deficits will contribute to economic resilience and foster

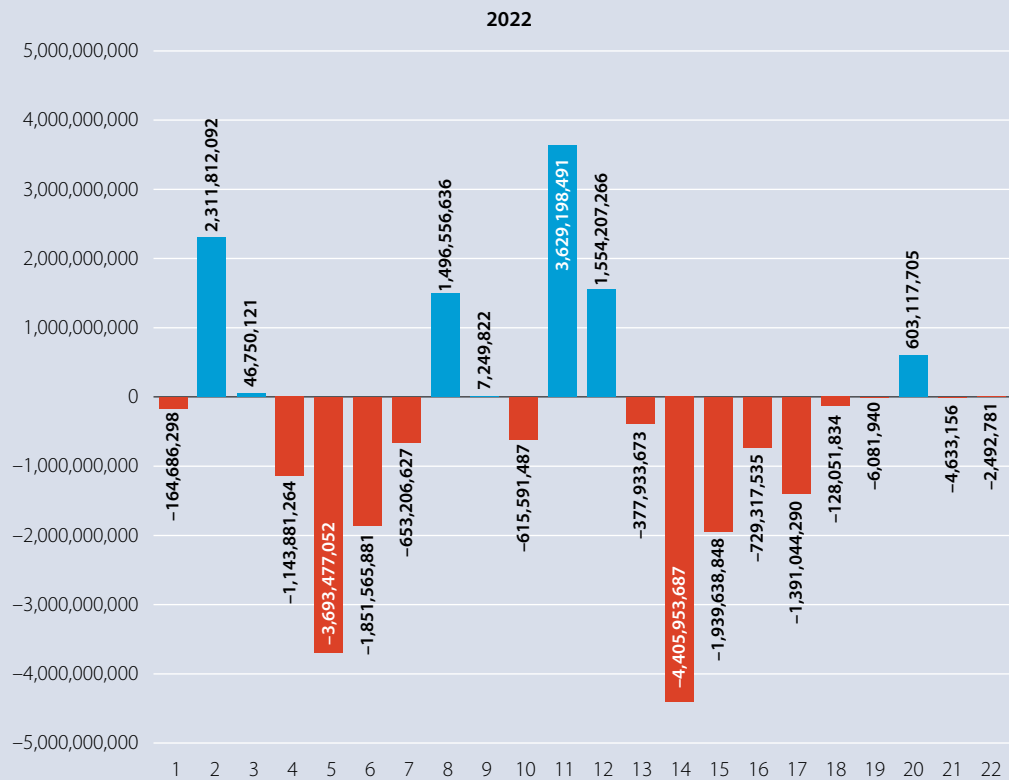
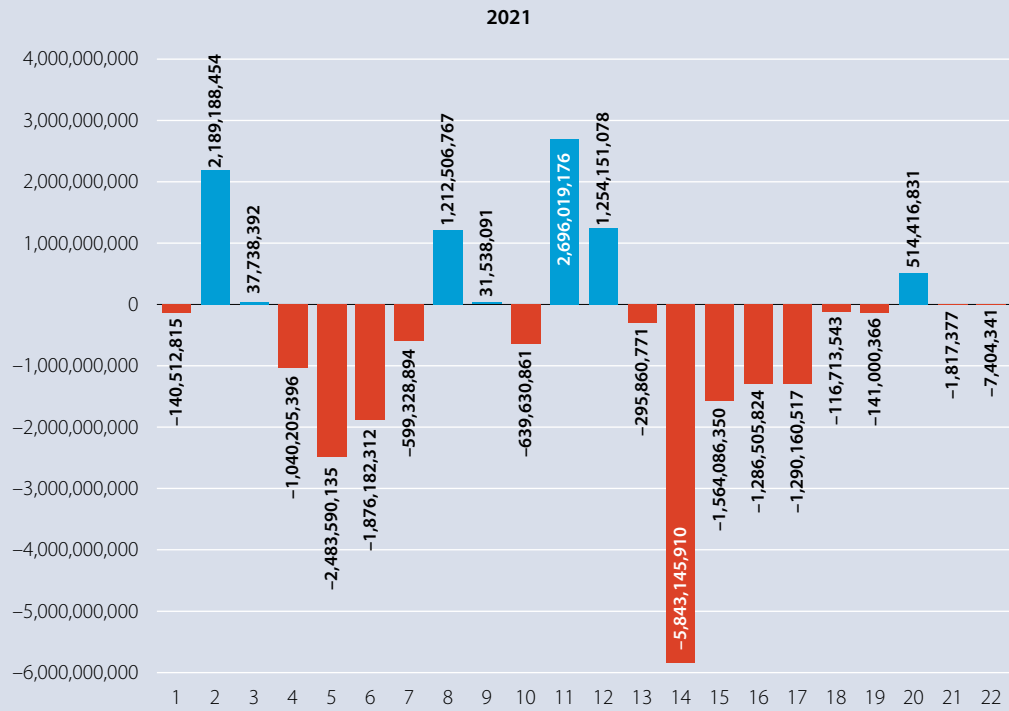
FIGURE 4

TRADE BALANCE GOODS BY HS CODE SECTION (2019–22).



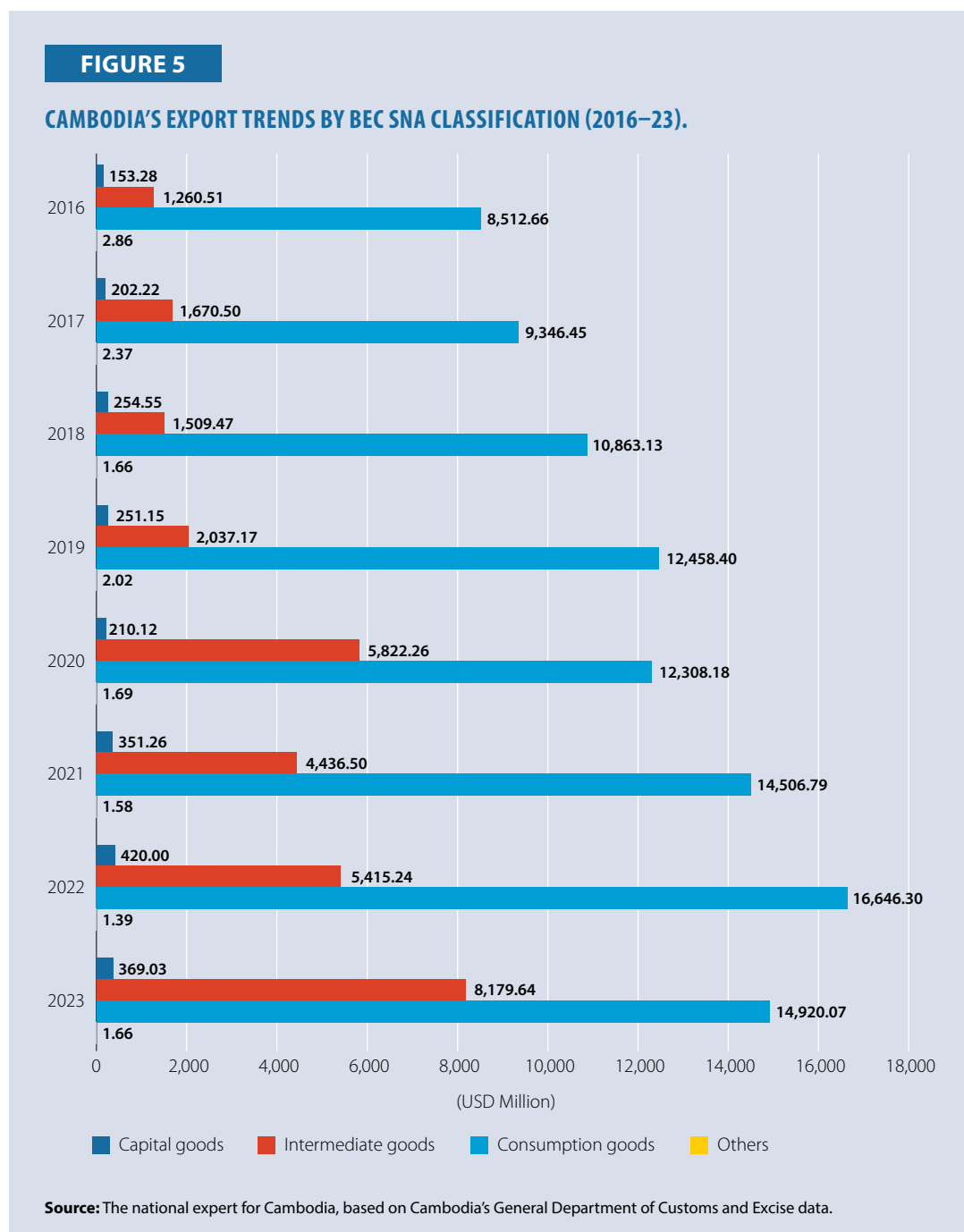
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Source: The national expert for Cambodia, based on Cambodia's General Department of Customs and Excise data.
Note: HS, Harmonized System; Trade Balance = Export - Import; details of the HS code section on tariff classification can be found at <https://customs.gov.kh/en/publications/14037-customs-tariff-of-cambodia-km-2022>.

employment, industry growth, and national security considerations. A comprehensive approach is essential to manage trade imbalances in these critical sectors and ensure a sustainable and well-rounded economic strategy for the nation.



As depicted in Figure 5, based on the Broad Economic Classification System of National Account (BEC SNA) from 2016–23, Cambodia's export trend notably increased during 2016–20. However, a slight decline was observed in 2021, which coincides with the global disruptions caused by the COVID-19 pandemic. This trend was not unique to Cambodia, as many countries in the ASEAN region and worldwide experienced similar disruptions in their economic activities during this period.

In 2021, Cambodia, like its counterparts, grappled with the multifaceted impact of the pandemic. The government implemented various measures to curb the spread of the virus, including travel restrictions, lockdowns, and vaccination campaigns. These actions aimed to protect public health and mitigate the economic fallout caused by the global health crisis.

The decrease in export data in 2021 may be attributed to disruptions in GSCs, reduced demand for certain goods and services, and logistical challenges arising from the pandemic. Despite these challenges, Cambodia demonstrated resilience by swiftly implementing mass testing and contact tracing strategies to detect and contain COVID-19 cases. These efforts were crucial in managing the impact of the virus on both public health and economic activities.

The positive note is the slight increase in Cambodia's export data in 2023, which indicates a reactivation of economic activities and a gradual recovery from the pandemic's adverse effects. As the country continues its vaccination campaigns and adapts to the evolving global situation, the export sector's recovery will likely play a pivotal role in sustaining economic growth.

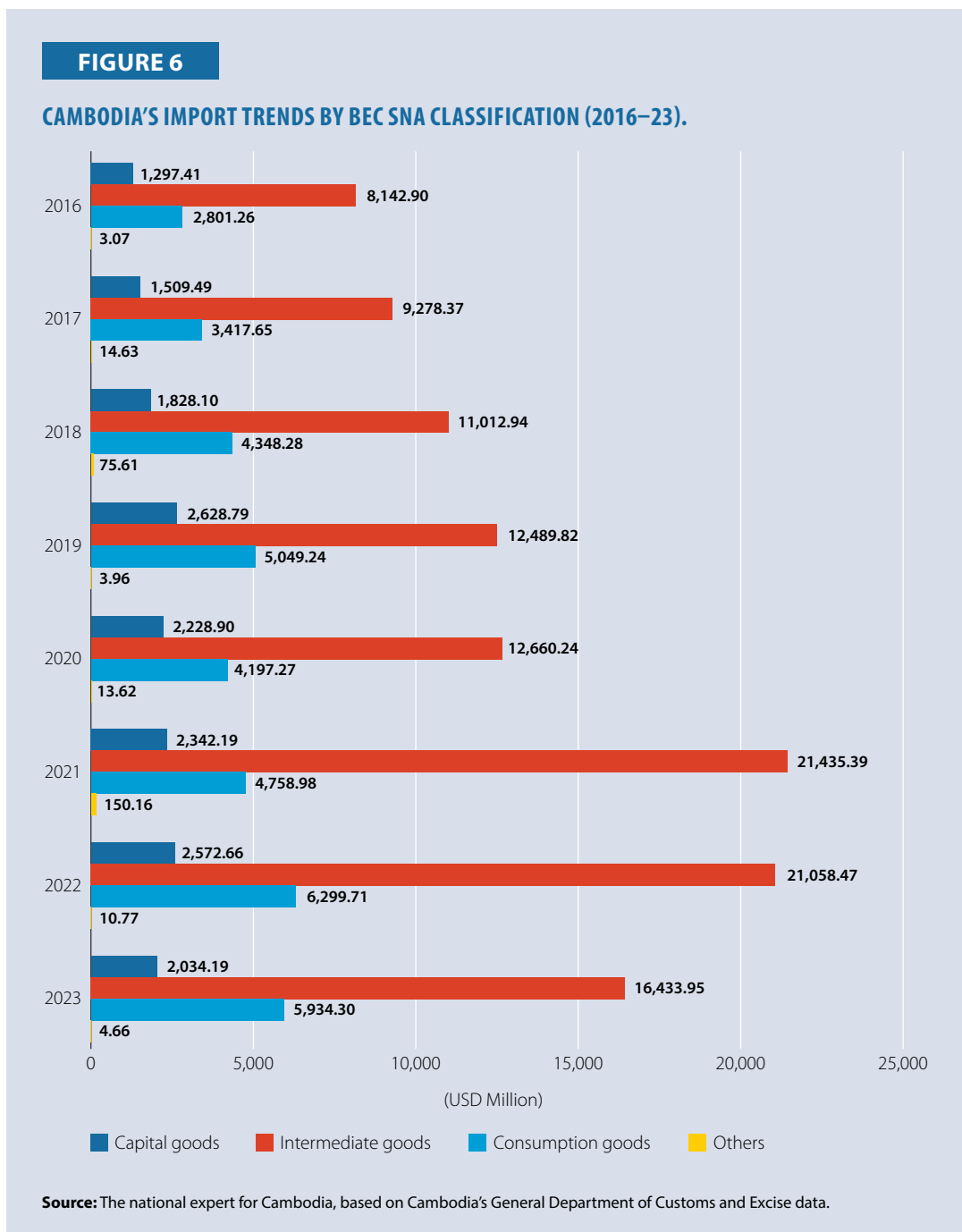
In summary, the fluctuation in Cambodia's export trend reflects the dynamic challenges posed by the COVID-19 pandemic. The country's proactive response through health measures and economic strategies demonstrates resilience and adaptability, laying the foundation for the recovery in export activities observed in 2023.

The capital goods sector also exhibited stability and even a slight increase in demand during the pandemic and through the postpandemic period. This resilience is noteworthy, considering the challenges posed by the COVID-19 pandemic and geopolitical concerns. Capital goods, encompassing machinery and durable equipment vital for production processes, demonstrated stability during economic downturns due to their essential nature for businesses.

The resilience of the capital goods sector can be attributed to several factors. The crucial role of capital goods in maintaining and enhancing production capabilities, strategic business decision-making, technological advancements, and adaptability within the sector contribute to its stability. Additionally, GSCs and trade dynamics influence the demand for capital goods, and supportive government policies, such as tax incentives and infrastructure development initiatives, foster continued growth in the sector.

Shifting the focus to the export of consumption goods, this sector showcased remarkable resilience during both the pandemic and the postpandemic period. Despite the challenges posed by the global health crisis, consumption goods maintained a robust export performance. This resilience is attributed to specific categories of consumption goods, such as everyday household items and non-durable goods, which remain in demand even during economic uncertainties due to their essential nature.

Consumer preferences and spending patterns adapted during times of crisis, with individuals prioritizing essential and comfort-oriented products. The agility of industries producing consumption goods to adjust to changing market dynamics played a crucial role in sustaining export resilience. As economic conditions gradually stabilized in the postpandemic period, the export of consumption goods continued to showcase its adaptability and capacity for sustained demand.



As shown in Figure 6 and classified by the BEC SNA from 2016–23, Cambodia's import trend highlights distinctive patterns across various categories. Capital goods, essential for production processes, experienced a slight decrease during 2020–23. In contrast, the trend for the import of consumption goods and intermediate goods exhibited consistent growth from 2016–22, with a minor decrease noted in 2023.

The slight decrease in the import of capital goods during 2020–23 may be influenced by various factors, including global economic conditions, changes in domestic demand, or fluctuations in investment patterns. Capital goods, often associated with long-term investments, can be sensitive to economic uncertainties.

Conversely, the import trend for consumption goods and intermediate goods displayed a consistent upward trajectory from 2016–22, indicating a sustained demand for everyday consumer items and materials used in production. This growth indicates economic activity, consumer spending patterns, and the overall health of industries relying on intermediate goods.

The observed slight decrease in the import of consumption and intermediate goods in 2023 may reflect evolving economic conditions or adjustments in supply chains. Economic factors, market dynamics, and global trade fluctuations can all contribute to variations in import trends.

In summary, the import trends in Cambodia from 2016–23 reveal nuanced dynamics across different categories. While capital goods experienced a slight decrease in specific years, consumption and intermediate goods demonstrated consistent growth trends. These fluctuations likely reflect the complex interplay of domestic and global economic factors influencing Cambodia's import landscape. Monitoring these trends is crucial for policymakers and businesses to make informed decisions in response to evolving economic conditions.

Research and Development Expenditure (% of GDP)

In 2015, Cambodia's R&D expenditure accounted for only 0.1% of its GDP, the second lowest among ASEAN countries. Furthermore, 35% of this funding was sourced from foreign partners and international organizations, influencing the research topics and project durations, often resulting in short-term projects (UNESCAP, 2022). However, Cambodia has set ambitious goals to increase its R&D investment to 1% of GDP by 2030 (RGC, 2021). These goals encompass eight key research areas: local food production, reliable energy supply, quality education, electronic and mechanical spare parts, cloud-based services, electricity and potable water accessibility, carbon neutrality, and digitally enhanced health (RGC, 2023). By promoting R&D in these areas, Cambodia aims to become an upper-middle-income economy by 2030 and a high-income economy by 2050 (RGC, 2021).

Cambodia's GDP sectoral distribution has remained relatively stable over ten years (see Figure 7.d.), with the service sector consistently above 30%, industry growing slightly, and agriculture declining slightly. Labor-intensive activities, such as garment and footwear industries, mainly contribute to the industry's economic share.

Figure 7.a. shows that the observed fluctuations in GDP per capita reflect the complex interplay of various economic factors, with the initial increase from 2015–19 likely driven by favorable economic conditions and growth. During this period, the country experienced a steady rise in GDP per capita from USD1170.7 to USD1671.4. This upward trajectory could be attributed to increased productivity, favorable global economic conditions, and government policies aimed at fostering economic development. However, the onset of the global COVID-19 pandemic in 2020 disrupted economies worldwide, leading to a sharp decline in GDP per capita to USD1577.9. The contraction during the pandemic can be attributed to factors like reduced economic activity, lockdown measures, and disruptions in supply chains, impacting the overall economic output and income per capita.

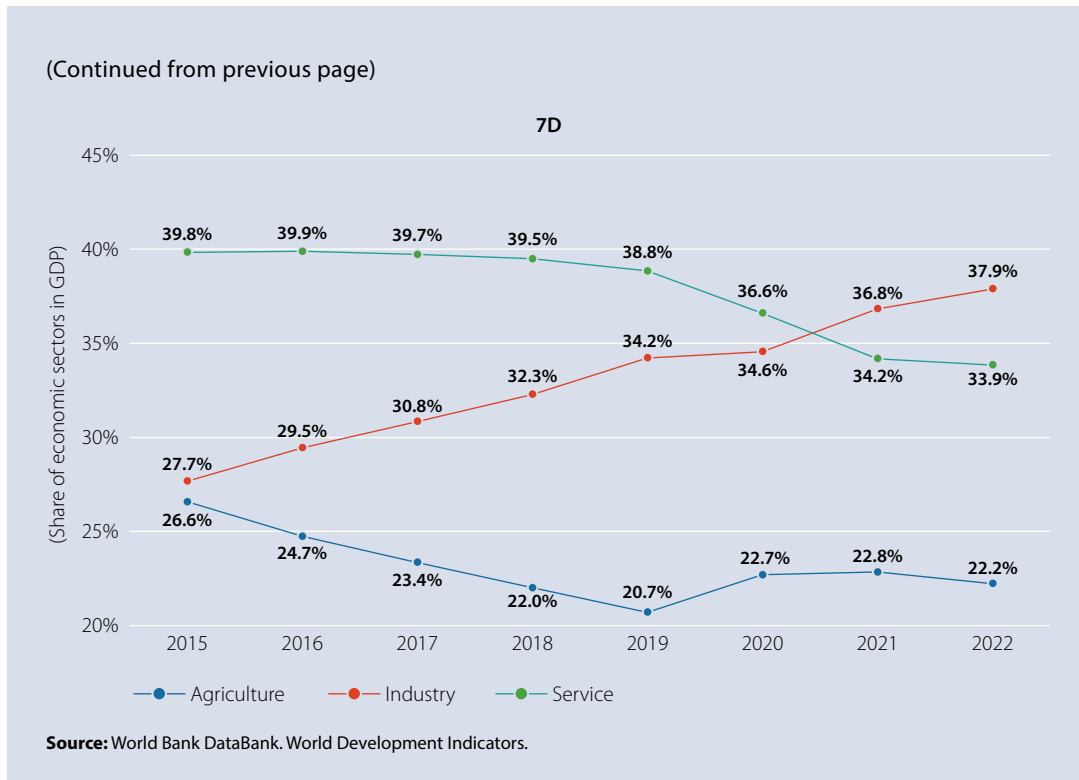
The subsequent recovery in GDP per capita in 2021 and 2022 reflects the resilience and adaptive measures taken post-pandemic. The slight increase to USD1625.2 in 2021 suggests initial efforts to rebuild and stabilize the economy. The sharp rise to USD1786.6 in 2022 indicates a more robust recovery, potentially driven by effective vaccination campaigns, stimulus measures, and a

FIGURE 7

DYNAMIC PERFORMANCE OVER TIME: GDP PER CAPITA, GDP PER CAPITA GROWTH, AND TOTAL LABOR FORCE.



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return to normal economic activities. Governments and businesses may have implemented strategies to bounce back from the pandemic-induced downturn, leading to increased production, employment, and overall economic growth. This recovery underscores the dynamic nature of economic systems, highlighting the ability of economies to rebound after facing significant challenges such as a global pandemic.

Cambodia has experienced a remarkable surge in economic growth in the past decades, as illustrated in Figure 7. b., surpassing many of its regional counterparts within the ASEAN community. However, during the pandemic, Cambodia’s GDP per capita growth declined from 5.8% in 2019 to -4.2% in 2020, which means Cambodia experienced negative growth in 2020 due to the impact of the pandemic. The country bounced back with a GDP growth of 1.8% in 2021 and 4% in 2022.

This robust economic expansion bolstered the nation’s economic standing and also significantly contributed to an improvement in the living standards of citizens. One of the most noteworthy consequences of this growth has been the substantial jump in job opportunities, as shown in Figure 7.c., across various sectors of the economy in Cambodia. This expanding job market has provided Cambodians with more employment options, making it easier to secure gainful employment and thereby contribute to their financial stability and overall well-being.

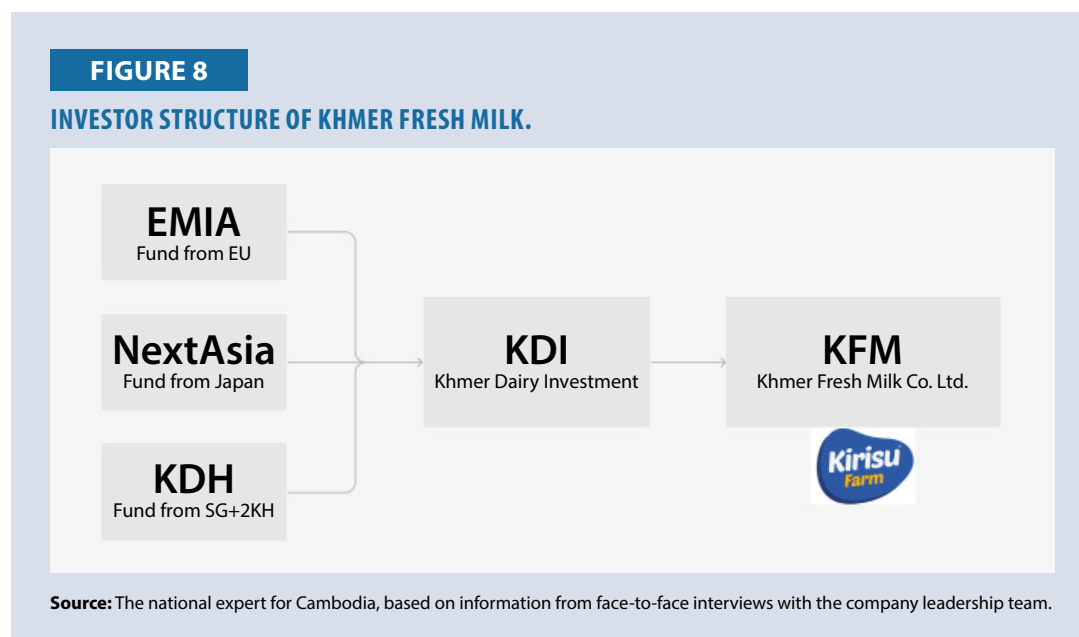
Case Study

Khmer Fresh Milk

Company Introduction and GSC Plans

Kirisu is a well-known product of Khmer Fresh Milk Co. Ltd., a Cambodian dairy company that produces and distributes fresh milk, yogurt, and other dairy products. The company was founded by four investors (see details in Figure 8) and began full operations in 2019. The

company established a long-term partnership with the Singapore-based Cambodia-Laos-Myanmar Development Fund II, managed by Emerging Markets Investment Advisers, Nexasia, a Japanese fund based in Singapore, and the founders’ group comprising highly successful Israeli and local investors.



The company’s core values of honesty, innovation, diversity, accountability, and reliability are key guiding principles that shape its culture and operations. These values are fundamental in defining the company’s identity and how it conducts business. With a strong commitment to excellence, the company envisions bringing pure, natural milk to the Cambodian market, produced using cutting-edge agricultural technology, modern techniques, and food preparation and processing under world-class hygienic standards.

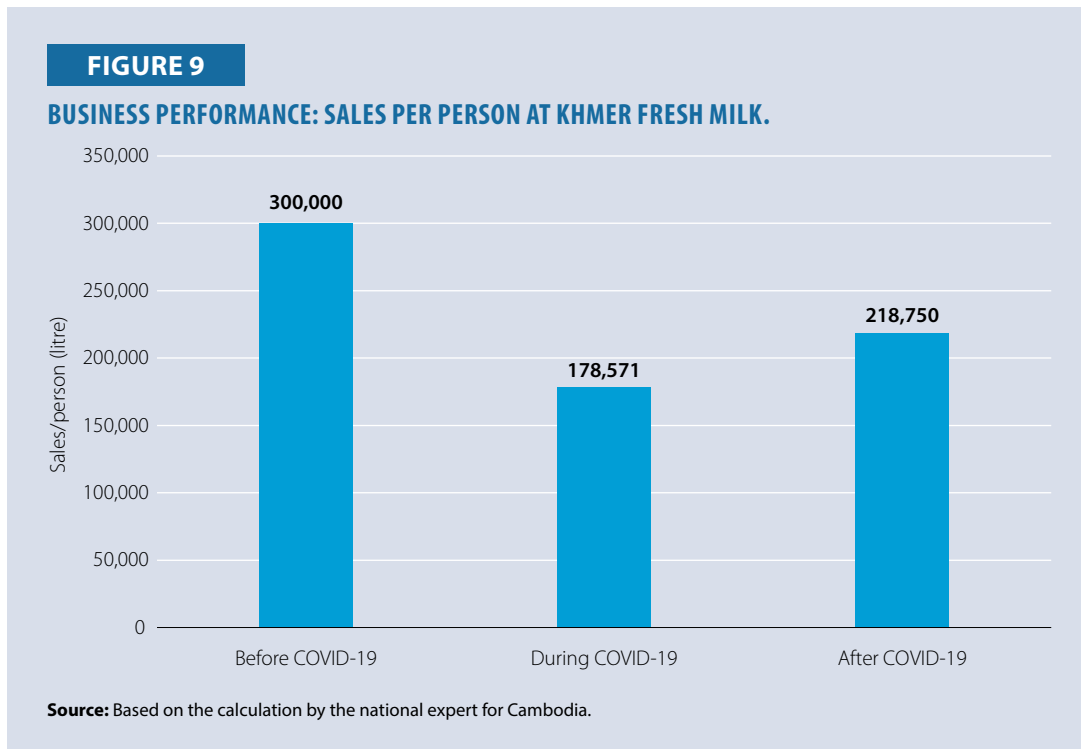
The company holds international certifications, including Good Manufacturing Practice (GMP) to ensure consistent product quality, the Hazard Analysis Critical Control Point (HACCP) food safety management system certificate, and the Food Security System Certificate (FSSC 22000) for food safety management. Proudly produced in Cambodia, the company offers customers 100% pure dairy products with a unique taste, the best quality, and the highest nutrition for their families.

Khmer Fresh Milk has significantly improved Cambodia’s dairy industry. The company has helped increase fresh milk production and made dairy products more affordable. Moreover, it has created jobs and supported local farmers.

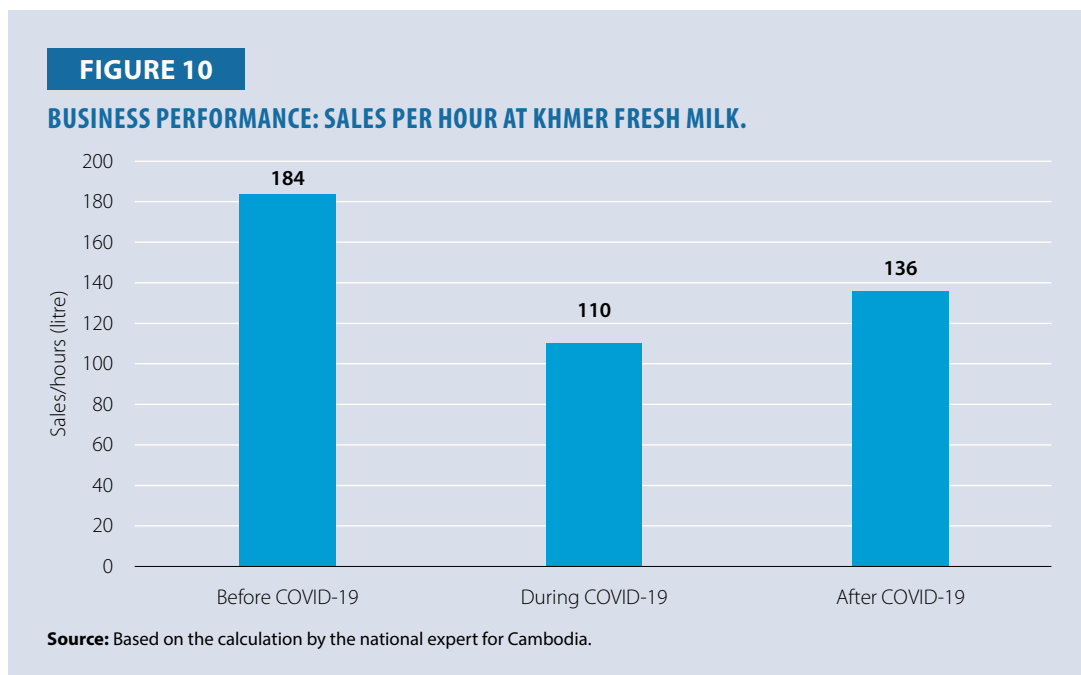
Despite its success, Khmer Fresh Milk faces several challenges. Operating in a competitive market, the company must constantly innovate to stay ahead of the competition. It also faces challenges in sourcing raw milk and raw materials and distributing its products, especially during the COVID-19 pandemic.

The company is committed to promoting environmental sustainability by implementing the 3Rs: reusing, reducing, and recycling wastewater and electricity. It employs a ‘clean in process’ strategy to manage water resources efficiently. Additionally, it harnesses solar and biogas energy to minimize reliance on conventional electricity sources, further contributing to a greener operational approach.

Impact of GSC on Khmer Fresh Milk

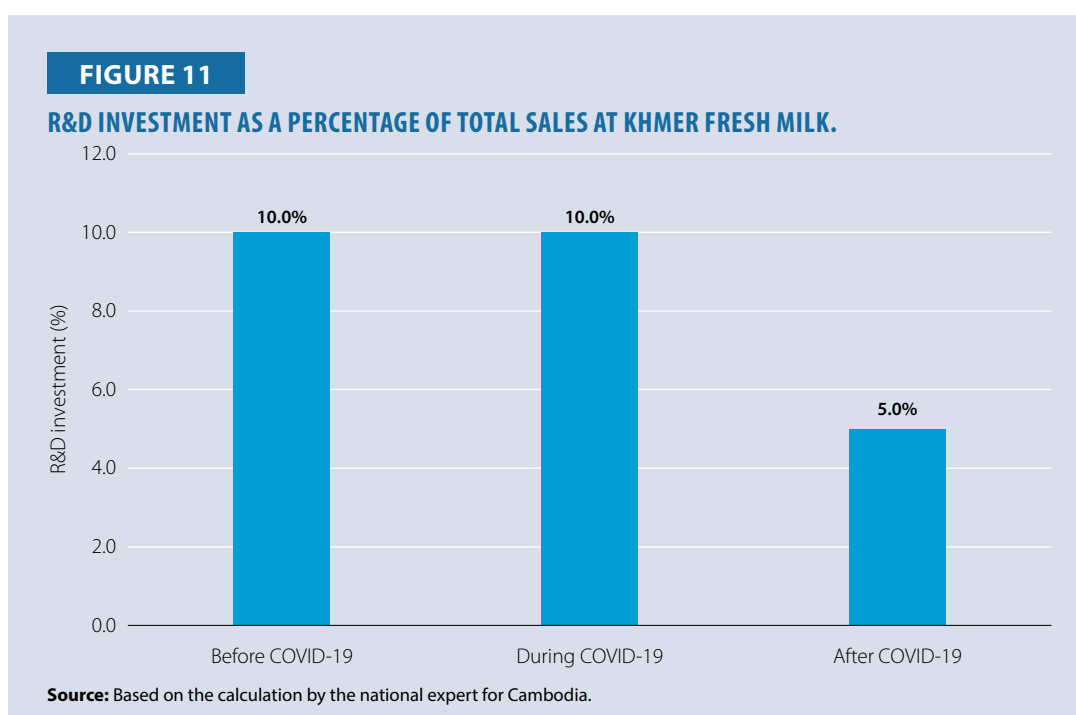


As illustrated in Figure 9, the company’s sales per person stood at USD300,000 during the pre-COVID-19 period. However, sales per person during the pandemic decreased substantially to USD178,571, marking a drop of USD121,429. Post-COVID-19, sales per person rose to USD218,750, reflecting an improvement of USD40,179 compared to the pandemic period. These fluctuations in sales highlight the impact of the pandemic on the business, showcasing both the challenges faced during the crisis and a modest rebound in the post-COVID-19 era.



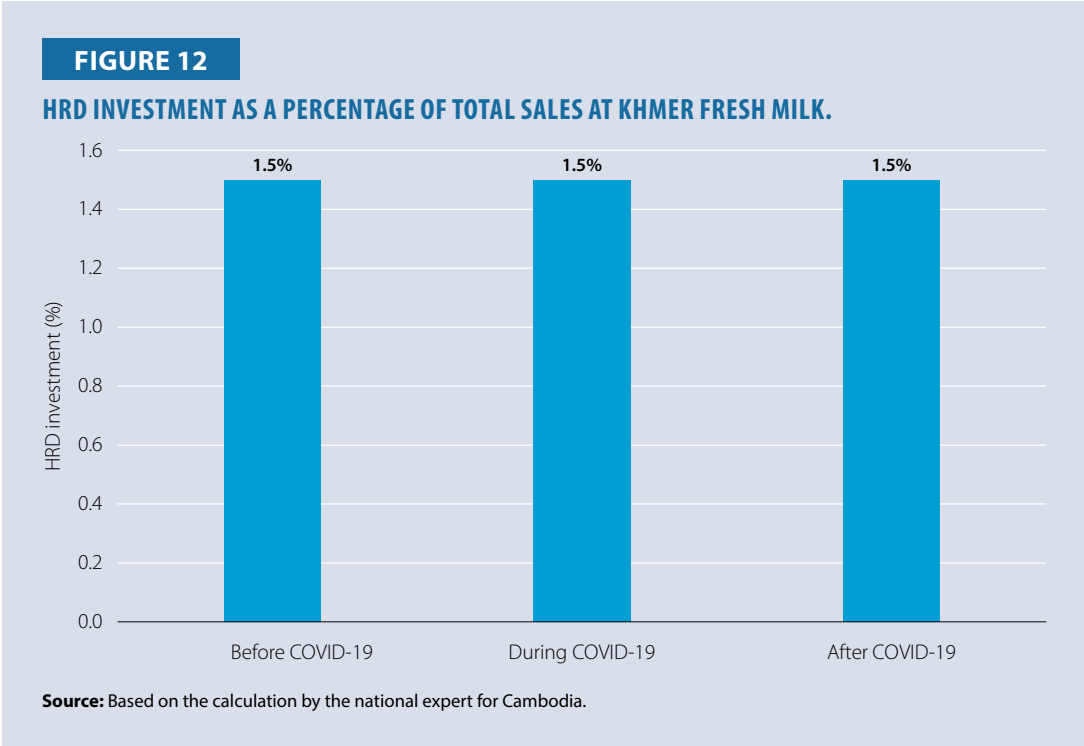
The fluctuating sales per hour across different phases of the COVID-19 pandemic, ranging from 184 liters pre-COVID-19 to 110 liters during the pandemic and then rising to 136 liters post-COVID-19, underscores the significant effects on the supply chain (see Figure 10). In the pre-COVID-19 period, high sales indicated robust demand, with optimized supply chain operations focusing on efficiency and meeting customer needs. However, during the pandemic, the sharp decline in sales led to challenges such as supply chain disruptions, shifts in inventory management to conserve cash flow, and difficulties adapting to fluctuating demand patterns.

In the post-COVID-19 period, the partial recovery in demand required businesses to quickly adapt by ramping up production while navigating the lingering effects of the pandemic, such as ongoing supply chain disruptions and labor shortages. Agility, resilience, and adaptability in supply chain management are crucial, emphasizing flexible operations, contingency planning, and efficient inventory management to meet changing demand patterns and effectively navigate disruptions.



As shown in Figure 11, the company allocated 10% of its financial budget to R&D investments before and during COVID-19 and 5% in the post-COVID-19 period. This underscores a deliberate and strategic commitment to growth and development. This budgetary allocation reflects the company’s dedication to fostering strategic initiatives to expand operations and strengthen its market position. These diversified investments may include capital expenditures, acquisitions, R&D, and other areas, reflecting a proactive approach to risk management and a pursuit of emerging opportunities.

Furthermore, the allocation emphasizes a long-term perspective, focusing on sustainability and creating shareholder value. By earmarking a specific percentage for investments, the company signals its adaptability and responsiveness to evolving market conditions, allowing flexibility in pursuing strategic opportunities and addressing challenges. This approach necessitates careful planning, thorough execution, and ongoing evaluation to ensure that the allocated budget aligns effectively with the company’s overarching business objectives and contributes to its sustained success.

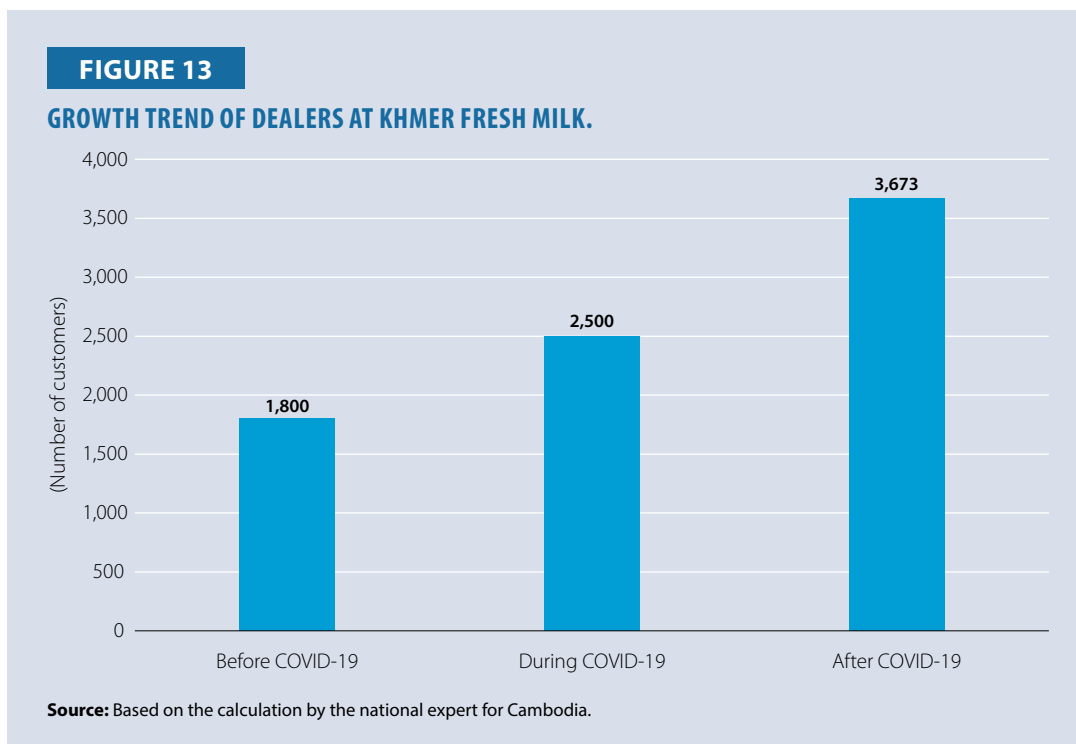


As illustrated in Figure 12, the company’s allocation of 1.5% of its financial budget towards HRD underscores its strategic commitment to nurturing the workforce and promoting employee growth. This targeted investment reflects the company’s recognition of human capital’s pivotal role in organizational success. By dedicating resources to HRD, the company aims to enhance employee skills through training programs, workshops, and educational initiatives. This focus on skill enhancement equips the workforce to meet evolving business needs and contributes to talent retention and motivation, fostering a positive workplace culture.

Moreover, the company’s commitment to HRD reflects its understanding of the importance of an adaptable and resilient workforce in the face of changing business landscapes. This investment strengthens employees’ ability to navigate challenges, fosters leadership development, and ensures a robust leadership pipeline. It also positively impacts employee engagement, as individuals feel valued when supported in their professional growth, ultimately boosting morale and job satisfaction.

Beyond the immediate benefits, the strategic allocation aligns the company’s goals with its investment in people, providing a competitive advantage in the marketplace. A well-trained, skilled workforce is better positioned to innovate, adapt to industry changes, and outperform competitors. While the percentage allocated may seem modest, the strategic impact of this investment is significant. Continuous evaluation and adjustment of these HRD initiatives are paramount, ensuring they remain aligned with the company’s evolving needs and objectives. This approach contributes to a dynamic and skilled workforce, which serves as a cornerstone for organizational excellence.

The company has experienced significant growth in Cambodia by strategically expanding its dealer network. Starting operations in 2019 with 1,800 dealers, the company increased its reach during the COVID-19 pandemic, expanding to 2,500 dealers (see Figure 13). Post-COVID-19, the dealer network grew even further to 3,673. This expansion demonstrates the company’s adaptability and



resilience, contributing to an increased market share. The strategic decision to grow the dealer network highlights the company’s ability to navigate challenges and capitalize on opportunities, reflecting positive market reception and sustained demand for its products.

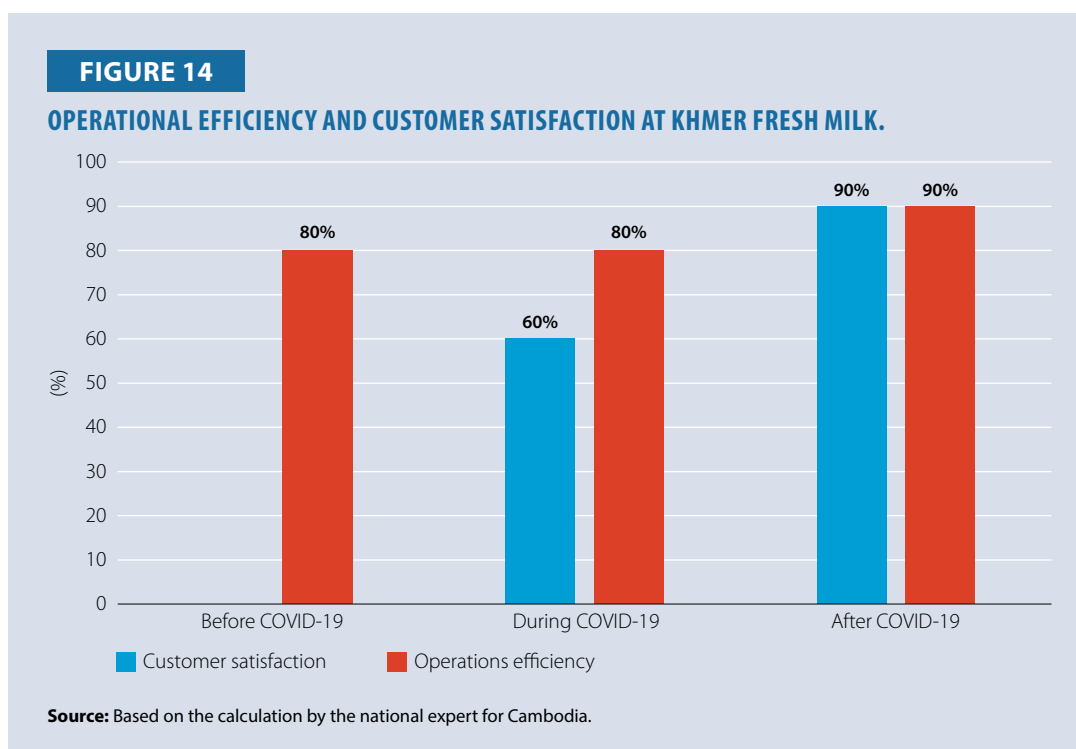


Figure 14 shows that the company’s operational efficiency remained strong, maintaining 80% before and during the pandemic and increasing to an impressive 90%. This trend reflects the

company's robust and effective management structure. The ability to sustain high operational efficiency during challenging times demonstrates the resilience and adaptability of the management team, contributing to the overall success and effectiveness of the company's operations.

Moreover, the company adopted a commendable strategy during the pandemic by focusing on community support and donations to areas under lockdown. This approach likely contributed to increased customer satisfaction, which jumped from 60% during the pandemic to 90% in the post-COVID-19 period.

The positive customer response may be attributed to various factors, including community involvement, social responsibility, and the perceived value of the products. Engaging in philanthropy and supporting local communities helped build customer trust and loyalty. During challenging times like the pandemic, businesses that demonstrate empathy and contribute positively to society often receive favorable responses from their customer base.

Analysis of the Company Data

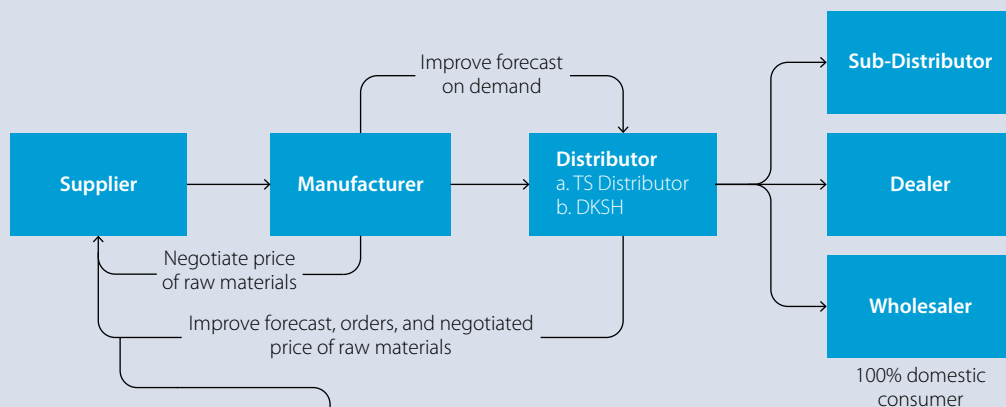
The case study examines the structure and dynamics of the company's supply chain system, as presented in Figure 15. The company's strategic focus on negotiating raw material prices, enhancing demand forecasting, and optimizing order processes with suppliers and distributors indicates a multifaceted approach to improving operational efficiency and cost-effectiveness. By effectively negotiating raw material prices, the company managed production costs and enhanced overall profitability.

Improving demand forecasting is crucial for aligning production levels with actual market demand, preventing overstock or shortages. Additionally, streamlining the ordering processes with suppliers and distributors underscores the company's emphasis on supply chain efficiency, reducing lead times, and ensuring a smoother flow of goods. This strategic focus demonstrates a commitment to cost control, operational excellence, and responsiveness to market dynamics, which in turn strengthens the company's competitiveness and supports its sustained growth.

The performance benchmarking following collaboration on the supply chain highlights the company's commitment to optimizing operational efficiency. By evaluating key performance indicators before and after the collaboration, the company gains valuable insights into the effectiveness of its initiatives. Whether negotiating better prices for raw materials, improving demand forecasting, or streamlining order processes with suppliers and distributors, the company aims to achieve cost savings, reduce lead times, and enhance supply chain responsiveness. This strategic approach aims to control costs, improve efficiency, and foster stronger relationships with suppliers and partners. The benchmarking process helps identify areas of success and opportunities for further refinement, ensuring that the collaborative supply chain efforts contribute to the company's competitiveness and sustained growth.

The case study examines the structure and dynamics of the company's supply chain system, with a strategic focus on learning and growth, particularly from the human capital perspective. This encompasses the development of knowledge, skills, and values among its workforce, underscoring the company's commitment to fostering continuous learning and personal growth. The company aims to cultivate a dynamic and adaptable workforce by prioritizing employees' skills and knowledge enhancement, ultimately strengthening its organizational capabilities.

FIGURE 15
STRUCTURE AND DYNAMICS OF THE SUPPLY CHAIN SYSTEM IN THE COMPANY.



Baseline Performance Before Collaboration		Benchmarked Performance After Collaboration
Aluminum foil for yogurt lid from Israel	vs	Aluminum foil for yogurt lid from Israel, China, and Vietnam
Packaging material from China and Vietnam	vs	Packaging material from China, Vietnam, and Cambodia
Supplier of ingredient locally by DKSH company	vs	Supplier of ingredient locally by DKSH company
Machine/system maintenance from Israel	vs	Machine/system maintenance from Cambodia and Israel

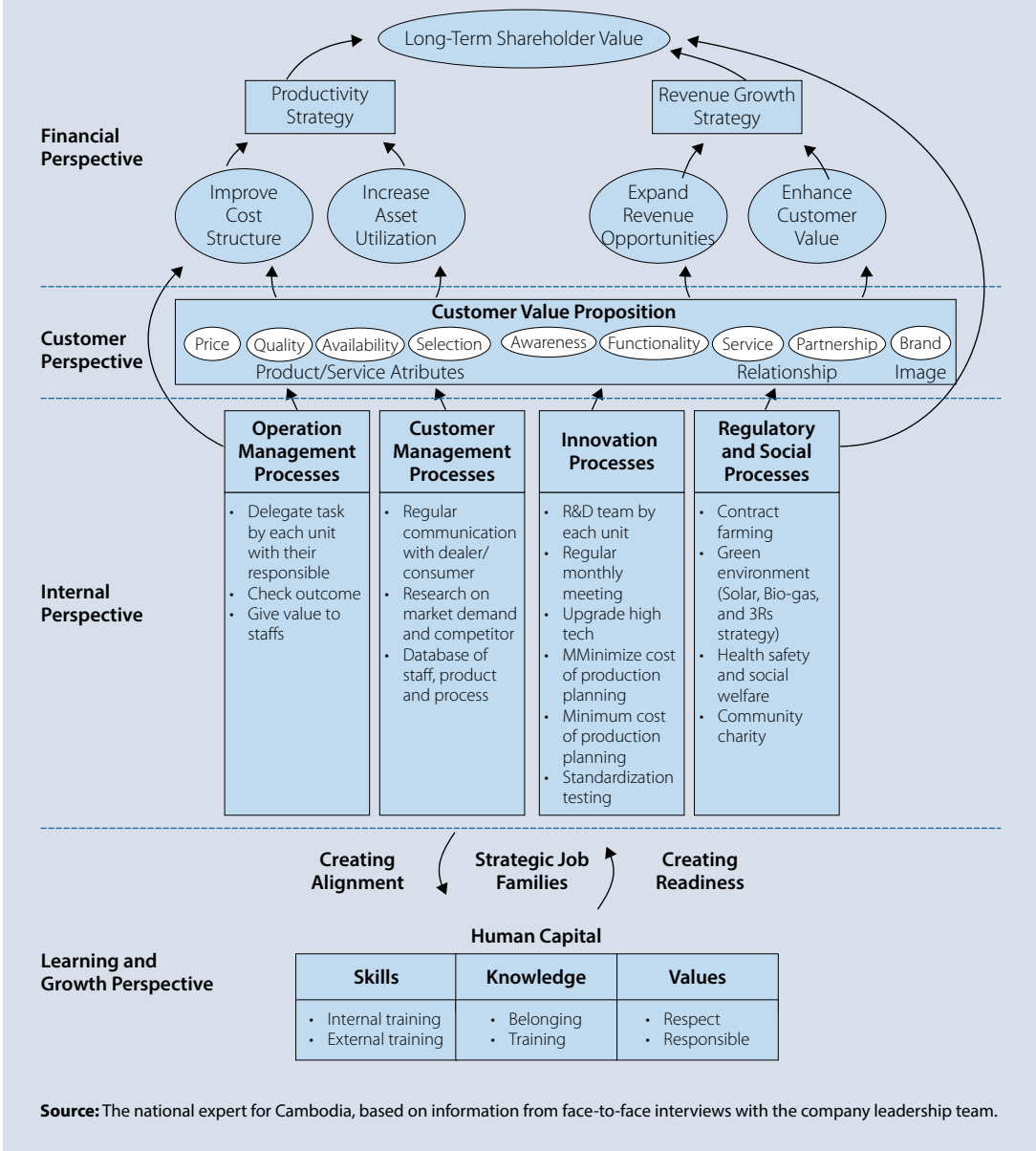
Source: The national expert for Cambodia, based on information from face-to-face interviews with the company leadership team.

The company has also structured its internal operations by focusing on critical areas such as operational management processes, customer management, innovation, and compliance with regulatory and social standards. This comprehensive approach demonstrates the company’s dedication to excellence in core operations, efficient customer relationship management, fostering innovation, and adhering to regulatory and social responsibilities. By addressing these internal factors, the company seeks to improve overall operational efficiency, customer satisfaction, and long-term sustainability, showcasing a holistic strategic management framework, as illustrated in Figure 16.

The company’s strategic focus also extends to improving customer satisfaction, loyalty, and engagement. By prioritizing customer needs and experiences, the company aims to build strong relationships and enhance its market position.

Finally, the financial perspective is integral to the company’s strategic framework. This involves optimizing financial performance, profitability, and return on investment. Efficient financial management ensures the company’s sustainability and ability to reinvest in key areas for continued growth and success. This comprehensive approach highlights the company’s commitment to balancing various aspects for overall organizational excellence.

FIGURE 16
MULTI-DIMENSIONAL BUSINESS PERFORMANCE EVALUATION FOCUSING ON HUMAN CAPITAL.



Source: The national expert for Cambodia, based on information from face-to-face interviews with the company leadership team.

Conclusion and Recommendations

The analysis highlights the challenges and opportunities that supply chains in Cambodia face, particularly in the post-COVID-19 era and amidst geopolitical tensions. The country’s strategic positioning and favorable policies make it an attractive destination for foreign investment, aligning with the global trend of adopting a ‘Plus One’ strategy. Cambodia’s commitment to enhancing administrative procedure aims to seamlessly integrate the country into regional and global supply chains, bolstered by government-led initiatives to foster deeper integration and ensure sustained economic growth and competitiveness on the global stage.

Cambodia’s proactive investments in infrastructure, participation in global trade agreements, and commitment to international collaboration position it as a significant player in the

evolving dynamics of the global supply chain. Despite positive trade balances in key sectors like textiles and agriculture, vulnerabilities were exposed, especially in tourism and manufacturing, highlighting the need for diversification and resilience. The government's focus on infrastructure, digitalization, and sustainability indicates a commitment to rebuilding and recovering GSCs.

Post-COVID-19 business performance can vary across industries due to factors such as market conditions and the effectiveness of adaptation strategies. In some cases, businesses may experience improved performance compared to pre- and during-COVID-19 levels, driven by increased demand for certain products and services, adopting efficient business practices, and accelerated digital transformation. However, ongoing supply chain disruptions, shifts in consumer behavior, and economic uncertainty may continue to pose challenges for others.

In the post-COVID-19 period, businesses must quickly adjust production levels to accommodate the partial recovery in demand while addressing the lingering effects of the pandemic, including supply chain disruptions and labor shortages. A focus on agility, resilience, and adaptability in supply chain management is essential, with strategies like flexible operations, robust contingency planning, and efficient inventory management being crucial to navigating changing demand patterns and the supply chain landscape.

Recommendations

Diversification and Technological Advancements: Cambodia should continue efforts to diversify its economy, reduce reliance on specific imports, and promote technological advancements. Encouraging businesses to adopt technology and digitalization across industries will enhance efficiency, productivity, and competitiveness. Incentivizing technology investment and supporting digital skills training will facilitate the adoption of innovative solutions.

Supply Chain Resilience: Investments in infrastructure, technology, and logistics are essential for enhancing supply chain resilience. Building a more robust and adaptable supply chain network will help mitigate the impact of future disruptions.

Promoting Domestic Production: Policymakers should implement measures to address negative trade balances, including incentives for local industries, investments in technology, and supporting capacity-building initiatives. This will reduce dependence on foreign sources and bolster local production.

Investment in R&D: Cambodia should aim to increase R&D expenditure to 1% of GDP by 2030, fostering innovation and long-term economic development. Encouraging public and private sector investment in R&D is essential to achieving this goal.

Adaptive Economic Strategies: Policymakers should focus on adaptive economic strategies, such as effective vaccination campaigns, stimulus measures, and support for industries affected by economic downturns, to ensure sustainable recovery and growth.

Sustainable Economic Growth: Policies should balance economic growth with sustainability by promoting environmentally friendly practices, responsible resource management, and social inclusion to ensure long-term resilience.

Additional Policy Implications

Infrastructure Development: Emerging economies can learn from Cambodia’s proactive stance on infrastructure development. Investments in critical infrastructure, such as science parks, SME clusters, industrial parks, and special economic zones with comprehensive industrial support, will improve connectivity, streamline logistics, develop digital infrastructure, and attract foreign investment. These initiatives are instrumental in facilitating Cambodia’s deeper integration into regional and global supply chains.

Strategic Partnerships and Trade Agreements: Forming strategic partnerships and participating in Regional Trade Agreements (RTAs) will create a conducive environment for businesses to thrive in the global marketplace. Policymakers should prioritize infrastructure development, trade facilitation, and sustainable economic diversification.

Agro-Processing and Skill Development: Cambodia should adopt a multifaceted approach to enhance the resilience and competitiveness of its supply chain. Prioritizing investments in agro-processing, addressing skilled labor shortages, and fostering technology adoption in agriculture are crucial for successful integration into GSCs. Ongoing collaboration with the private sector will also be vital for success.

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INDIA

Introduction

Geopolitical uncertainties, the COVID-19 pandemic, trade tensions, and regional wars have brought the vulnerabilities inherent in the GSC to the forefront. With its strategic location, vast talent pool, young workforce, and burgeoning market, India has positioned itself as a promising destination for diversifying shifts in the GSC.

Among other things, the COVID-19 pandemic has caused a shift in the attitude toward supply chains from efficiency to security and from 'just in time' to 'just in case.' The Government of India sensed a big opportunity in this shift and quickly introduced the Production Linked Incentive (PLI) Scheme to demonstrate its commitment to playing an essential role in the GSC ecosystem. The country now has the physical and digital infrastructure to raise the share of the manufacturing sector in the economy and make a realistic bid to be a key global supply chain player (MoF, 2023).

GSC Diversification and Relocation Strategies

With companies aiming to reduce supply-related risks associated with overreliance on specific regions or countries, GSC diversification and relocation strategies have gained prominence. Diversification involves spreading sourcing and production activities across multiple regions or countries to increase flexibility and resilience. This strategy enhances supply chain resilience by mitigating the impact of local disruptions and conflicts. Relocation strategies involve moving production facilities to diverse geographic locations to reduce vulnerability to supply chain disruptions in specific regions. Firms strategically relocate to markets with favorable trade policies, operational environments, and proximity to target markets.

GSC diversification and relocation strategies require digitalization and support of advanced technologies for real-time monitoring, data analytics, and predictive modeling. This helps optimize supply chain operations, anticipate disruptions, and adjust sourcing and production strategies. Technologies like Blockchain enhance transparency and traceability for better risk management. GSC diversification and relocation strategies are vital for building resilient and adaptable supply chain networks, ensuring business continuity in an increasingly uncertain world. India's push for digitization, reflected in the Digital India initiative, facilitates e-governance, electronic manufacturing, and IT-enabled services.

Overview of the Government Approach

Nestled between the Middle East and Southeast Asia along with an expansive coastline, India promotes port-led industrial development, propelling it as a manufacturing and export nucleus. India has become a key player in the GSC restructuring process due to its strategic advantages and proactive policy reforms. Some of the policy initiatives taken by the Government of India and diversification and relocation trends have been outlined in the following sections.

Policy Initiatives of the Government of India

Policy Initiatives: The government introduced the Make in India initiative in 2014, aiming to transform India into a global manufacturing hub by facilitating investments and fostering innovation

in 25 manufacturing sectors, including electronics, textiles, and automobiles (DPIIT, n.d.). The Make in India campaign encourages foreign and domestic companies to set up their manufacturing base in the country. It emphasizes easing business regulations, infrastructure development, and sector-specific reforms to drive economic growth. The impact of these initiatives is reflected in India's consistent rise in the World Bank's Ease of Doing Business ranking from 130th in 2016 to 63rd in 2020 (World Bank, 2020).

Establishing sector-specific clusters, such as electronic manufacturing clusters, provides an ecosystem for efficient resource utilization and knowledge sharing, making it attractive for businesses to relocate.

The Government of India notified the PLI Scheme for IT Hardware on 3 March 2021, offering incentives of 4% to 2% or 1% on net incremental sales (over the base year) of goods manufactured in India within the target segment to eligible companies for four years.

The scheme aims to promote large-scale manufacturing, boost exports, reduce import dependency, and attract global supply chain investments. It also increases applicants' flexibility and is tied to incremental sales and investment thresholds to incentivize growth further.

Semiconductor design, IC manufacturing, and packaging are also included as incentivized components of the PLI Scheme 2.0 for IT Hardware. The scheme extends an average incentive of around 5% on net incremental sales (over the base year) of goods manufactured in India and covered under the target segment to eligible companies for six years. The target segments include laptops, tablets, all-in-one PCs, servers, and ultra-small form factor devices (MeitY, 2023).

Infrastructure Development: Recognizing the critical role of robust infrastructure in supply chain management, the Government of India has prioritized the development of industrial corridors, dedicated freight corridors, logistics parks, and digital connectivity (NICDC, n.d.). Notable projects include the Delhi-Mumbai Industrial Corridor and the Sagarmala initiative. The Sagarmala project, which focuses on port-led development, represents a significant step toward boosting India's maritime logistics capacity (Ministry of Ports, Shipping, and Waterways, 2016).

FDI Liberalization: The government has made concerted efforts to attract FDIs in India. It has liberalized the FDI norms for several sectors, including defense, telecom, and retail, enabling easier capital inflow and technology transfer (DPIIT, 2020).

Global Partnerships: Strengthening bilateral ties with countries like Australia, Japan, and the USA has bolstered India's position in the global supply chain. The QUAD, comprising Australia, India, Japan, and the US, has been actively discussing the creation of a resilient supply chain initiative to reduce over-reliance on a single country or region (MEA, 2021). Similarly, the government has formed the India-Japan Industrial Competitiveness Partnership to promote cooperation in relocating businesses and diversifying supply chains (MEA, 2023).

Skill and Technology Focus: Initiatives like Skill India and Digital India (GoI, 2015) aim at leveraging the demographic dividend and digitization for a tech-integrated supply chain. The Skill India initiative seeks to empower the youth with industry-relevant skills. With over 62% of India's population in the working age group (15–59 years) and more than 54% of the total population below 25, the initiative aims to reap the benefits of the demographic dividend.

According to the US Census Bureau estimate, by 2022, countries like China, the UK, and the USA will fall short of skilled labor by 10 million, 2 million, and 17 million, respectively, while India will have a surplus of almost 47 million workforce in the age group of 19–59 years. Countries of destination can leverage this strength to meet their labor and skill shortages. The Skill India initiative was launched to train people in different industrial skills (Ministry of Skill Development and Entrepreneurship, 2015).

Tax and Financial Incentives: A reduction in corporate tax, the introduction of the Goods and Services Tax (GST), and other financial reforms have helped simplify business operations in India and make the country an economically viable option for relocation.

The government’s multi-pronged approach towards supply chain diversification and relocation is a testament to its commitment to establishing India as a reliable and competitive player in the global supply chain ecosystem. By creating a conducive environment through policy reforms, incentives, and infrastructure development and by fostering international collaborations, the country is poised to play a significant role in the evolving global supply chain narrative.

New GSC Dynamics and Their Impact on Aggregate and Firm-Level Productivity

The global supply chain landscape has dramatically changed due to geopolitical tensions, technological progress, and the COVID-19 pandemic. These shifts impact the flow of goods and services worldwide and significantly affect productivity, particularly in emerging economies like India.

Impact of GSC on India

This section analyses GDP per capita and its growth during 2005–22. The country’s GDP per capita more than doubled from USD948 in 2005 to USD2,085 in 2022, at a Cumulative Average Growth Rate (CAGR) of 4.87%. During the COVID-19 pandemic in 2020, the growth rate declined to -5.83%. R&D expenditure as a percentage of GDP fell from 0.85% in 2005 to 0.66% in 2018. The labor force increased at a CAGR of 1.36% during 2005–22.

Similarly, the country’s labor productivity grew at a CAGR of 4.98% during 2005–22, increasing by over twofold from USD2,593 in 2005 to USD5,639 in 2022, as shown in Table 1. Labor productivity in India declined substantially during COVID-19, dropping to -1.52% in 2019 and further to -5.07% in 2020. It then rebounded strongly, reaching 6.69% in 2021. Figure 1 presents India’s GDP and labor productivity growth trends between 2005 and 2022.

TABLE 1

GDP, R&D EXPENDITURE, LABOR FORCE AND PRODUCTIVITY IN INDIA (2005–22).

Year	GDP Per Capita (Constant 2015 USD)	GDP Per Capita Growth (Annual %)	R&D Expenditure (% of GDP)	Labor Force Total (Million)	GDP (Constant USD 2015 Million)	Labor Productivity (USD 2015)	LP Growth (in %)
2005	947.76	7.92	0.82	422	1,094,324	2,593.19	–
2006	1,008.67	8.06	0.80	431	1,182,534	2,743.70	5.80
2007	1,070.13	7.66	0.81	441	1,273,126	2,886.91	5.22
2008	1,087.58	3.09	0.86	450	1,312,424	2,916.50	1.02
2009	1,156.88	7.86	0.83	459	1,415,605	3,084.11	5.75
2010	1,238.01	8.50	0.79	469	1,535,897	3,274.84	6.18

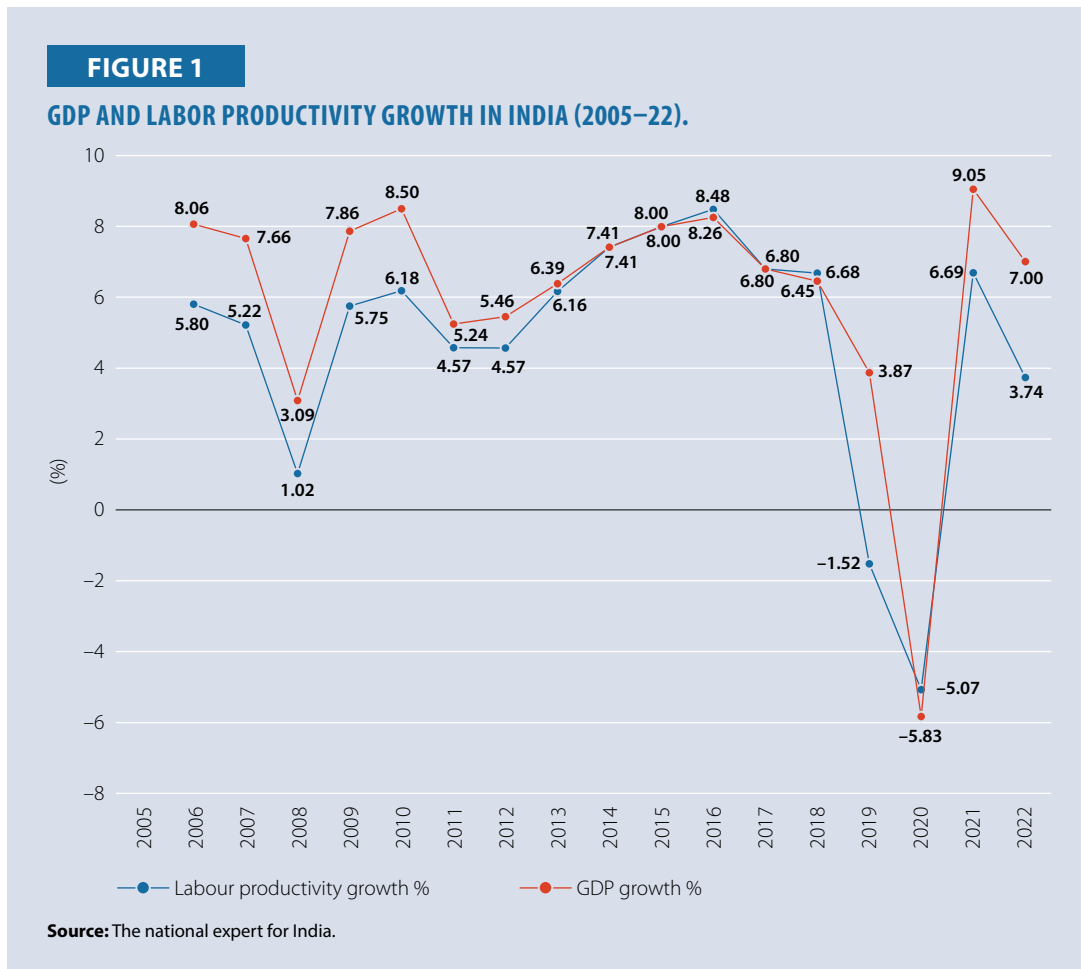
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Year	GDP Per Capita (Constant 2015 USD)	GDP Per Capita Growth (Annual %)	R&D Expenditure (% of GDP)	Labor Force Total (Million)	GDP (Constant USD 2015 Million)	Labor Productivity (USD 2015)	LP Growth (in %)
2011	1,285.28	5.24	0.76	472	1,616,399	3,424.57	4.57
2012	1,337.48	5.46	–	476	1,704,596	3,581.08	4.57
2013	1,404.55	6.39	0.71	477	1,813,453	3,801.79	6.16
2014	1,490.03	7.41	0.70	477	1,947,834	4,083.51	7.41
2015	1,590.17	8.00	0.69	477	2,103,588	4,410.04	8.00
2016	1,701.18	8.26	0.67	476	2,277,267	4,784.17	8.48
2017	1,795.91	6.80	0.67	476	2,432,016	5,109.28	6.80
2018	1,891.14	6.45	0.66	475	2,588,974	5,450.47	6.68
2019	1,944.31	3.87	–	501	2,689,205	5,367.68	-1.52
2020	1,813.53	-5.83	–	497	2,532,396	5,095.36	-5.07
2021	1,961.96	9.05	–	508	2,761,585	5,436.19	6.69
2022	2,085.12	7.00	–	524	2,954,977	5,639.27	3.74
CAGR (%)	4.87	–	–	1.36	6.41	4.98	–

Note: CAGR, Cumulative Average Growth Rate.

Source: The national expert for India, based on World Development Indicators 2023 data (World Bank, 2023).



An analysis of India's export and import trends from 2014–15 to 2021–22 reveals a significant decline during the COVID-19 pandemic, particularly in 2019–20 and 2020–21 (Table 2). However, in the post-pandemic years, notably 2021–22, exports and imports recovered substantially, with an impressive annual growth rate of 44.62% for exports and 55.42% for imports.

TABLE 2

TRENDS IN INDIA'S EXPORT AND IMPORT (2014–15 TO 2021–22).

Year	Export (in USD Million)	Import (in USD Million)	Export Growth Rate (in %)	Import Growth Rate (in %)
2015–16	262,291	381,008	–	–
2016–17	275,852	384,357	5.17	0.88
2017–18	303,526	465,581	10.03	21.13
2018–19	330,078	514,078	8.75	10.42
2019–20	313,361	474,709	–5.06	–7.66
2020–21	291,808	394,436	–6.88	–16.91
2021–22	422,004	613,052	44.62	55.42

Source: The national expert for India, based on Economic Survey 2018–19, 2020–21, and 2022–23 – Statistical Appendix data.

Challenges and Opportunities

Reshoring and Nearshoring Trends: Recent GSC disruptions worldwide have exposed the vulnerability of overreliance on single-country sourcing, leading to reconsidering supply chain structures. India is emerging as a favorable nearshoring destination, bolstered by the Atmanirbhar Bharat initiative, which aims to promote domestic manufacturing and self-reliance (PIB, 2020).

Digitalization of Supply Chains: The imperative for digital transformation is accelerating the adoption of IoT, AI, and Blockchain technologies. India's burgeoning IT sector is well-positioned to provide supply chain digital solutions, potentially increasing productivity through more efficient operations (NASSCOM, 2019).

Diversification of Supply Chains: Companies diversify their supplier base to mitigate future risks. India's large market, skilled labor force, and reformative policies make it an attractive destination for supply chain diversification.

Evolution of Trade Blocs: Despite opting out of the RCEP India is shaping its trade strategy through bilateral agreements and engagements with groups like the QUAD to strengthen trade ties (MEA, 2021).

Changing Consumer Preferences: The e-commerce market in India is rapidly expanding, driven by a shift toward online shopping and the demand for faster delivery. This shift enhances productivity through advanced logistics and warehousing.

Emphasis on Sustainability: The global shift towards sustainability is driving industries in India to adopt greener practices and innovate, aligning with international standards and opening up new markets (Ministry of New and Renewable Energy, 2019). Recognizing emerging markets' unique environmental and social challenges, the Securities and Exchange Board of India (SEBI) has mandated that ESG schemes invest at least 65% of Assets Under Management in listed entities that assure their Business Responsibility and Sustainability Report (BRSR) Core. To address concerns about transparency and

inappropriate selling of green securities, SEBI has also made it compulsory for the ESG-related schemes offered by asset management companies, particularly mutual funds, to invest 65% of their assets in listed companies that have embedded the BRSR Core. The BRSR Core requirements initially apply to the top 150 listed companies for the Financial Year 2023–24 (SEBI, 2023).

Aggregate Economy-Level Productivity in India

India's labor productivity at the aggregate economy level, measured as GDP per worker in US dollars (using 2017 PPP, reference year 2020), was USD15,400 in 2020. This represented 11% of the labor productivity level in the US during the same year. India's GDP growth during 2015–2020 was reported at 3.6% per annum, with contributions from various sectors: IT capital at 0.2%, non-IT capital at 2.5%, hours worked at 0.5%, labor quality at 0.2%, and the TFP showing a negative contribution of -0.2% (APO, 2022).

According to the IMD World Competitiveness Yearbook 2022, labor productivity at the national level in 2021, estimated in terms of GDP (PPP) per person employed, was reported at USD19,277. Labor productivity varies significantly across different sectors. For example, labor productivity in the agriculture sector, estimated in terms of GDP (PPP) per person employed in agriculture, was reported at USD6,795. In contrast, it was reported at USD20,587 in the industry sector, while in the services sector, it was significantly higher at USD34,999.

Regarding overall Competitiveness, India improved its rank from 44th in 2018 to 37th in 2022. The country ranked 43rd in 2021 but improved its overall competitiveness after the COVID-19 pandemic to 37th among 63 major global economies (IMD-World Competitiveness Yearbook, 2022).

Firm-Level Productivity in India

Operational Strategies: Domestic companies have been compelled to reevaluate their operational strategies to remain competitive on a global scale. They focus on process optimization, cost-efficiency, and adopting advanced technologies, such as automation and data analytics, to enhance their productivity.

Increased Competition: Indian firms now face increased competition from global players in domestic and international markets. This competition has driven companies to improve product quality, innovate, and streamline operations to maintain productivity.

Quality and Compliance Standards: Indian firms must meet stringent quality and compliance standards to participate effectively in GSCs. This has led to investments in quality control measures and regulatory compliance, further enhancing productivity.

Skill Development: To remain competitive, Indian firms increasingly focus on skill development among their workforce. Training programs and upskilling initiatives have become essential to ensure that employees are equipped with the necessary expertise to thrive in the evolving global supply chain landscape.

The evolving dynamics of GSCs have substantially changed India's competitive landscape at the firm level. Some of the broad firm-level productivity parameters have been summarized in Table 3. It may be noted that among seven parameters considered between 2014–22, improvements have been reported from four parameters such as firms competing against unregistered firms as percentage of total firms (Sl. no.2), firms formally registered when operations started as percentage of total firms (Sl. No.3), firms using banks to finance working

capital as percentage of total firms (Sl. No.5) and firms visited or required meetings with tax officials as percentage of total firms (Sl. No.6).

TABLE 3**FIRM-LEVEL PRODUCTIVITY PARAMETERS (2014–22).**

Sl. No.	Productivity Parameters (% of Firm)	2014	2022
1.	Firms that spend R&D	37.7	4.3
2.	Firms competing against unregistered firms	50.1	32.7
3.	Firms formally registered when operations started	87.2	77.8
4.	Firms offering formal training	35.9	7.7
5.	Firms using banks to finance working capital	36.4	33.9
6.	Firms visited or required meetings with tax officials	35.3	17.0
7.	Firms with female participation in ownership	10.7	3.9

Source: The national expert for India, based on World Development Indicators 2023 data (World Bank, 2023).

Impact of Global Supply Chains

Sectoral Coverage of GSC in India

GSCs have profoundly impacted various sectors of the Indian economy, affecting both traditional and emerging industries and reshaping the production, trade, and competitiveness landscape. This section analyses how GSCs have affected various sectors in India.

Manufacturing Sector

There was a visible uptick in electronics, pharmaceuticals, and automobile manufacturing activities. The government's Make in India initiative aimed to promote India as a global manufacturing hub. Manufacturing sector output growth in India before COVID-19, during COVID-19, and post-COVID has been reported in Figure 2. It may be noted that manufacturing sector output was over 9% before the pandemic. However, the manufacturing sector reported negative -3.82% growth during the 2019–20 COVID period. The industry reported a remarkable recovery post-COVID, growing at 21.27% during 2021–22, followed by 7.05% growth in 2022–23.

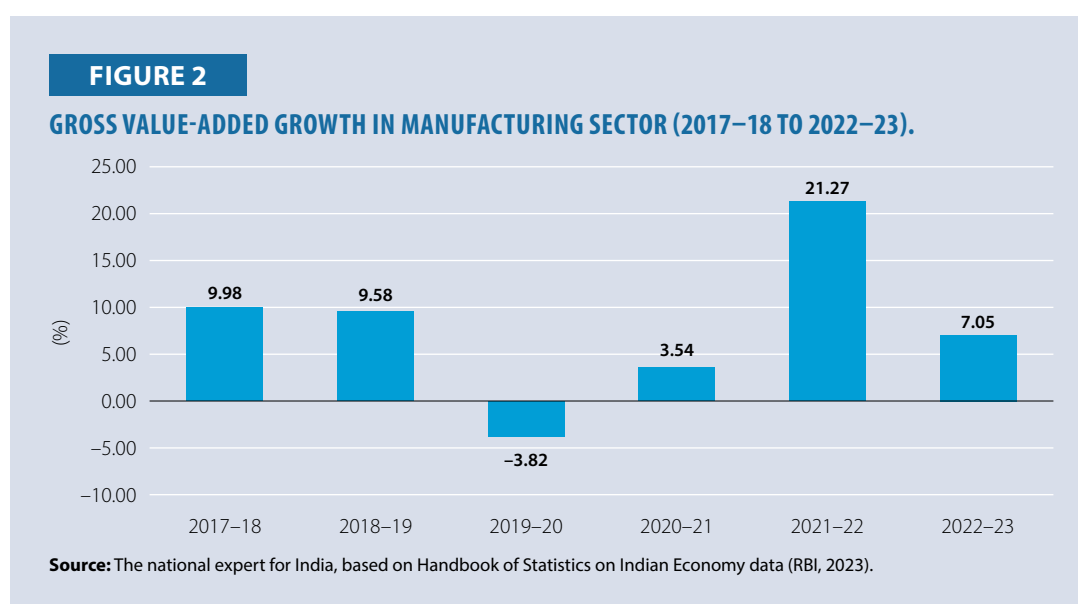
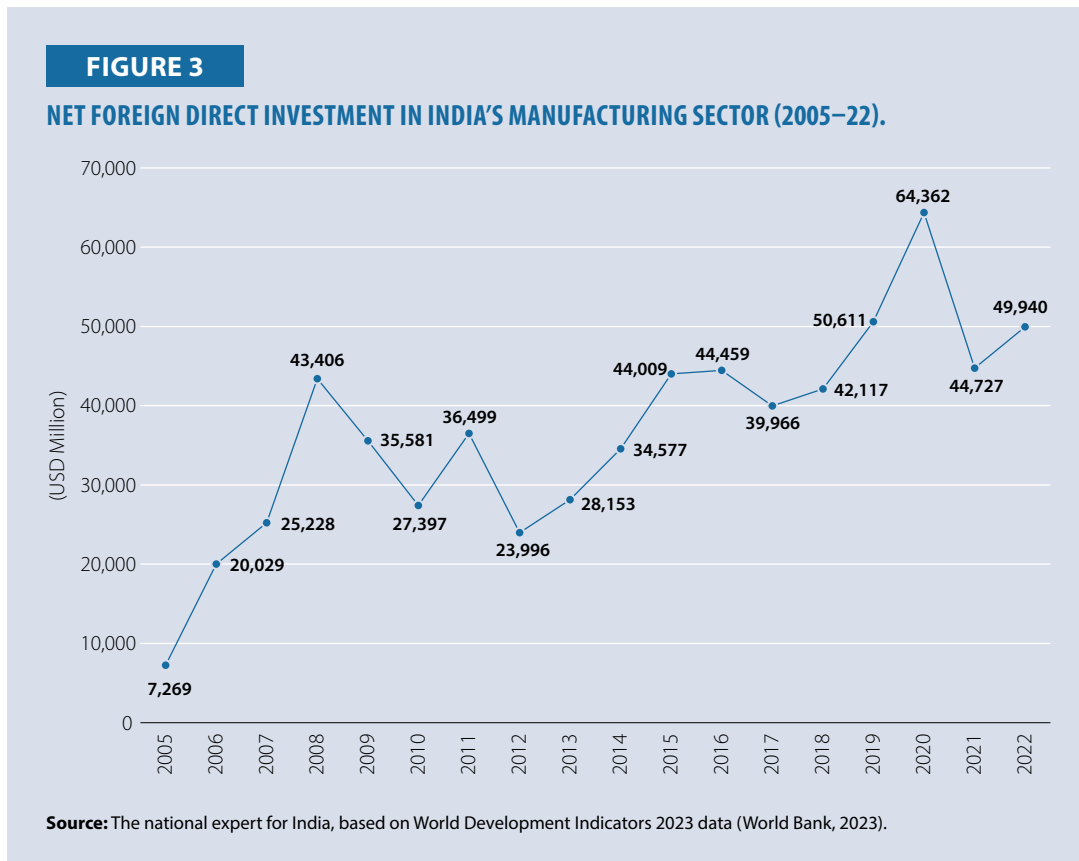


Figure 3 highlights the trends of net FDI inflows into India's manufacturing sector during 2005–22. The data shows a consistent increase in FDI over the years, with inflows rising almost sixfold from USD7,269 million in 2005 to USD49,940 million in 2022.



Information Technology and Services

India's IT and Business Process Outsourcing (BPO) industry has been at the forefront of global supply chain dynamics. The country's skilled workforce and cost-effective services have attracted global companies seeking outsourcing solutions. India's prowess in IT and services has integrated it into the global supply chain, offering services ranging from software development to BPO.

The IT sector has consistently grown, with many global firms establishing their R&D centers in India (Statista, 2024). The Information Technology–Business Process Management (IT–BPM) sector contributed about 7.5% of the GDP in fiscal year 2023. BPM is more like a discipline than a process, incorporating methods to analyze, automate, and improve business processes.

The share of the IT-BPM sector in GDP ranged from 5.8% in 2009 to 9.5% in 2015. The share declined to 7.5% in 2023 (Statista, 2024).

Electronics and Electricals

India's electronics and electrical sector has witnessed significant growth, positioning the country as an important manufacturing hub for electronic components and devices. Multinational electronics companies have established production units, promoting domestic manufacturing and technology transfer. Policies like the PLI scheme have boosted domestic electronics manufacturing (MeitY, 2023).

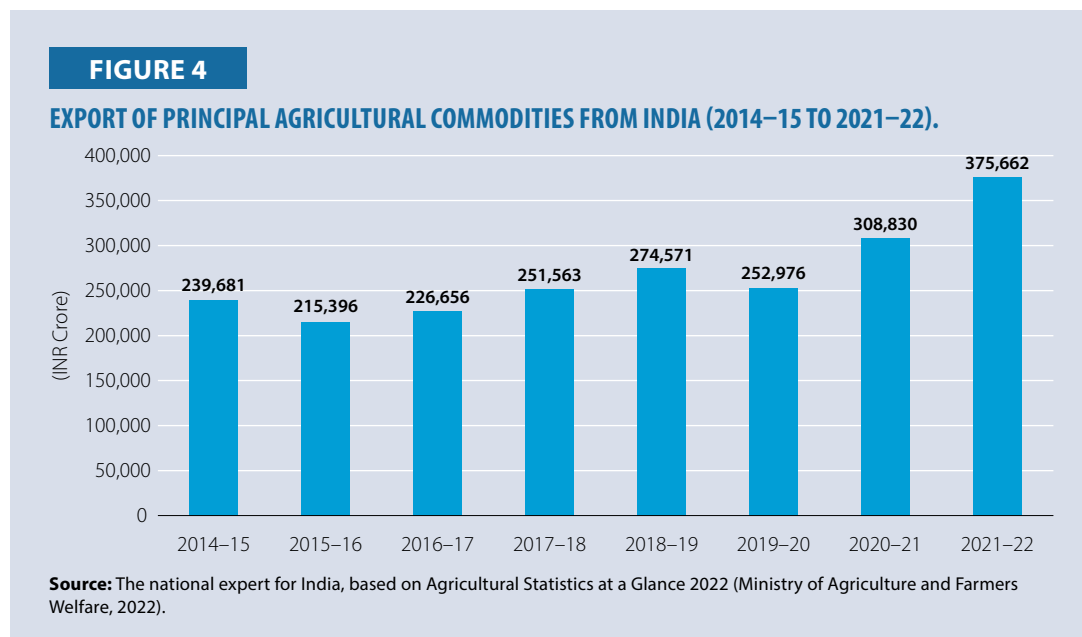
Key Highlights

- India's domestic production grew at a CAGR of 13%, rising from USD49 billion in FY 2016–17 to USD101 billion in FY 2022–23.
- The country's electronics exports are projected to reach USD120 billion by FY 2025–26.
- India ranked 61st in the Network Readiness Index 2022, improving by six ranks from 67th in 2021.
- Data costs in India saw a substantial reduction, dropping from INR 269 per GB in 2014 to INR10.1 per GB in 2023.
- The government has allowed 100% FDI under the automatic route. In the case of defense electronics, while FDI is allowed up to 49% through the automatic route, any investment beyond 49% requires government approval.

India will become a trillion-dollar digital economy by FY 2025–26. Currently, the electronics market in India is valued at USD155 billion, with domestic production accounting for 65%. Technology transitions such as the rollout of 5G networks and IoT are accelerating the adoption of electronics products. Initiatives such as Digital India and Smart City projects further drive demand for IoT devices, ushering in a new era for the country's electronic sector (Invest India, 2023).

Agriculture and Food Processing

While exports of items like Basmati rice and spices have increased, there has also been a need to diversify crops and improve storage facilities (APEDA, 2020). As illustrated in Figure 4, the export of principal agricultural commodities from India showed a significant upward trend, rising from INR239,681 crore in 2014–15 to INR375,662 crore in 2021–22. This growth was particularly notable during COVID-19, indicating the resilience and global demand for India's agricultural exports despite global supply chain disruptions.



Textiles and Apparel

India's textiles and apparel industry has leveraged GSCs to become one of the largest textile producers and exporters worldwide. Increased demand for Indian textiles and garments has spurred sectoral growth, generating employment and improving productivity. With trade wars and the shift away from China, India has seen opportunities but faces competition from nations like Bangladesh and Vietnam (Ministry of Agriculture & Farmers Welfare, 2022).

Exports of textiles and apparel, including handicrafts, remained static until 2018–19 (Figure 5). However, the COVID-19 pandemic negatively impacted exports during 2019–20 and 2020–21.

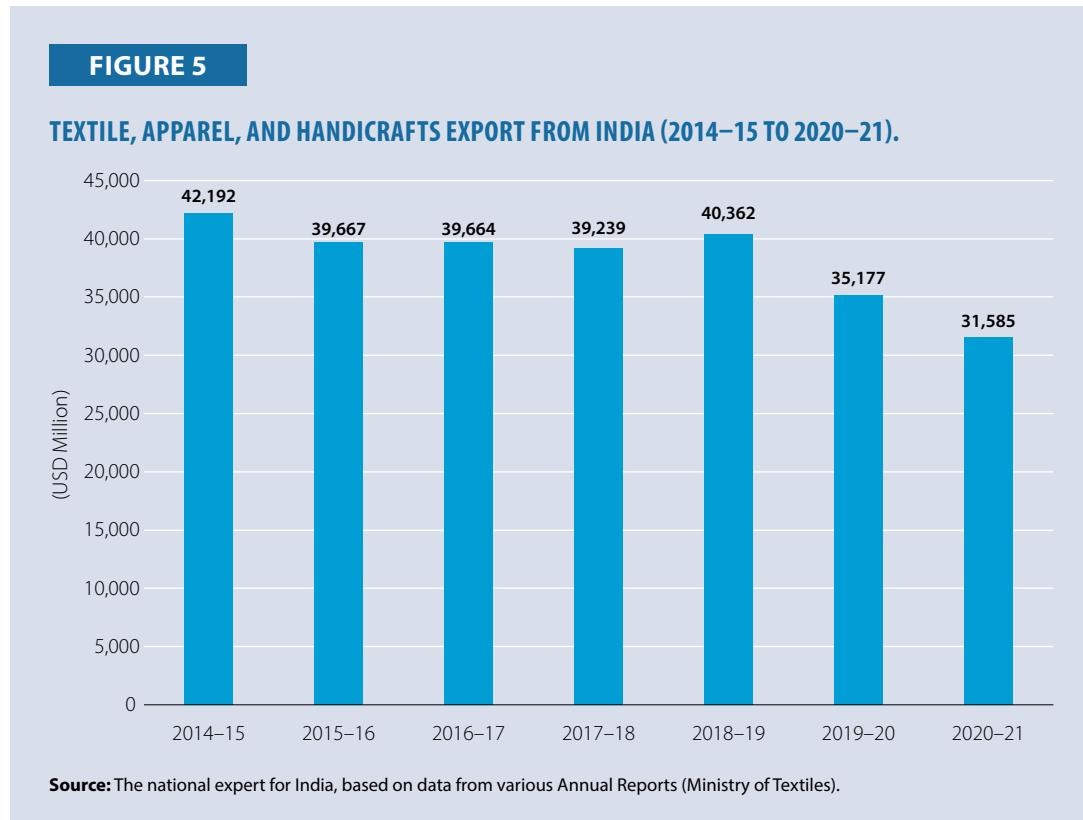


Figure 6 presents the share of textile and apparel, including handicrafts, in total exports from India. The figure exhibits a steady decline, as the share declined from 13.6% in 2014–15 to 10.8% in 2020–21.

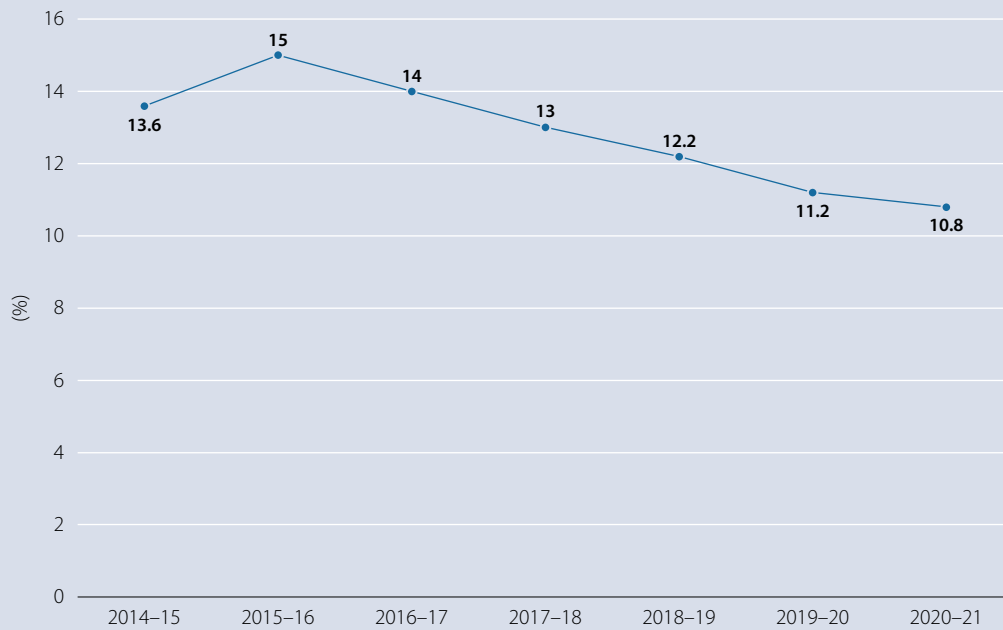
Renewable Energy

India is making significant strides in expanding its renewable energy capacity, with an ambitious target of reaching 450 GW by 2030 (Ministry of New and Renewable Energy, 2019). As shown in Figure 7, the country's generation capacity of renewable energy sources has grown substantially from 61719 MU (5.56% of total energy) in 2014–15 to 170912 MU (11.46% of total energy) in 2021–22.

Figure 8 shows that the year-on-year RES generation growth rate remained steady at around 24% until the COVID-19 outbreak in 2019–20. The growth rate declined considerably during the pandemic (2019–20 and 2020–21). However, post-COVID recovery saw a resurgence, with RES generation growth rebounding to 16.07% in 2021–22.

FIGURE 6

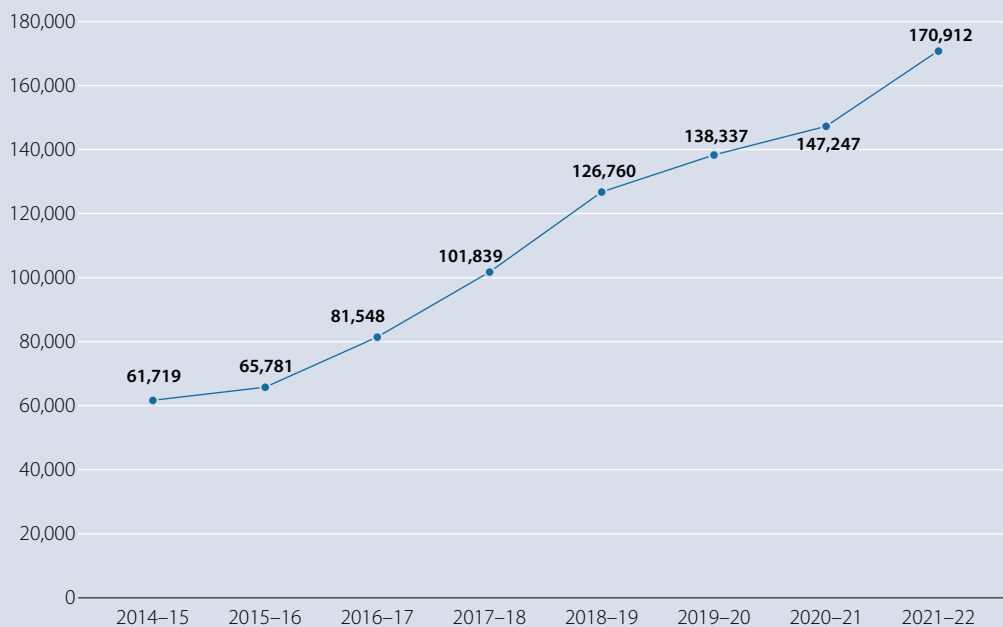
SHARE OF TEXTILE, APPAREL, AND HANDICRAFTS AS PERCENTAGE TO TOTAL EXPORT.



Source: The national expert for India, based on data from various Annual Reports (Ministry of Textiles).

FIGURE 7

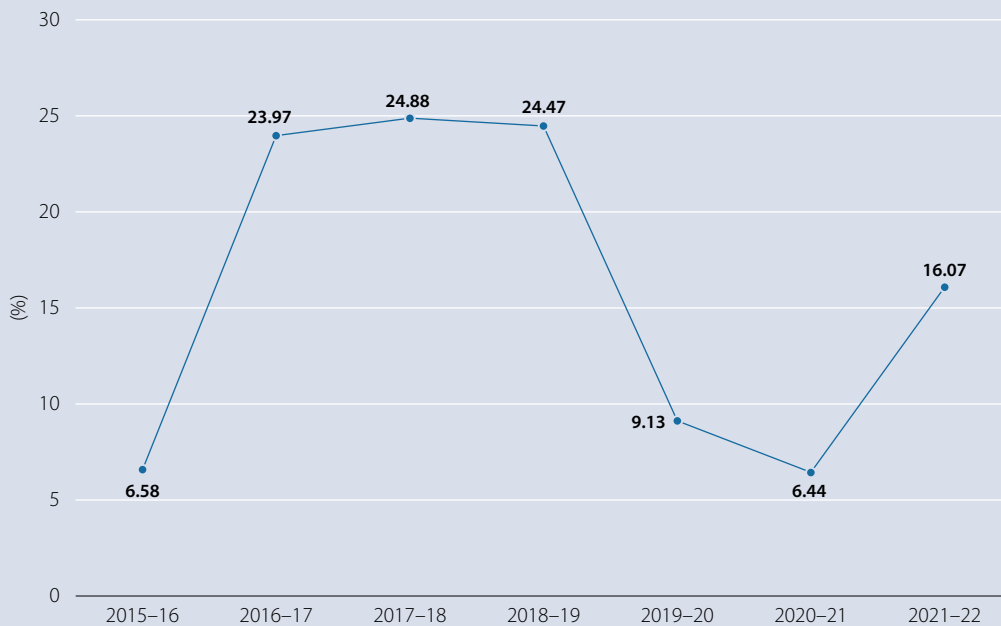
RENEWABLE ENERGY SOURCES GENERATION (MU) IN INDIA (2014-15 TO 2021-22).



Source: The national expert for India, based on CEA Annual Report 2021-22 data.

FIGURE 8

RES GENERATION GROWTH RATE IN INDIA (2014–15 TO 2021–22).



Source: The national expert for India, based on CEA Annual Report 2021–22 data.

Automotive Industry

The automotive sector in India has experienced substantial growth and diversification due to its integration into the GSC. Multinational automobile manufacturers have established production facilities in India, increasing domestic production and exports. This sector contributes over 7% to India's GDP, or almost 49% of the manufacturing GDP, and employs (directly and indirectly) over 29 million people. According to the India Brand Equity Foundation, India replaced Germany in 2019 as the world's fourth-largest automobile market and is expected to reach USD300 billion by 2026 (Chowdhary, 2021).

Pharmaceuticals and Healthcare

India's pharmaceutical sector plays a critical role in the global supply chain, particularly for generic medicines, and has been instrumental in the global fight against the COVID-19 pandemic. Indian pharmaceutical companies are major suppliers to international markets, including Europe and the United States.

India's domestic pharmaceutical market was valued at USD41 billion in 2021 and is projected to touch USD65 billion in 2024, with further expectations to reach USD130 billion by 2035. Globally, India is ranked third in pharmaceutical production by volume and 14th by value. The country holds a 20% share of the global supply of generic medicines and is the leading vaccine manufacturer worldwide, commanding a 60% market share in this segment (MoF, 2023).

Impact of New GSC Trends on Aggregate Productivity and Economic Development

Recent trends in GSCs have positively contributed to India's aggregate productivity and overall economic development. The pandemic highlighted the fragility of highly concentrated supply chains, particularly in sectors like healthcare and electronics. Lockdowns, travel restrictions, and

disruptions in the flow of goods underlined the need for diversification and redundancy. Additionally, consumers' changing behaviors, including increased reliance on e-commerce, amplified the demand for supply chain adaptability and speed. India, traditionally reliant on China for various sectors, particularly pharmaceuticals and electronics, felt the need to diversify its import sources.

Shift from Unilateral to Multilateral Supply Chains

Recent GSC trends showcase a transition from single-source supply chains to multiple, diversified sources. This shift has placed India in a vantage position as companies seek alternative sourcing destinations, particularly manufacturing. The influx of companies boosts domestic manufacturing and stimulates aggregate productivity (World Bank, 2020).

Table 4 provides data on India's imports from China, Vietnam, and Thailand during 2017–18 to 2022–23. The share of total imports from China was reported at 13.68% in 2018–19, which increased to 21.16% in 2022–23, exhibiting an increasing trend.

TABLE 4

INDIA'S IMPORTS FROM CHINA, VIETNAM, AND THAILAND (2017–18 TO 2022–23).

Years	China (USD Million)	% to Total	Vietnam (USD Million)	% to Total	Thailand (USD Million)	% to Total	Total Import (USD Million)
2017–18	76,381	16.41	5,018	1.08	7,134	1.53	465,581
2018–19	70,319	13.68	7,192	1.40	7,442	1.45	514,078
2019–20	65,261	13.75	7,283	1.53	6,788	1.43	474,709
2020–21	65,212	16.53	6,120	1.55	5,683	1.44	394,436
2021–22	94,571	15.43	7,438	1.21	9,332	1.52	613,052
2022–23	98,506	21.16	8,794	1.23	11,194	1.56	715,968

Source: The national expert for India, based on data from the Export-Import Databank (Department of Commerce, n.d.).

China Plus One Strategy

Globally, companies are adopting the China Plus One strategy, ensuring a secondary base outside China. This strategy allows India to attract businesses seeking an alternative to China. The government's incentives, such as the Make in India and PLI schemes, have been designed to capitalize on this trend.

Reshoring and Nearshoring Trends

Post-COVID, businesses are looking closer to home or reshoring their operations for better risk management. With its market size and favorable labor dynamics, India is increasingly viewed as a suitable reshoring destination, particularly for businesses shifting away from China.

Relocation and Infrastructure Challenge

Relocating businesses needs robust infrastructure, a long-standing challenge for India. India has accelerated its infrastructural development projects, focusing on industrial corridors, dedicated freight corridors, and port-led development under the Sagarmala project. Post-COVID-19, there has been an emphasis on creating resilient supply chains that can withstand shocks.

Further, PM GatiShakti has helped accelerate infrastructure development by integrating the seven growth engines of roads, railways, airports, ports, mass transport, waterways, and logistic infrastructure. While traditional infrastructure sectors such as roads and railways have received a

renewed push in recent years, sectors such as inland water transport and civil aviation, which have significant untapped potential, are also being encouraged sufficiently. Parallely, the focus is also on improving coordination among stakeholders and ministries. This will help resolve compliance issues and increase the efficiency and effectiveness of investments (MoF, 2023).

As presented in Table 5, over 1,521 infrastructure projects were underway across India during 2022–23, with an original cost of INR2,118,597 crore and an anticipated cost of INR2,576,798 crore.

TABLE 5

INVESTMENT IN INFRASTRUCTURE PROJECTS IN INDIA (2018–19 TO 2022–23).

Year	Number of Infrastructure Projects	Original Cost (INR Crore)	Anticipated Cost (INR Crore)
2018–19	1,405	1,809,681	2,139,924
2019–20	1,686	2,066,772	2,471,948
2020–21	1,737	2,233,410	2,669,649
2021–22	1,579	2,195,197	2,678,366
2022–23 (up to Oct 2022)	1,521	2,118,597	2,576,798

Source: The national expert for India, based on data from answers to Unstarred Question No. 636 during the Rajya Sabha Session 258 (Open Government Data Portal, 2022).

Diversification of Suppliers: Indian companies have been diversifying their supplier bases, reducing overreliance on a single source. This strategy mitigates risks associated with supply chain disruptions. For example, pharmaceutical companies have diversified their API suppliers.

Promotion of Domestic Manufacturing: The Indian government has actively promoted domestic manufacturing through the Make in India campaign. Incentives such as the PLI scheme encourage companies to set up manufacturing units in India to reduce import dependency (MeitY, 2023).

Investment in Infrastructure: The development of logistics and infrastructure, including ports, transportation networks, and cold chain facilities, has been prioritized. Improved infrastructure enhances supply chain efficiency.

Digital Transformation: Companies have accelerated digital transformation efforts to enhance supply chain visibility and responsiveness. Blockchain, IoT, and AI are being adopted to improve transparency and traceability (NITI Aayog, 2021).

Focus on Pharmaceuticals and Healthcare: The pandemic underscored the need for self-reliance in critical healthcare supplies. India has been investing in the pharmaceutical sector, aiming to become a global manufacturing hub for pharmaceuticals and medical devices.

Diversification into New Markets: Indian businesses are exploring new markets and trade partners. RTAs offer opportunities for diversifying export destinations (MEA, 2021a; MEA, 2023; MEA, 2021b).

Technological Integration in Supply Chains

The rise of Industry 4.0, marked by the integration of AI, IoT, and Blockchain, has become integral in GSCs. The enhanced technological integration boosts the IT sector and increases overall productivity by streamlining supply chain processes.

Emphasis on Sustainable Supply Chains

Sustainability has been at the forefront of recent GSC trends, emphasizing eco-friendly practices and sustainable sourcing. Despite initial challenges, India is transitioning towards green manufacturing and renewable energy. Environmental concerns are pushing businesses to adopt sustainable practices in their supply chains. While India faces challenges due to its coal-centric energy profile, there is an ongoing shift towards renewables and sustainable manufacturing practices, attracting green investments.

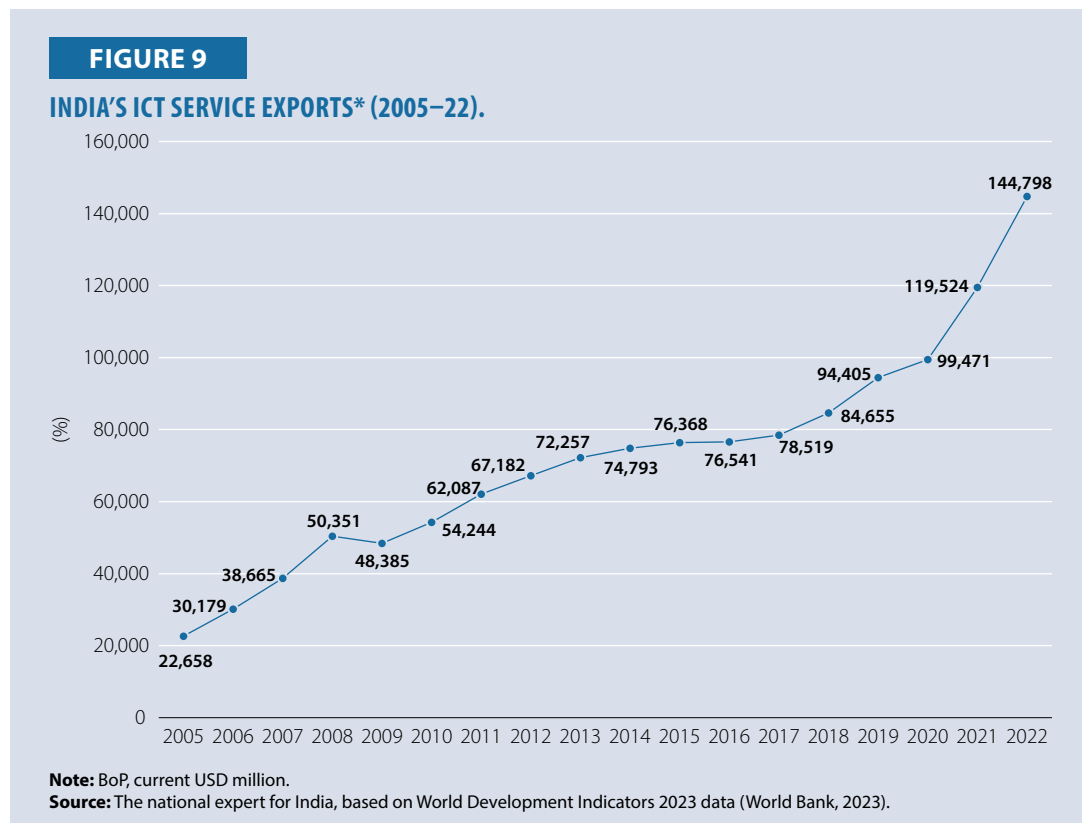
Rise of E-commerce and Digital Trade

E-commerce platforms have recently expanded and boosted the logistics, warehousing, and digital payment sectors. This not only increases productivity but also contributes significantly to economic growth. Digital payments have significantly increased recently due to the government's coordinated efforts with all stakeholders. The volume of digital payments has increased fourfold, from INR2,071 crore in FY 2017–18 to INR8,840 crore in FY 2021–22, a fourfold increase at a CAGR of 43.74% (MeitY, 2023).

Technological Disruptions

Emerging technologies such as AI, IoT, and Blockchain are becoming pivotal in GSCs. India, an IT giant, has capitalized on this shift, offering tech-driven solutions that enhance productivity and boost IT and services exports.

Figure 9 shows a steady rise in ICT service exports from India, from USD22,658 million in 2005 to USD144,798 million in 2022, about seven times in nominal terms. During the COVID-19 pandemic, ICT services exports from India increased from USD94,405 million in 2019 to USD144,798 million in 2022, driving an average annual growth of 15.32% throughout the pandemic years.



Ease of Doing Business

The Government of India has continuously introduced reforms to improve the Ease of Doing Business and make the country a lucrative relocation destination. India's Ease of Doing Business rankings, based on the World Bank's Doing Business Reports, improved from 142nd rank in 2014 to 63rd rank in 2020, as indicated in Table 6.

TABLE 6

INDIA'S RANKING ON EASE OF DOING BUSINESS.

Year	Ease of Doing Business Rank (India)
2014	142
2015	130
2016	130
2017	100
2018	77
2019	63
2020	63

Source: World Bank, 2020.

Regional Trade Agreements

The complexity of global trade dynamics is prompting economies to pursue RTAs. India has actively negotiated RTAs to boost trade and benefit its economy. The country has signed 13 RTAs and FTAs with various countries and regions, including ASEAN member countries, South Asian Association for Regional Cooperation (SAARC) nations, Australia, Japan, South Korea, Mauritius, and the United Arab Emirates (Table 7). These agreements have facilitated notable growth in India's merchandise exports to these regions over the past decade, significantly contributing to the country's trade expansion (PIB, 20 July 2022).

TABLE 7

INDIA'S EXPORTS TO RTA AND FTA PARTNER COUNTRIES AND REGIONS.

India's RTA and FTA Partner Countries/ Region	Names of RTA and FTA	Exports in 2011 (USD Billion)	Exports in 2021 (USD Billion)
ASEAN	India-ASEAN FTA	34.5	40.6
	India-Singapore CECA		
	India-Malaysia CECA		
	India-Thailand Early Harvest Scheme		
Japan	India-Japan CECA	5.6	6.1
South Korea	India-South Korea CECA	4.6	7.0
SAFTA	Agreement on SAFTA	13.0	31.6
	India-Sri Lanka FTA		
	India-Nepal Treaty of Trade		
	India-Bhutan Agreement on Trade, Commerce and Transit		

Source: The national expert for India, based on information from the Ministry of Commerce & Industry (PIB, 2022).

Impact on Economic Development

- India's integration into the GSC has attracted significant FDI, driving economic development through job creation, infrastructure development, and technological advancements. FDI inflows in developing Asia remained flat at USD662 billion, accounting for more than half of global FDI. India and ASEAN were the most buoyant recipients, registering growth of 10% and 5%, respectively, with strong growth in project announcements. While China, the second largest FDI host country in the world, saw a 5% increase, FDI in Persian Gulf States declined, though the number of project announcements increased by two-thirds (UNCTAD, 2023).
- FDI flows to India rose 10% to USD49 billion, making it the third-largest host country for announced greenfield projects and the second-largest for international project finance deals. Among the largest greenfield projects were the plans by Foxconn (Taiwan) and Vedanta Resources (India) to build one of the first chip factories in India for USD19 billion and a USD5 billion project to produce urea from green hydrogen by a joint venture of Total Energies (France) and Adani Group (India). In project finance deals, Posco (Republic of Korea) and the Adani Group sponsored the construction of a steel mill for USD5 billion in Gujarat (UNCTAD, 2023).
- Multinational corporations are establishing their presence in India, bringing advanced technologies and best practices. This inflow of capital and knowledge has stimulated innovation and modernization in various industries, contributing to India's overall economic development.
- Outward investment by Indian MNEs fell by 16% to USD15 billion. However, greenfield project announcements by Indian MNEs more than tripled to USD42 billion. Two of the largest greenfield projects were in renewables, with Acme Group announcing a USD13 billion plant in Egypt to produce 2.2 billion tons of green hydrogen annually and ReNew Power announcing that it will set up a USD8 billion green hydrogen plant in the Suez Canal Economic Zone (UNCTAD, 2023).
- The disruptions caused by events like the COVID-19 pandemic have underscored the need for greater resilience and adaptability in supply chain management. Indian businesses have been compelled to reevaluate their supply chain strategies, emphasizing agility and adopting advanced technologies to mitigate risks and maintain productivity.
- SMEs form the backbone of India's economy. Their integration into GVCs has allowed them to enhance their capabilities, improve productivity, and expand their market reach.
- Expanding supply chain activities, especially in labor-intensive sectors, has generated employment opportunities. This has a direct impact on poverty reduction and improved income distribution.
- India's active engagement in the GSC has facilitated its transition from an agrarian economy to an industrial one. This shift promotes industrialization and economic diversification, which are essential for sustained development.

- The demands of supply chain integration have led to investments in infrastructure, including transportation networks, logistics facilities, and digital connectivity. These investments have had broader economic benefits and have contributed to development.
- India's participation in the GSC has expanded export opportunities. Increased exports contribute to economic growth by earning foreign exchange and enhancing competitiveness in global markets (MEA, 2021).
- Digital transformation is enhancing the reach and efficiency of GSCs. The proliferation of digital platforms, fintech, and e-commerce has made India one of the largest digital economies, creating jobs and boosting the service sector.

Impact on Aggregate and Sectoral Productivity

Table 8 captures the impact of GSC on GDP per capita and R&D expenditures during 2005–22. During the period, the GDP per capita, at constant 2015 US dollars, more than doubled, rising from USD947.76 in 2005 to USD2085.12 by 2022. However, a notable decline of -5.83% was reported in 2020, reflecting the economic downturn during the COVID-19 pandemic. In contrast, R&D expenditures as a percentage of GDP consistently declined during the same period.

TABLE 8

GDP PER CAPITA AND R&D EXPENDITURE (2005–22).

Year	GDP Per Capita (Constant 2015 USD)	GDP Per Capita Growth (Annual %)	R&D Expenditure (% of GDP)
2005	947.76	7.92	0.82
2006	1,008.67	8.06	0.80
2007	1,070.13	7.66	0.81
2008	1,087.58	3.09	0.86
2009	1,156.88	7.86	0.83
2010	1,238.01	8.50	0.79
2011	1,285.28	5.24	0.76
2012	1,337.48	5.46	–
2013	1,404.55	6.39	0.71
2014	1,490.03	7.41	0.70
2015	1,590.17	8.00	0.69
2016	1,701.18	8.26	0.67
2017	1,795.91	6.80	0.67
2018	1,891.14	6.45	0.66
2019	1,944.31	3.87	–

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Year	GDP Per Capita (Constant 2015 USD)	GDP Per Capita Growth (Annual %)	R&D Expenditure (% of GDP)
2020	1,813.53	-5.83	–
2021	1,961.96	9.05	–
2022	2,085.12	7.00	–

Source: The national expert for India, based on World Development Indicators 2023 data (World Bank, 2023).

Research and development may produce different spillover effects, depending on the technological, spatial, and other economic distances between firms. The two most common spillover effects have opposite outcomes. The first type is the knowledge spillover effect, which may increase the productivity of other firms. The second is the business-stealing effect, in which productivity gains in an innovating firm decrease the value of competing firms.

The agriculture sector in India has grown at an average annual growth rate of 4.6% during the 2014–22 period. Policies such as Soil Health Cards, the Micro Irrigation Fund, and organic and natural farming have helped farmers optimize resource use and reduce cultivation costs. Promoting Farmer Producer Organizations and the National Agriculture Market extension platform has empowered farmers, enhanced their resources, and enabled them to get good returns.

The Agri Infrastructure Fund has supported the creation of various agricultural infrastructures. Kisan Rail exclusively caters to the movement of perishable agriculture and horticulture commodities. The Cluster Development Programme has promoted integrated and market-led development for horticulture clusters. Farmers are also being supported in creating a Start-up ecosystem in agriculture and allied sectors. All these measures are directed towards supporting the growth in agricultural productivity and sustaining its contribution to overall economic growth in the medium term (MoF, 2023).

Industry holds a prominent position in the Indian economy, accounting for 31% of GDP, on average, during FY12 and FY21 and employing over 12.1 crore people. The sector's relevance can be identified through various direct and indirect linkages with other sectors, contributing to economic growth and employment. First, it ensures that domestic production can accommodate domestic demand and reduces the reliance on imports, thereby improving trade and current account balances. Second, industrial growth has multiplier effects, which translates into employment growth. Some industries, such as textiles and construction, have high employment elasticities. Third, industrial growth spurs growth in services sectors such as banking, insurance, and logistics. (MoF, 2023). Manufacturing PMI in India averaged 52.61 points from 2012 until 2023, reaching an all-time high of 58.90 points in October 2020 and a record low of 27.40 points in April 2020 (Trading Economics, n.d.).

India has been a major player in services trade, being among the top ten service-exporting countries in 2021. It has increased its share in world commercial services exports from 3% in 2015 to 4% in 2021. India's services exports have remained resilient during the COVID-19 pandemic and amid current geopolitical uncertainties, driven by higher demand for digital support, cloud services, and infrastructure modernization catering to new challenges (MoF, 2023).

Sectoral Employment Scenario and Skilled Manpower

As shown in Table 9, agriculture was the largest employer in 2005, accounting for 56% of the labor force. However, its share gradually declined to 44% by 2021.

TABLE 9

LABOR FORCE IN ECONOMIC SECTORS, EDUCATION LEVEL AND UNEMPLOYMENT IN INDIA.

Years	Agriculture (in %)	Industry (in %)	Service (in %)	Total Number of Labor Force	Labor Force with Advanced Education (% of total)	Number of Technicians in R&D (per million population)	Unemployment (% of total labor force with advanced education)
2005	56.00	18.80	25.20	421,959,547		92	10.2
2006	55.10	19.37	25.53	431,250,073			
2007	54.17	20.00	25.83	440,568,412			
2008	53.39	20.53	26.08	449,860,965			
2009	52.48	21.12	26.41	459,168,942			
2010	51.52	21.81	26.68	468,646,281		101	7.5
2011	49.26	23.11	27.63	472,419,461			
2012	47.00	24.36	28.64	476,025,371			8.09
2013	46.43	24.43	29.14	476,574,166			
2014	45.78	24.53	29.69	476,778,623			
2015	45.16	24.58	30.26	476,681,505		96	
2016	44.52	24.71	30.77	476,439,285			
2017	43.94	24.85	31.21	475,894,660			
2018	43.33	24.95	31.72	474,730,667	60.65	73	16.51
2019	41.39	25.37	33.24	501,044,031	61.45		15.73
2020	44.30	23.93	31.76	496,925,540	61.10		17.91
2021	43.96	25.34	30.70	507,704,858	61.89		15.78
2022				523,839,158			

Source: World Development Indicators 2023 (World Bank, 2023).

The industry and service sectors saw a jump in their share of employment during this period. The industry sector's share rose from 18.80% in 2005 to 25.34% in 2021, while that of the service sector increased from 25.20% in 2005 to 30.70% by 2021. The table also highlights that over 60% of India's labor force holds advanced education.

Case Study

The section discusses two contrasting company case studies from India. The first case study is of Tata Consultancy Services (TCS), a leading global IT services and consulting company headquartered in Mumbai, India, which demonstrated resilience and growth during the COVID-19 pandemic. A second case study focuses on Kitex Garments Pvt Ltd, a Kerala-based manufacturer of cotton and organic cotton ready-to-wear garments for infants and children aged 0–24 months.

Impact of GSC on TCS

TCS is an IT services, consulting, and business solutions organization that has partnered with many of the world's largest businesses in their transformation journeys for over 55 years. Its consulting-led, cognitive-powered portfolio of business, technology, and engineering services and solutions is delivered through its unique Location-Independent Agile delivery model, recognized as a benchmark of excellence in software development.

A part of the Tata Group, India's largest multinational business group, TCS has over 614,000 of the world's best-trained consultants in 55 countries. The company generated consolidated revenues of USD27.9 billion in the fiscal year ended 31 March 2023 and is listed on the Bombay Stock Exchange and the National Stock Exchange in India. The company's proactive stance on climate change and award-winning work with communities worldwide have earned it a place in leading sustainability indices such as the MSCI Global Sustainability Index and the FTSE4 Good Emerging Index (TCS Annual Report, 2015-16 to 2022-23).

Brand Valuation of TCS

TCS has showcased remarkable growth and has also played a significant role in the evolution of the country's IT and services sector. This case study delves into TCS's growth trajectory before COVID-19, during the pandemic, and in the post-COVID periods, highlighting its strategies to adapt to global supply chain adjustments. Table 10 presents the brand valuation of TCS during the last ten years.

TABLE 10

THE TCS BRAND VALUE (2014–23).

Year	Brand Value (in USD Billion)	Annual Growth (in %)
2014	8.2	–
2015	8.7	6.10
2016	9.4	8.05
2017	9.1	–3.19
2018	10.4	14.29
2019	12.8	23.08
2020	13.5	5.47
2021	14.9	10.37
2022	16.8	12.75
2023	17.2	2.38

Source: TCS. Annual Report 2015–16 to 2022–23.

According to Brand Finance, the world's leading brand valuation firm, TCS is the second most valuable brand globally in the IT services sector (TCS Annual Report, 2015-16 to 2022-23).

GSC Plans of TCS

TCS reported a substantial increase in total revenue from INR123,104 crore in 2017–18 to INR225,458 crore in 2022–23. The company's employee costs doubled from INR66,396 crore in 2017–18 to INR127,522 crore in 2022–23. Similarly, its Profit After Tax (PAT) steadily increased from INR25,826 crore in 2017–18 to INR42,303 crore in 2022–23. The consistent improvements across key financial metrics indicate that TCS successfully navigated the COVID-19 pandemic without significant disruptions to its global operations.

Figure 10 illustrates the trends in total revenue, employee cost, and PAT from 2017–18 to 2022–23, showcasing the company’s resilience and robust performance throughout the pandemic.

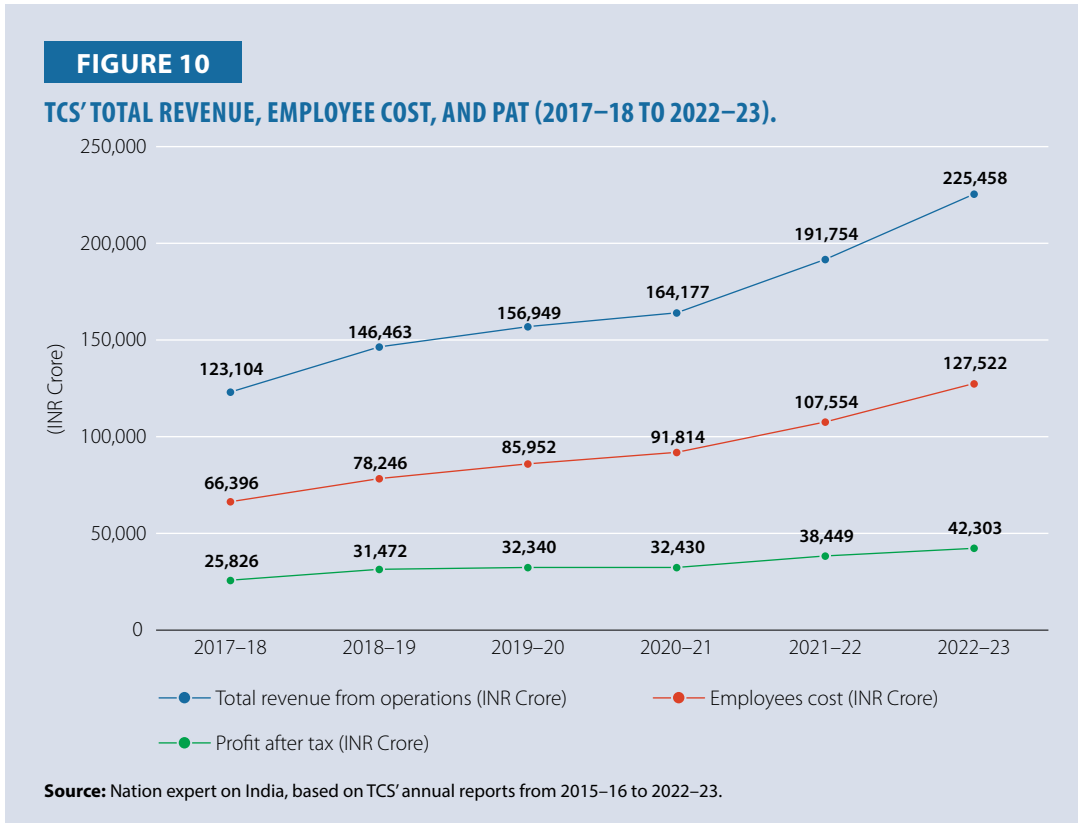
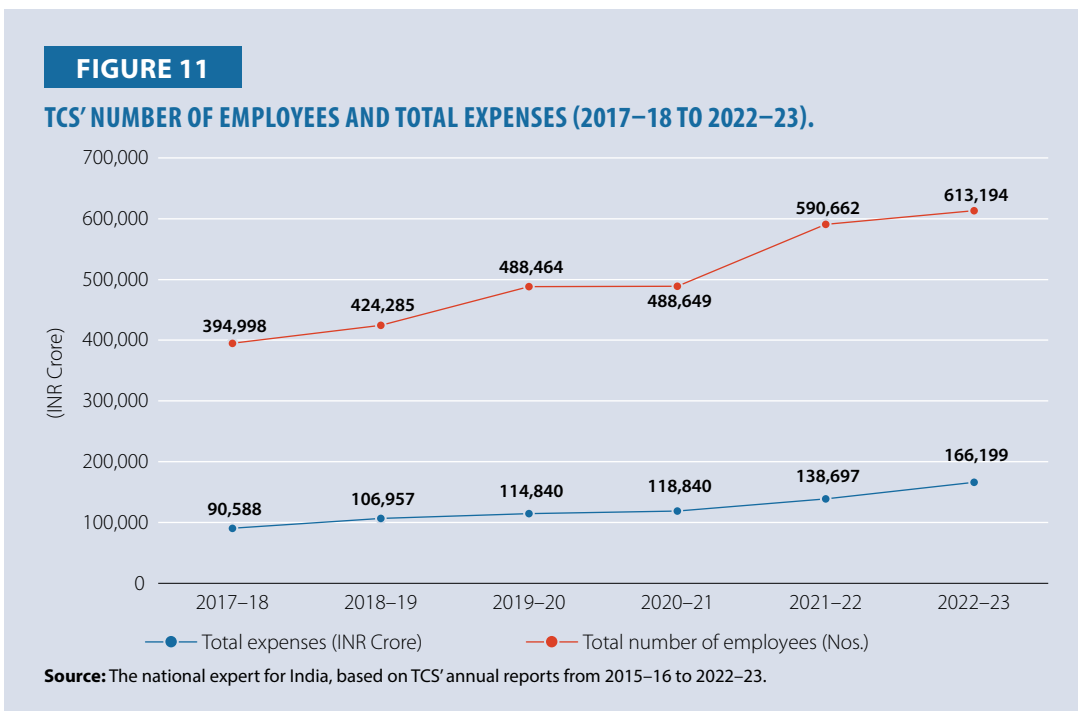
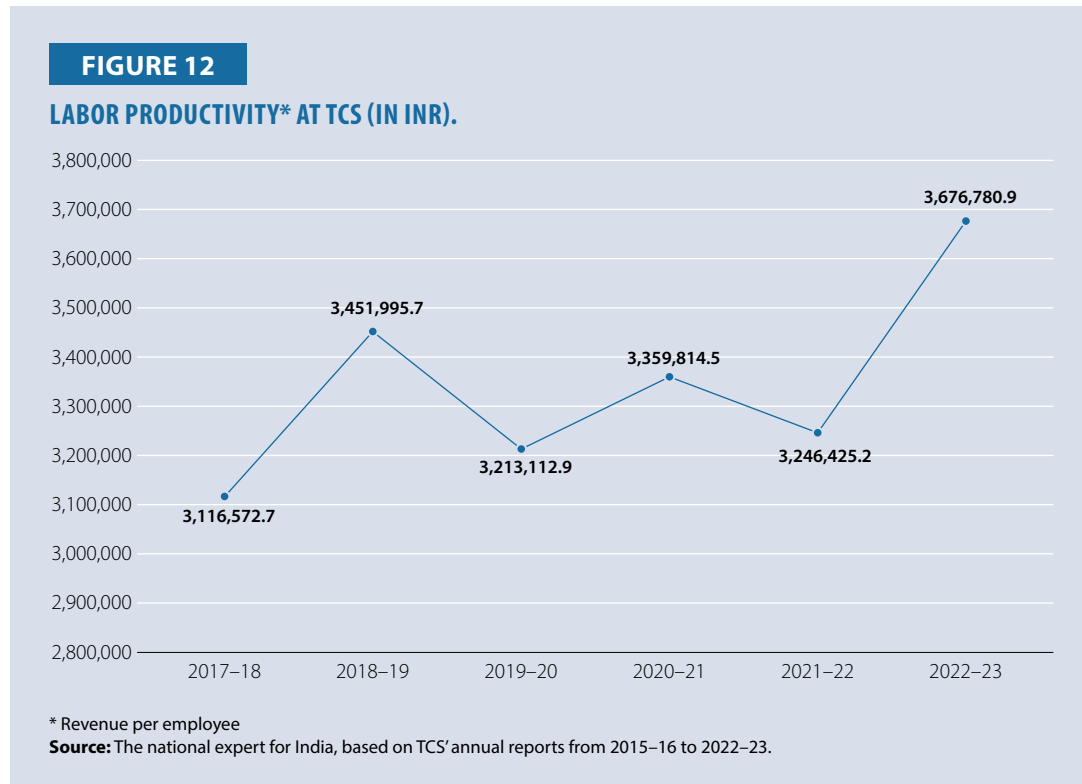


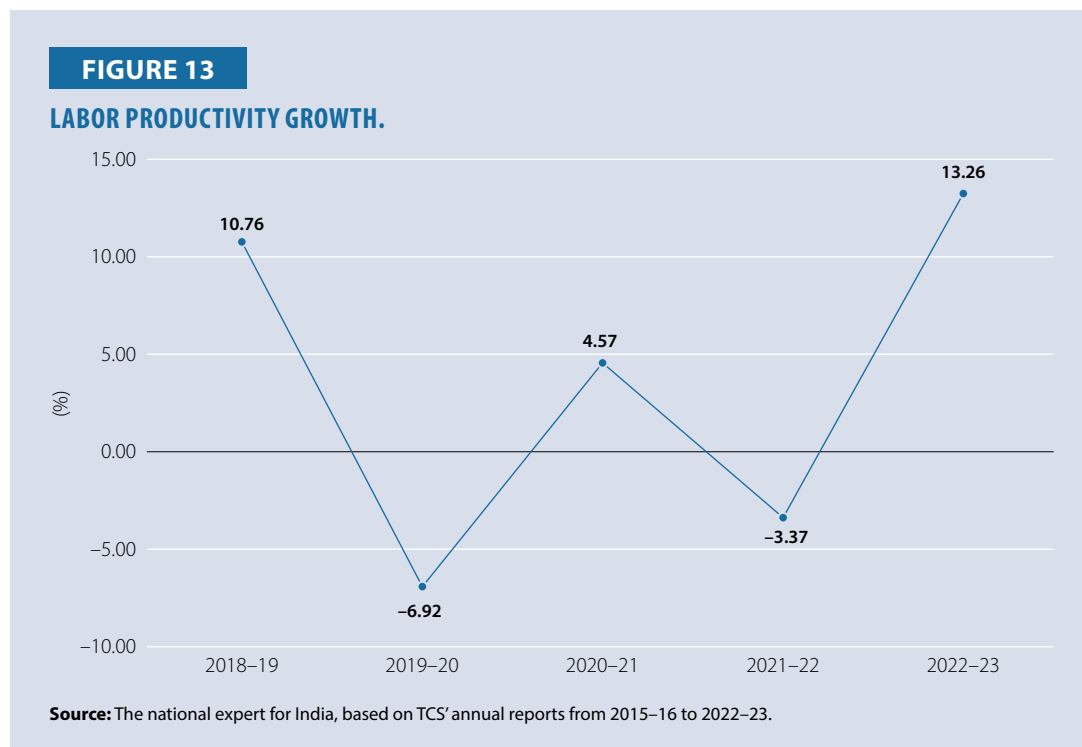
Figure 11 presents the total expenses and the number of employees in TCS from 2017–18 to 2022–23. Both the variables nearly doubled during the six years.



Similarly, Figure 12 presents labor productivity (revenue per employee), which shows fluctuations during the first six years and a considerable increase during the post-COVID-19 period.



As illustrated in Figure 13, labor productivity growth in TCS was adversely impacted by the COVID-19 pandemic, which reported negative growth rates during the pandemic period.



Pre-COVID Growth

Global Footprint

TCS had a robust global presence well before the COVID-19 pandemic. With operations in over 50 countries, it served a diverse client base across various industries, including banking, healthcare, retail, and technology (TCS Annual Report, 2015-16 to 2022-23). This extensive international presence allowed TCS to gain deep insights into global supply chain dynamics.

Digital Transformation Focus

TCS has strategically positioned itself as a leader in digital transformation services, offering a wide range of digital solutions, including cloud computing, data analytics, AI, and cybersecurity (TCS Annual Report, 2015-16 to 2022-23). This focus on cutting-edge technology solutions positioned TCS as a valuable partner for clients looking to modernize their operations and accelerate digital transformation efforts.

Agile Supply Chain Management

TCS has earned a reputation for its agile and efficient supply chain management. The company's global network of delivery centers and offices enables it to provide services seamlessly across different time zones. This network allows TCS to respond swiftly to client demands while optimizing costs (TCS Annual Report, 2015-16 to 2022-23).

Performance During COVID-19

Immediate Response

When the COVID-19 pandemic struck, TCS displayed exceptional agility and responsiveness. The company swiftly transitioned to a remote work model, leveraging its technological capabilities to enable its employees to work from home. This transition was facilitated by TCS' substantial investments in digital collaboration tools and IT infrastructure (TCS, n.d.).

Support to Clients

TCS recognized that many of its clients were grappling with the immediate impact of the pandemic on their supply chains. The company extended its support by helping clients adapt to remote work, secure their digital assets, and ensure business continuity during uncertain times (TCS, n.d.). This client-centric approach helped solidify TCS's reputation as a trusted partner.

Supply Chain Challenges

Despite a solid digital foundation, TCS faced specific supply chain challenges during the COVID-19 crisis. Global supply chain disruptions impacted the availability of critical hardware components required for its IT projects. Additionally, travel restrictions hindered the company's ability to deploy personnel on-site for critical projects, affecting project timelines and delivery schedules and leading to a drop in labor productivity (TCS Annual Report, 2015-16 to 2022-23).

Diversification and Innovation

To mitigate supply chain disruptions, TCS adopted a two-pronged strategy. Firstly, the company diversified its sourcing strategies for critical hardware components, reducing reliance on a single supplier or location. Secondly, TCS invested in innovation to develop new solutions that addressed emerging client needs during the pandemic, including tools for remote collaboration, healthcare support, and cybersecurity (TCS Annual Report, 2015-16 to 2022-23).

Post-COVID Recovery and Growth

Hybrid Work Model

TCS introduced a hybrid work model as the world transitioned to the post-COVID phase. This approach allowed employees to work from home and the office, providing flexibility and accommodating diverse preferences (TCS, 2021). The hybrid model attracted talent, improved work-life balance, and contributed to the company's growth.

Resilience in Supply Chain

TCS further strengthened its supply chain resilience by implementing risk mitigation strategies. This included diversifying its sourcing of critical hardware components and building redundancy into its supply chain to address unexpected disruptions (TCS Annual Report, 2015-16 to 2022-23). The pandemic underscored the importance of supply chain resilience. TCS' proactive efforts to diversify sourcing, enhance redundancy, and manage risks in its supply chain ensured uninterrupted service delivery to clients.

Accelerated Digital Transformation

The COVID-19 pandemic accelerated the global digital transformation trend. Organizations worldwide sought to expedite their digital initiatives to remain competitive and resilient. The company capitalized on this trend by enhancing its digital capabilities and expanding operations. The strategic focus on digital transformation services positioned TCS as a leader in a rapidly evolving market. The company's expertise in digital technologies allowed it to meet the increased demand for digital solutions during and after the pandemic.

Sustainability Initiatives

Recognizing the growing importance of sustainability in the post-COVID world, TCS initiated programs focusing on reducing its carbon footprint and promoting eco-friendly practices throughout its supply chain. The company's sustainability initiatives align with broader efforts to build a more environmentally conscious and responsible supply chain. In May 2022, TCS became the first company in India to publish BRSR, disclosing its ESG practices. The BRSR framework is based on the National Guidelines for Responsible Business Conduct and consists of three sections (TCS Annual Report, 2015-16 to 2022-23). TCS's commitment to sustainability reflects its awareness of evolving global priorities.

Conclusion

TCS serves as a compelling case study of a company that adeptly navigated the challenges of the pre-COVID, COVID-19, and post-COVID periods with resilience and adaptability. Its strategic focus on digital transformation, supply chain resilience, sustainability, and employee-centric

policies positioned it for growth during the most challenging times. Through its journey, TCS not only sustained its growth but also contributed significantly to India’s transformation as a global IT powerhouse and a hub for technological innovation.

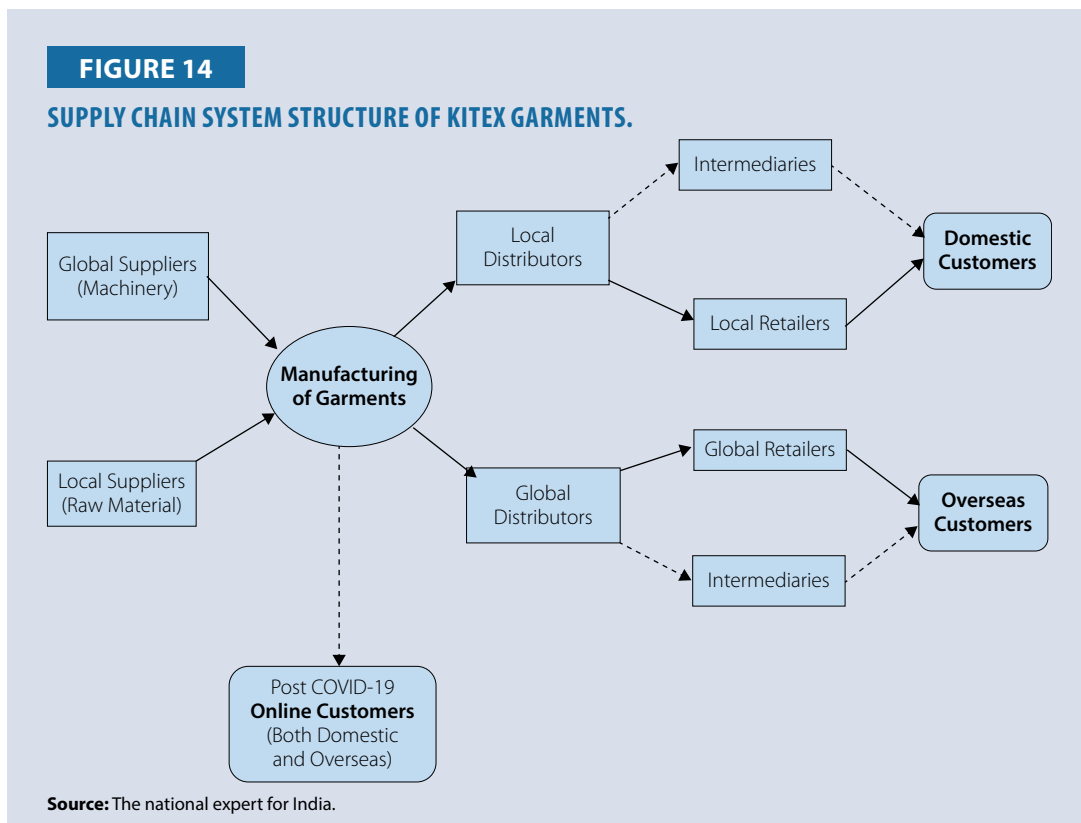
Impact of GSC on Kitex Garments

Kitex Garments is a key player in the global infant garments sector and part of the Anna-Kitex Group of companies. It has established itself as a leader in the textile industry since its inception in 1992. It is recognized as the world’s second-largest manufacturer of cotton and organic cotton ready-to-wear garments for infants and children aged 0–24 months (Kitex Annual Report, 2014–15 to 2022–23). With a substantial market share in Europe and the United States, the company produces over a million pieces of clothing daily. Its success is built on the commitment to quality, timely delivery, and a sustainable production model.

Apart from the products under the corporate brand Kitex, the company launched clothing under the brand Little Star in the US market a few years ago. It has also partnered with Lamaze Organic Baby-Wear, offering a full range of styles, including bodysuits, coveralls, pants, sets, sleepwear, and accessories.

Kitex’s operations exemplify the complexities of a global supply chain, sourcing materials worldwide and relying on an extensive logistics network. This international operational framework, integral to its success, also exposed the company to global supply chain disruptions caused by the COVID-19 pandemic in early 2020. The pandemic posed unprecedented challenges, including factory shutdowns, logistics delays, fluctuating market demands, and workforce safety (Kitex Garments, 2021).

A broad supply chain system structure of Kitex Garments is presented in Figure 14.



Kitex responded to the pandemic with agility and strategic foresight, effectively adapting its operations to the evolving challenges. A key part of its strategy involved diversifying its supplier base and reducing reliance on a single region to secure a more stable supply chain amidst global disruptions. The company also capitalized on changes in consumer behavior, notably the surge in online shopping and preference for comfortable infant wear.

Prioritizing employee health and safety, Kitex implemented rigorous safety protocols in its manufacturing units. These measures helped safeguard the workforce while ensuring operational continuity.

The company's resilience and adaptability throughout the pandemic underscored its strong risk management strategies and unwavering commitment to quality and safety. Kitex's swift changing conditions and its ability to maintain high operational standards during the crisis are testaments to its strong leadership and a deep understanding of global supply chain dynamics.

Kitex's Strategic Responses to Challenges

- **Diversifying the Supply Chain:** Kitex mitigated risks by diversifying its supplier base, reducing reliance on a single source for procuring raw materials.
- **Adapting to New Market Realities:** Responding to the changing market demands, Kitex realigned its production, focusing on in-demand products, such as comfortable home wear for infants.
- **Leveraging Technology:** Kitex accelerated the adoption of digital technologies for remote working, virtual meetings, and digital showrooms for buyers.
- **Workforce Safety and Management:** The company implemented strict safety protocols in its facilities, including regular sanitization, social distancing, and employee health monitoring.
- **Building Resilience in Logistics:** The company collaborated with logistics partners to identify alternative shipping routes and methods, ensuring timely delivery.
- **Engaging with Stakeholders:** Kitex ensured regular communication with clients, suppliers, and employees, which was instrumental in managing expectations and maintaining transparency.

Outcomes of Strategic Initiatives

- **Business Continuity:** Despite the initial setbacks caused by the pandemic, Kitex resumed operations quickly and ensured that it met its delivery commitments.
- **Market Positioning:** By adapting to changing market dynamics, particularly the surge in demand for comfortable infant wear, Kitex maintained its position as a leading infant garment manufacturer globally.
- **Operational Efficiency:** The adoption of technology and the implementation of new operational strategies enhanced overall efficiency.

- **Employee Welfare and Productivity:** Kitex's focus on employee safety and welfare during the pandemic resulted in high morale and sustained productivity even in challenging conditions.

Pre-COVID-19 Performance

Before the pandemic, Kitex, known for its specialization in infant wear, operated a well-oiled supply chain, sourcing raw materials globally and exporting finished products mainly to European and the US markets. The company's state-of-the-art manufacturing facilities, combined with a robust distribution network, ensured efficient operation. Its efficient supply chain, quality production, and consistent growth anchored the company's success. Kitex's commitment to innovation and customer satisfaction helped it build a robust market presence.

Performance During COVID-19

The outbreak of COVID-19 brought significant challenges for Kitex, as it did for the global textile industry. The pandemic severely disrupted supply chains, delaying raw material supplies and logistics. With lockdowns and safety protocols in place, the company faced temporary halts in production, which resulted in a decline in productivity. Additionally, fluctuating market demands during the pandemic adversely impacted sales and operational efficiency.

Post-COVID-19 Recovery and Growth

In the post-COVID era, businesses, including Kitex, began to recover and adapt to the new normal. For Kitex, this involved redefining supply chain strategies, incorporating more digital and flexible approaches, and responding to changing consumer behaviors. As the company recovered from the initial impacts of the pandemic, the company focused on regaining its pre-COVID growth trajectory by enhancing operational resilience and exploring market re-entry strategies.

During 2021–22, its board of directors approved a significant expansion project at an investment of INR2,406 crore in Telangana state. The project aimed to establish a vertically integrated fiber-to-apparel cluster, including spinning, knitting, processing, garments manufacturing, and associated activities in a known for its raw material production.

Performance of Kitex Garments (2014–15 to 2022–23)

The company reported a decline in permanent employees, from 5,727 in 2014–15 to 4,486 in 2022–23. Although the number of employees did not decrease during the peak of the COVID-19 pandemic in 2020–21, employee expenses dropped to INR7,726 lakh, down from an all-time high of INR12,148 lakh in 2019–20 (Figure 15).

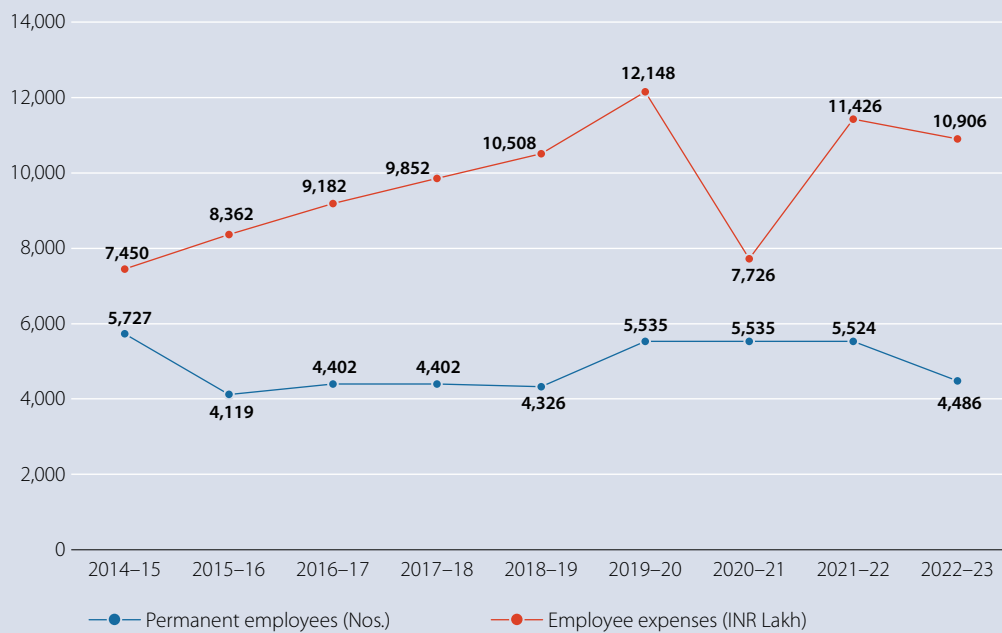
The company's sales value fluctuated between INR51,109 lakh in 2014–15 and a peak of INR78,833 lakh in 2021–22. As illustrated in Figure 16, the numbers nearly halved during the peak of the COVID-19 pandemic in 2020–21.

Kitex reported a Profit PAT of INR9,852 lakh in 2014–15. However, as Figure 17 shows, the company's PAT declined to an all-time low of INR5,990 lakh during COVID-19 in 2020–21.

Labor productivity in Kitex increased from INR8.92 lakh per employee in 2014–15 to INR14.27 lakh per employee in 2021–22. As illustrated in Figure 18, the company's productivity per employee dropped to INR8.23 lakh during the COVID-19 pandemic in 2020–21.

FIGURE 15

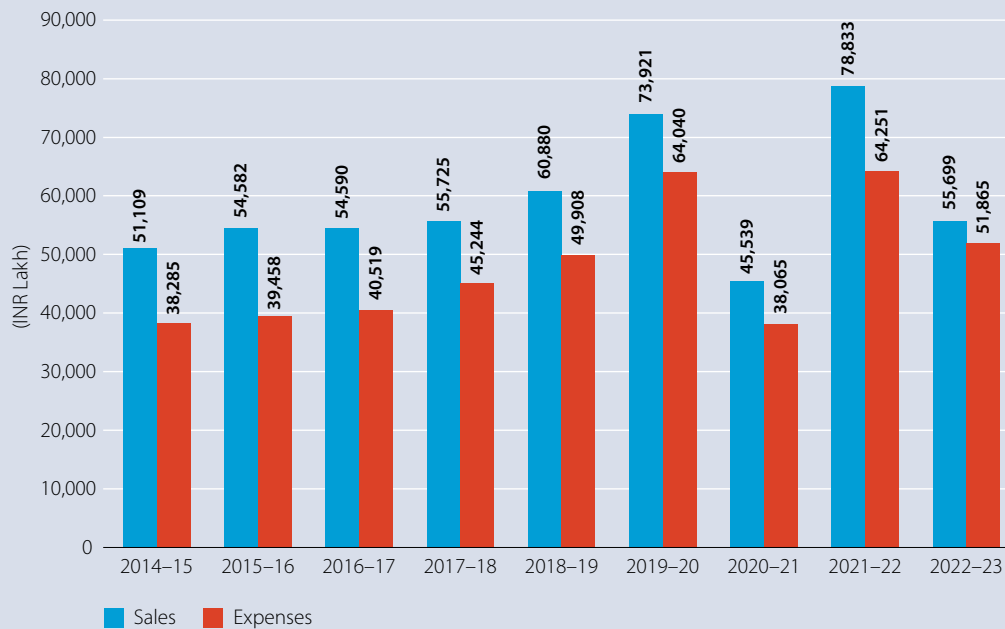
PERMANENT EMPLOYEES AND EMPLOYEE EXPENSES AT KITEX GARMENTS (2014–15 TO 2022–23).



Source: The national expert for India, based on Kitex Garments' annual reports from 2014–15 to 2022–23.

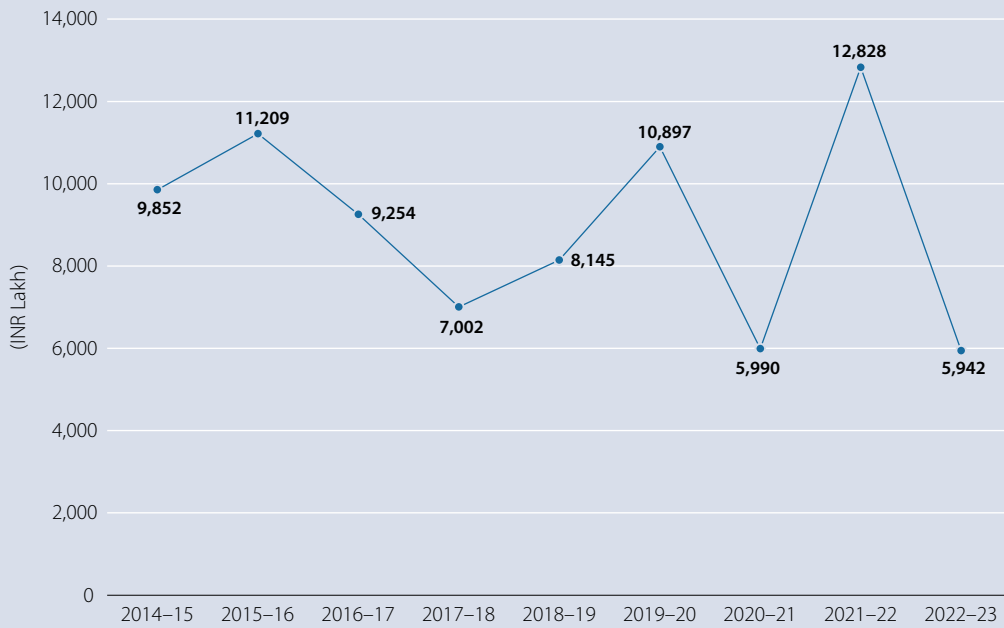
FIGURE 16

SALES VALUE AND EXPENSES AT KITEX GARMENTS.



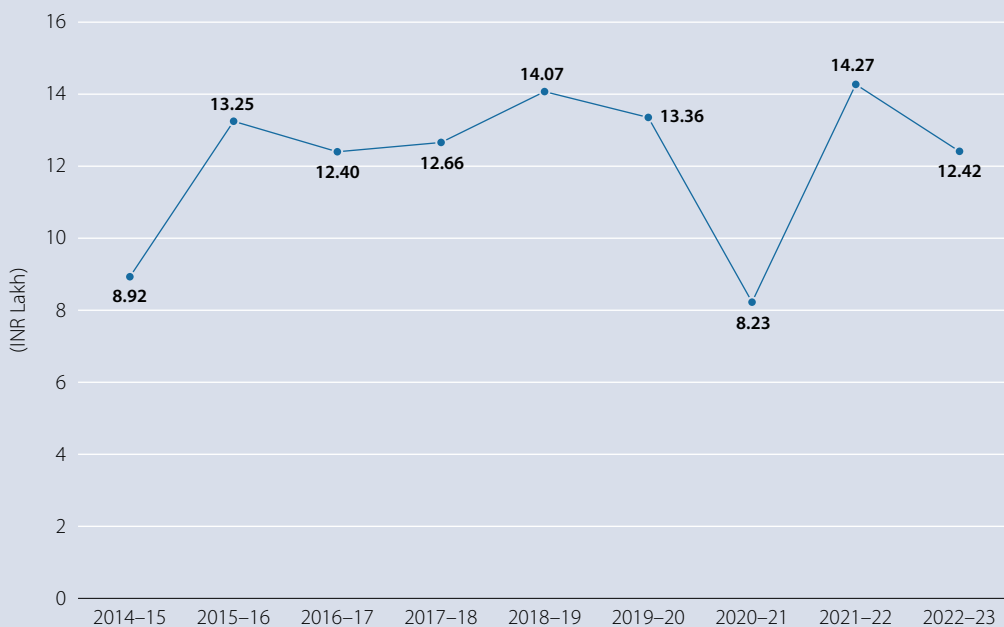
Source: The national expert for India, based on Kitex Garments' annual reports from 2014–15 to 2022–23.

FIGURE 17
KITEX GARMENTS PROFIT AFTER TAX.



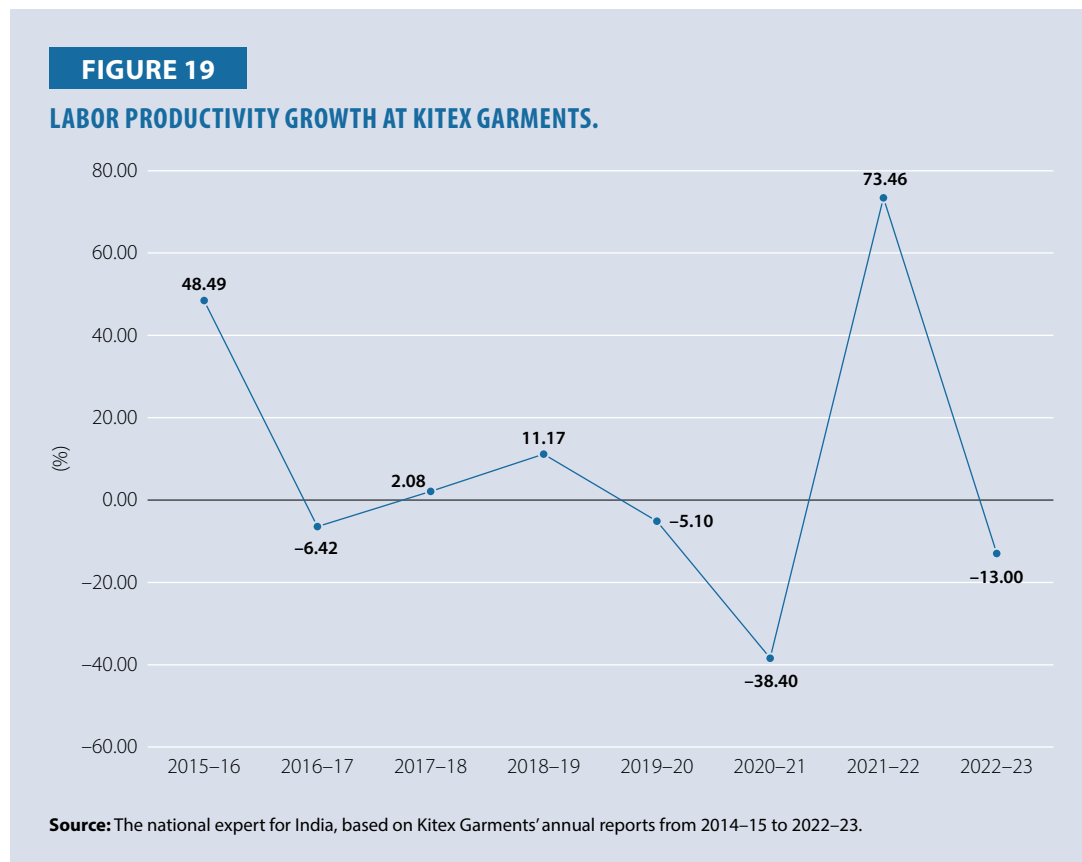
Source: The national expert for India, based on KiteX Garments' annual reports from 2014-15 to 2022-23.

FIGURE 18
PER EMPLOYEE LABOR PRODUCTIVITY AT KITEX GARMENTS.



Source: The national expert for India, based on KiteX Garments' annual reports from 2014-15 to 2022-23.

Labor productivity in Kitex fluctuated widely between 2014–15 and 2022–23. It declined sharply to -38.40 % during the COVID-19 year of 2020–21, followed by a remarkable recovery to an all-time high growth rate of 73.76% in 2021–22. However, labor productivity growth dropped again to -13% during 2022–23 (Figure 19).



Conclusion

Kitex Garments successfully navigated the challenges posed by the COVID-19 pandemic through agile response, strategic foresight, and robust risk management practices. The company's ability to quickly adapt to changing market conditions, effective use of technology, and emphasis on employee welfare were crucial factors in mitigating the impact of supply chain disruptions.

During 2021–22, the board of directors approved a significant investment of INR2,406 crore in an expansion project in Telangana state to set up a vertically integrated fiber-to-apparel cluster, including spinning, knitting, processing, garment manufacturing, and associated activities.

Kitex Garments' experience during the pandemic is a testament to businesses' resilience and adaptability in confronting global challenges. This case study offers valuable insights for other organizations facing similar supply chain disruptions.

Summary and Recommendations

Summary

The geopolitical dynamics and recent disruptions, such as the COVID-19 pandemic, have brought the vulnerabilities inherent in GSCs to the forefront. The government introduced the Make in India

initiative in 2014 to transform the country into a global manufacturing hub. This initiative, alongside economic reforms, significantly improved India's World Bank's Ease of Doing Business ranking from 142 in 2014 to 63 in 2020.

The PLI Scheme for IT Hardware was introduced in 2021 to promote large-scale manufacturing further and boost exports. It provides an incentive of 4% to 2% or 1% on net incremental sales (over base year) of goods manufactured in India for four years. This reflects India's focus on strengthening domestic manufacturing capabilities and attracting global investments in key target segments.

Recognizing the critical role of robust infrastructure in supply chain management, the Government of India emphasizes developing industrial corridors, dedicated freight corridors, logistics parks, and digital connectivity. These infrastructural initiatives are essential to modernizing India's supply chains, enhancing efficiency, and promoting economic growth.

By strengthening bilateral ties with countries like Australia, Japan, and the US, India has bolstered its position in the global supply chain. Initiatives like Skill India and Digital India aim to leverage the demographic dividend and drive digitization, supporting a tech-integrated supply chain. According to US Census Bureau estimates, by 2022, countries like China, the UK, and the USA will face significant shortages of skilled labor by 10 million, 2 million, and 17 million, respectively. In contrast, India is projected to have a surplus of almost 47 million people in the prime working age group of 19–59 years, positioning it advantageously in the global labor market.

Reduction in corporate tax, introduction of the GST, and other financial reforms simplify business operations and make India an economically viable option for relocation. India is emerging as a favorable nearshoring destination, bolstered by the Aatmanirbhar Bharat initiative, to promote domestic manufacturing and self-reliance. India is shaping its trade strategy through bilateral agreements and engagements with groups like the QUAD despite opting out of the RCEP to strengthen trade ties.

During the COVID-19 pandemic in 2020, the GDP per capita growth rate declined to -5.83%. However, subsequent years reported a turnaround in the economy, with 9% growth in 2021. Labor productivity, calculated at the national level with 2015 as a base, declined during 2019 (-1.52%) and 2020 (-5.07%). However, subsequent years in 2021 saw Labor Productivity increase to 6.69% and 3.74% in 2022.

Firm-level productivity, estimated as the percentage of firms competing against unregistered firms, reported a substantial reduction from 2014 (50.1%) to 2022 (32.7%). Firms that visited or required meetings with tax officials (% of the firms) reported a considerable decline from 35.3% in 2014 to 17% in 2022.

Increased integration into GSCs has attracted massive FDI into India. FDI flows to India rose by 10% to USD49 billion, making India the third-largest host country for announced greenfield projects and the second-largest for international project finance deals.

There has been a visible uptick in electronics, pharmaceutical, and automobile manufacturing activities. The manufacturing sector grew at an annual rate of 9% before the COVID-19 pandemic. However, the sector reported negative growth of -3.82% in the 2019–20 COVID period. The sector

reported a remarkable recovery post-COVID-19 at the rate of 21.27% during 2021–22. Exports of principal agricultural commodities increased post-COVID-19. Increased demand for Indian Textiles and garments has spurred sectoral growth, resulting in employment generation and improved productivity.

India is rapidly expanding its renewable energy capacity, aiming for a target of 450 GW by 2030. India is ranked third worldwide in the production of generic medicines, occupying a 20% share in global supply by volume, and is the leading vaccine manufacturer globally, with a 60% market share.

Globally, companies are adopting the ‘China plus one’ strategy, ensuring a secondary base outside China. This strategy allows India to attract businesses seeking an alternative to China. Digital trade, accelerated by the pandemic, is a dominant GSC trend. E-commerce platforms are expanding, boosting logistics, warehousing, and digital payment sectors. This not only increases productivity but also contributes significantly to economic growth.

Emerging technologies such as AI, IoT, and Blockchain are becoming pivotal in GSCs. India, an IT giant, has capitalized on this shift, offering tech-driven solutions that enhance productivity and boost the IT and services sector.

India has signed 13 RTAs/FTAs with various countries/regions, including Japan, South Korea, the ASEAN region, SAARC countries, Mauritius, the United Arab Emirates, and Australia. India’s merchandise exports to all these countries/regions registered significant growth during 2011–21.

Sixty-two percent of India’s population is in the working age group (15–59 years), and more than 54% is below 25. The complexity of modern supply chains demands a skilled workforce. Consequently, there has been a focus on skill development and education, resulting in a more capable and productive labor force.

The TCS case study showcased how the company adeptly navigated the challenges before COVID-19, during the pandemic, and in the post-COVID period with resilience and adaptability. TCS, the second most valuable brand in the global IT services sector, achieved remarkable growth during the pandemic. The company offers various digital solutions, including cloud computing, data analytics, AI, and cybersecurity. Besides, TCS’s operations are spread across more than 50 countries, serving a diverse client base across various industries, including banking, healthcare, retail, and technology.

When the COVID-19 pandemic struck, the company swiftly transitioned to a remote work model, leveraging its technological capabilities to enable employees to work from home. TCS reported steady growth in its total revenue, employee cost, and PAT from 2017–18 to 2022–23, demonstrating its ability to successfully navigate the pandemic without any significant impact on its global operations. However, labor productivity growth declined to -6.92% during 2019–20 but rebounded to 13.26% in 2022–23.

As the world transitioned to the post-COVID phase, TCS introduced the hybrid work model quickly. In May 2022, TCS became the first company in India to publish the BRSR, providing investors with enhanced disclosures about its ESG practices. The company’s proactive efforts to diversify sourcing, enhance redundancy, and manage risks in its supply chain ensured uninterrupted service delivery to clients.

Company case study of Kitex Garments, the second-largest manufacturer of cotton and organic cotton ready-to-wear garments for infants and children aged 0–24 months, exemplifies the complexities inherent in a global supply chain. The company sources materials from around the world and relies on an extensive logistics network. The onset of the COVID-19 pandemic in early 2020 brought unprecedented challenges, including factory shutdowns, logistics delays, fluctuating market demands, and the necessity of ensuring workforce safety.

Kitex responded by adapting its operations to the new landscape shaped by the pandemic. The company's labor productivity substantially increased from a low INR8.23 lakh per employee in 2020–21 to INR14.27 lakh, reflecting a growth rate of 73.46% in 2021–22. A key strategy adopted by Kitex to overcome the disruptions was diversifying its supplier base, reducing its dependency on any single region, and securing a more resilient supply chain. The company collaborated closely with logistics partners to identify alternative routes and methods for shipments, ensuring timely deliveries despite the global disruptions.

During 2021–22, Kitex made a substantial investment of INR2,406 crore in an expansion project in Telangana, a major cotton-producing region. This vertically integrated fiber-to-apparel cluster includes spinning, knitting, processing, garment manufacturing, and associated activities, further strengthening Kitex's supply chain and enhancing its production capacity.

Implications for Businesses and Future Performance

The rapidly evolving geopolitical landscape and recent disruptions like the COVID-19 pandemic have underscored the vulnerabilities inherent in GSCs. In 2021, the Government of India introduced the PLI Scheme for IT Hardware to further boost domestic manufacturing and enhance exports. This scheme aims to incentivize large-scale manufacturing by offering financial benefits based on incremental sales. Additionally, the emphasis on developing robust infrastructure, such as industrial corridors, freight corridors, and digital connectivity, underscores India's commitment to strengthening its supply chain management capabilities.

India has bolstered its position in the global supply chain arena by fostering strong bilateral ties with key strategic partners like Australia, Japan, and the US. Initiatives like Skill India and Digital India are leveraging India's demographic dividend and digital advancements to create a tech-integrated supply chain ecosystem.

Financial reforms, including reduced corporate taxes and implementation of the GST, have streamlined business operations and positioned India as an attractive destination for relocation. The Aatmanirbhar Bharat initiative, promoting domestic manufacturing and self-reliance, further aims to enhance India's appeal as a nearshoring destination.

Despite the challenges posed by the COVID-19 pandemic, India's economy demonstrated resilience and recovery, with significant growth in electronics, pharmaceuticals, and automobiles. The country's focus on renewable energy, pharmaceuticals, and vaccine manufacturing underscores its leadership in key sectors.

As global companies adopt strategies like 'China plus one' to diversify their supply chain, India stands to benefit as an alternative destination for businesses seeking to reduce reliance on China. The growing trend of digital trade, coupled with India's expertise in emerging technologies like AI and Blockchain, positions the country as a hub for tech-driven solutions in supply chain management.

India has strengthened its trade ties through RTAs and partnerships and boosted merchandise exports. With a young and skilled workforce, India is investing in skill development to meet the demands of modern supply chains.

Case studies of TCS and Kitex Garments highlight how organizations have navigated challenges with resilience and adaptability. These companies have leveraged innovation, diversification, and strategic partnerships to overcome disruptions and enhance productivity in their supply chains.

India's strategic initiatives, focus on technology/innovation, and robust trade partnerships position the country as a key player in the global supply chain ecosystem post-COVID-19. India is the world's fifth-largest economy by nominal GDP and is poised to become the third-largest global economy by 2027. By leveraging its strengths and fostering innovation, India is poised to play a pivotal role in shaping the future of supply chain management globally.

Recommendations

- **Resilience:** Overreliance on GSCs can expose the economy to vulnerabilities during disruptions. Balancing efficiency with resilience is a key policy challenge.
- **Regulatory Frameworks:** Effective regulatory frameworks are necessary to address issues related to fair competition, Intellectual Property Rights (IPR), and labor standards within GSCs. Ensuring a conducive regulatory environment that encourages ease of doing business is essential. Streamlining customs procedures and reducing red tape can further support supply chain efficiency.
- **Infrastructure Bottlenecks:** While India has made significant strides in infrastructure development, challenges such as congestion at ports and inadequate last-mile connectivity persist. Addressing these bottlenecks is crucial for an efficient supply chain.
- **Skill Development:** Initiatives like 'Skill India' and 'Digital India' aim at leveraging the demographic dividend and digitization for a tech-integrated supply chain. The 'Skill India' initiative was launched with the aim of training people in different industrial skills. 'Skill India' aims to empower the youth with industry-relevant skills. 62% of India's population is in the working age group (15–59 years), and more than 54% is below 25. A skilled workforce is crucial for manufacturing and supply chain excellence. According to the US Census Bureau estimate, by 2022, countries like USA, UK, and China will fall short of skilled labor by 17 million, 2 million, and 10 million, respectively, while India will have a surplus of almost 47 million in the age group of 19–59 years. Countries of destination can leverage this strength to meet their labor and skill shortages.
- **Inequality:** Unequal access to the benefits of globalization and supply chain integration can exacerbate income inequality. Policymakers must focus on equitable development and inclusive growth.
- **Environmental Concerns:** Expanding supply chains can lead to environmental degradation. Sustainable practices and environmental regulations are essential to mitigate negative impacts.

- **Sustainability:** As supply chains diversify and relocate, there is an opportunity to incorporate sustainable practices. This includes reducing carbon emissions, adopting circular economy principles, and addressing environmental concerns.

The global supply chain integration has diverse implications for India's sectoral landscape. Sectoral shifts influenced by global supply chain disruptions require the Government of India to be more proactive in policy-making, infrastructure development, and skill enhancement. It has posed challenges and opportunities due to the dynamics of supply chain disruptions, exposure to global competition, the requirement of compliance with quality standards, and the need for infrastructure development. Firms across sectors must adopt advanced technologies, enhance their productivity, and meet global quality standards to remain competitive.

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LAO PDR

Introduction

GSC diversification and relocation strategies have become critical components of business transformation, enhancing companies' dynamic capabilities. The Lao PDR has been actively pursuing global economic integration. The country's exports and participation in the GSC are primarily driven by hydropower, mining and natural resources, agriculture, garment and textile industry, and tourism. The COVID-19 pandemic, however, caused severe disruptions to the supply chain in Laos.

This study aims to analyze the evolving dynamics of the GSC in the post-pandemic period and identify trends in supply chain diversification and relocation, along with their impact on productivity.

This study employs dynamic performance analysis over time using multiple indicators by integrating primary and secondary data. It examines the global supply chain system structure and dynamics within the context of our case studies. Following the reopening of the border, labor productivity showed a slight improvement, which consequently influenced the overall performance of firms. The subpar performance of firms in developing countries is influenced by a multitude of factors, including inadequate education and skills, limited technology, the dominance of the informal economy, challenges in ease of doing business, trade facilitation issues, and other external factors. Given the complexity of these issues, a multifaceted approach in policy recommendations is essential to address the new dynamics of GSCs and improve productivity.

GSC Diversification and Relocation Strategies

Global supply chains have evolved significantly due to the impact of COVID-19, geopolitical tensions, and new industry standards. Manufacturers now face mounting political and competitive pressure to boost domestic production, generate employment within their home countries, reduce or eliminate reliance on sources considered risky, and reconsider their use of lean manufacturing techniques that involve reducing the inventory kept in their international supply chains.

GSC diversification and relocation strategies have become crucial for business transformation, helping companies enhance their dynamic capabilities. A practical solution to overreliance on a single medium- or high-risk source—such as a specific factory, supplier, or region—is to diversify supply sources across multiple locations with different risk profiles. For instance, many companies have adopted China plus one strategy, distributing production between China and a Southeast Asian country, such as Indonesia, Thailand, or Vietnam, to mitigate risks arising from the US-China trade war. A broader geographic diversification is also recommended to protect businesses from unanticipated regional crises.

Companies are increasingly considering a regional manufacturing approach, producing essential commodities closer to regions where they will be consumed. Labor-intensive operations in China could be shifted to Mexico and Central America to better serve North America. Similarly, firms may depend more on Turkey, Ukraine, and the eastern European Union (EU) member states to

supply goods within Western Europe. In response to shifting dynamics, Chinese companies are exploring low-tech, labor-intensive production opportunities in Egypt, Ethiopia, Kenya, Myanmar, and Sri Lanka to retain their global market share.

Overview of the Government Approach

In response to the global COVID-19 outbreak, many countries implemented various mitigation measures, including confinement at home, travel restrictions, business closures, trade restrictions, and border shutdowns (Gentle et al., 2020). While these measures aimed to curb the spread of the virus, they had severe economic and social consequences worldwide. The economic disruptions caused by the pandemic led to the adoption of policies designed to support recovery while ensuring the long-term sustainability of national economies (Malliet, 2020). Global manufacturers, in turn, began relocating their production closer to suppliers or diversifying their supply chain networks to reduce reliance on current suppliers and reassess sourcing strategies. Some multinational firms shifted their manufacturing facilities entirely due to the relocation of the supply network and multiple sourcing strategies.

Lao PDR, a small open economy in Southeast Asia, relies heavily on the tourism, agriculture, and forest industries. The COVID-19 pandemic had a profound impact on the country's economy. A 2021 World Bank report projected that Lao PDR's GDP would contract by -0.6% in 2020, marking the worst economic downturn since the 1998 Asian financial crisis. Public debt was expected to increase from 73% to 89% of GDP by 2022, but the pandemic accelerated this rise, pushing it to 88% as early as 2021. The economic damage was compounded by the sharp decline in commodity exports and a sudden drop in national revenue collection.

The government-imposed border closures and restrictions on the movement of goods within the country, especially during the lockdown period, significantly impacted the country's economy. These measures were further exacerbated by a 2% increase in inflation (~10% to April 2022) (World Bank, 2021; World Bank, 2022).

To mitigate the impact of COVID-19 on GSCs, the Lao government devised several strategic measures. Firstly, the government recognizes the importance of supply chain diversification in building resilience. Reducing reliance on a single source for essential goods and services, particularly in critical security and public health sectors, is central to this strategy. The government is adopting digital technologies to enhance supply chain efficiency and transparency. This includes leveraging data analytics, Blockchain, and AI to monitor and manage the flow of goods more effectively.

The Lao National Single Window, a joint venture between BIVAC Lao Co. Ltd. and the Ministry of Finance of the Lao PDR, commenced operations in 2021. The system offers multiple benefits to Lao PDR and its traders, such as reducing the use of paper in trade procedures by single submission of forms, lowering operating costs through faster validation and inspection of cross-border trade, enhancing transparency between the public and private sectors, and streamlining workflows for personnel (Greatermekong, 2021).

The Lao government is actively expanding its trade agreements to maintain its position within international supply chains. This includes participation in the RCEP, which aims to foster a more open and connected global trade by reducing trade barriers and negotiating favorable trade terms (ITA, n.d.).

Additionally, the Lao government has placed significant emphasis on infrastructure development in recent years to enhance connectivity, logistics, and transportation, reduce bottlenecks, and streamline supply chain operations. A key initiative is the Lao–China expressway, a 440-kilometer highway project that will improve passenger and cargo transportation, boost production, and stimulate investment, commerce, tourism, and service sectors. The expressway consists of four sections, with the first section already connecting Vientiane and Vangvieng (Greatermekong, 2021).

The Boten-Vientiane railway, a 414 km electrified high-speed railway connecting the Lao PDR-China border town of Boten with the capital, Vientiane, was opened in December 2021. This project positions Lao PDR as a potential land-linked hub that can link the rest of the region. The railway primarily serves the country's northern region, which is distant from critical commercial and industrial hubs (Medina, 2021).

The Lao government has introduced policies encouraging the local production of essential goods to further support domestic industries. This includes subsidies, financial incentives, and legislative measures. To lessen the effects of the COVID-19 pandemic, the Lao government's SMEs Promotion Fund has invested LAK152 billion (approximately USD7.3 million) through commercial banks to provide soft loans to small businesses. These soft loans offer much-needed capital to SMEs, promoting continued business activity and supporting the expansion of agricultural operations, thereby reducing reliance on imported produce through increased domestic production.

Finally, the Lao government has directed relevant authorities to implement strategies to address ongoing economic and financial challenges posed by inflation, unfavorable currency exchange rates, escalating prices, and foreign debt (Lao News Agency, 2023).

Regarding sustainability and environmental impact, urbanization and population growth are putting pressure on city disposal sites, rendering them inadequate. The waste collection rate is still relatively low, and hazardous and medical waste is often improperly discarded in vacant lots and municipal waste disposal sites (World Bank, 2022).

Following the Ministry of Industry and Commerce regulations, the Department of Industry is responsible for conducting factory inspections during operation license issuance and regularly monitoring the management of chemicals and waste within the factory. Department of National Resources and Environment leads community and school-based educational initiatives concerning hazardous waste management. The Savan-Seno SEZ, established in 2003 along the Thai border of Savannakhet Province on the East-West Corridor (linking Mawlamyine in Myanmar to Da Nang in Vietnam via Thailand), was the first SEZ in Lao PDR. Within the SEZ, Svan EMC Company, an environmental management and pollution control service provider, was jointly set up by SEZ Authority and TML Alliance, a private-sector company. TML Alliance provides a wide range of environmental services, including environmental surveys and waste disposal (JICA, 2021).

To enhance social welfare, the Lao government is dedicated to implementing reforms leading to Universal Health Coverage by 2025, especially for the most vulnerable populations, such as mothers and children. This will ensure that everyone has equitable access to high-quality healthcare without worrying about financial hardships while availing of healthcare services (Bodhisane & Pongpanich, n.d.).

The government's efforts align with the Resilience Framework, which focuses on three major components:

1. **Green Growth:** Promoting green infrastructure, sustainable waste management, green budgeting, green bonds for renewable energy, and transition towards low-carbon economy and clean energy transitions.
2. **Resilience to Climate Change:** Developing resilient supply chains and infrastructure to assist local communities withstand natural disasters and climate change effects while reinforcing biodiversity, wildlife protection, and ecosystem protection.
3. **Disaster Risk Management:** Strengthening collaboration among the private sector, communities, government, and other stakeholders to reduce disaster risks and losses, ensuring a safe and sustainable future (Insisienmay, 2023).

New GSC Dynamics and Their Impact on Aggregate and Firm-Level Productivity

GSC has emerged as an indispensable component of the global economy, transforming production, investment, and trade patterns worldwide. Lao PDR recognizes that MSMEs can be economically viable and are essential for job creation. To achieve this, MSMEs must establish close connections with domestic and international production networks and markets.

The government encourages SMEs to increase their participation in value chains and global markets to gain access to new technologies and innovations. By integrating into regional and international supply chains, SMEs can enhance their market reach and productivity. Nonetheless, the Lao-China Railway is vital in linking Lao PDR to global and regional supply chains by land. This could increase the country's appeal to investors, generate new employment opportunities, and drive economic growth.

Given its strong correlation with GDP per capita, labor productivity has attracted considerable interest. Using the growth accounting framework, the average growth of hourly labor productivity can be broken down into three distinct factors.

Quality-Adjusted Labor Input Per Hour Worked: This reflects qualitative improvements in labor, leading to a more skilled and efficient workforce.

Capital Deepening: This factor assesses how effectively labor can utilize additional capital, as measured by capital input per hour worked.

Total Factor Productivity: This metric evaluates the utilization efficiency with which both labor and capital inputs can be utilized.

Labor productivity growth is contingent upon the efficient utilization of capital and technology and improvements in labor quality. Empirical evidence from various economies indicates that economic growth is often accompanied by capital deepening, where labor productivity rises as workers benefit from greater access to capital.

Lao PDR experienced a decline in labor productivity, with an average growth rate of -0.2% during 2015–20. Meanwhile, economies like Bangladesh, China, India, Lao PDR, Myanmar, and Turkey made significant progress, moving to the forefront of productivity growth.

In 2017, the average labor productivity in the Lao PDR stood at USD5.8 per hour, significantly lower than the USD20.7 per hour average across 20 APO members and the USD11.7 per worker average in ASEAN. Lao PDR aims to reach the ASEAN average level by 2025, targeting labor productivity of USD12.9 per hour. By 2030, the country seeks to achieve an average of USD18.8 per hour, positioning Lao PDR among the top-performing APO nations.

The Lao PDR National Productivity Master Plan identifies two key strategies to exceed baseline productivity projection.

1. **Relocation of Labor:** Shifting labor from the agriculture sector toward manufacturing to improve productivity.
2. **Sectoral Investments and Improvements:** Encouraging investments in manufacturing and services to stimulate growth (APO, 2021).

The country's 9th Five-Year National Socio-Economic Development Plan (2021–2025) emphasizes that the Lao government is committed to collaborating with businesses to develop and improve the consistency of Technical and Vocational Education and Training (TVET) programs, regularly monitoring quality, and integrating graduate data into the national labor market information system. The five-year plan also aims to enhance the learning environment by upgrading facilities, teaching materials, tools, and machinery to meet industry standards.

It also encourages private sector involvement in internship programs to connect students' educational experiences with practical job opportunities. Moreover, to facilitate a more extensive entry into the labor market while aligning with the requirements of the public and private sectors, the government is strengthening human resources training to align TVET programs with labor market requirements. Furthermore, developing educational programs that enable graduates of TVET schools to pursue tertiary studies is of utmost significance.

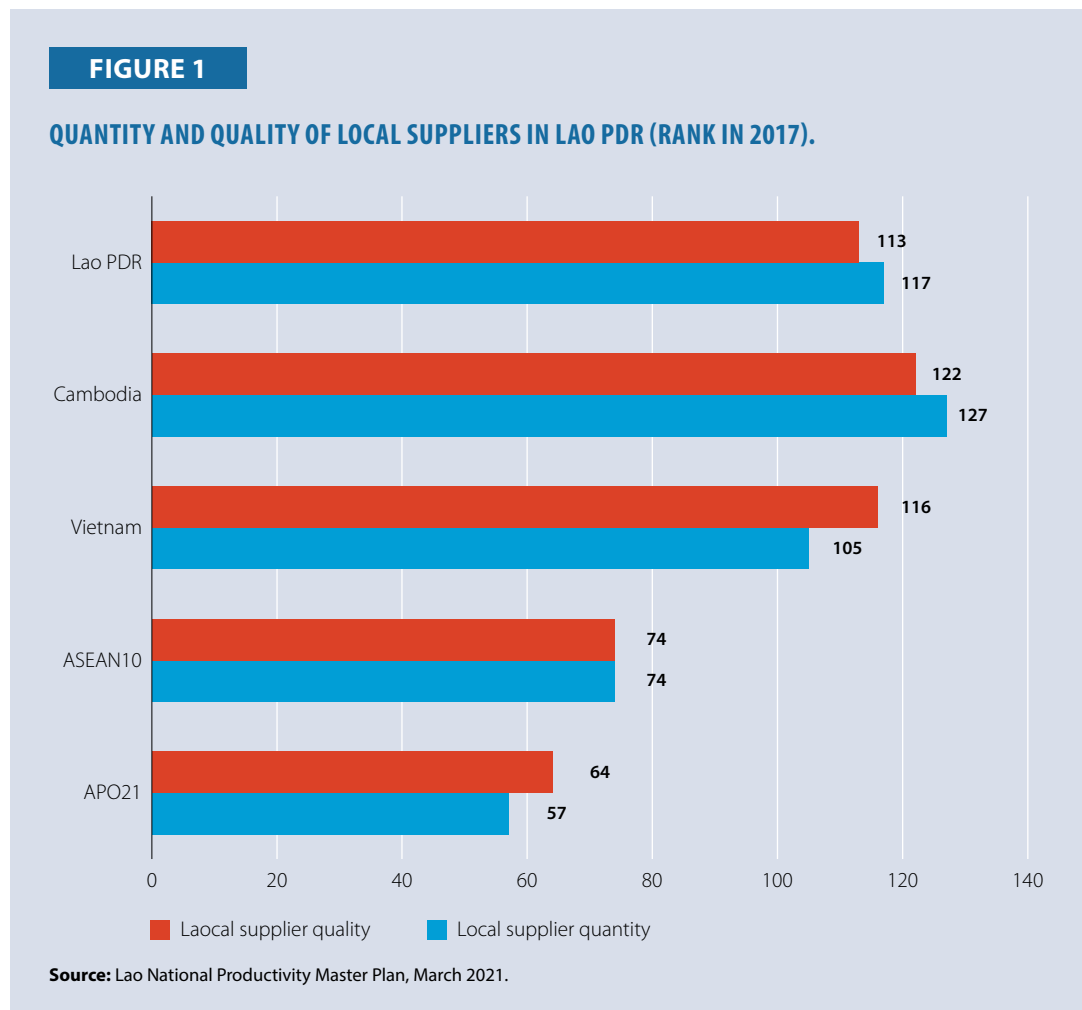
A systematic framework for ranking TVET institutions based on established standards is essential to enhance institutional management and foster competition. Additionally, the government encourages public-private partnerships between TVET institutions and regional businesses, increasing funding for HRD, including technical and vocational education and training, as well as early childhood education and university education. The objective is to enhance the quality of instruction and learning, ensure that curricula remain current, and help equip students with the skills necessary to compete in the era of Industry 4.0 and digital advancement (APO, 2021).

The priorities for accelerating the structural transformation of the Lao PDR include the following:

- Highly concentrated exports and production structure despite a low productive capacity.
- Low level of human capital and inadequate education quality.
- Inadequate and poor infrastructure.

There are also concerns about the absorptive capacity of domestic companies. FDI has been identified as a significant mechanism for technology transfer and knowledge spillover between domestic and foreign-invested firms, especially those with absorptive capacity. This connection

has served as a critical conduit for productivity increase. This linkage has significantly facilitated productivity gains. According to Figure 1, in 2017, Lao PDR ranked 113th out of 137 economies for the quality and number of local suppliers, according to the Global Competitiveness Index of the World Economic Forum. Although the country performs slightly above the average of its neighbors and regional counterparts, it remains marginally below the ASEAN 10 and the APO 21 averages, indicating that further improvements are necessary. Capacity-building initiatives targeting Lao companies are essential to facilitate the spillover effects from foreign to domestic firms and strengthen business ties.



FDI plays a pivotal role in facilitating the transfer of knowledge and technology, which can lead to enhanced product diversity and sophistication. This transfer strengthens the ability of Lao PDR enterprises to manufacture and distribute more complex goods in international markets, forming a key foundation for productivity growth. Given the current economic landscape, Lao PDR has the potential to boost domestic manufacturing by substituting imports with locally produced goods. This process can begin by using domestically sourced raw materials and expanding into new, higher-value products with greater complexity.

Currently, Lao PDR produces most basic goods using domestic raw materials. More than 70% of inputs for products such as paper, leather, textiles, wood, nonmetallic minerals, and food are

sourced locally. Conversely, over 70% of the raw materials used in producing high and medium-tech goods, including transport equipment, communications equipment, and electrical and optical components, are imported. Given its growing capacity to manufacture a broader range of sophisticated products, Lao PDR is strategically positioned to prioritize promoting existing domestically sourced products. Over time, the country can gradually transition toward manufacturing more advanced high- and medium-tech goods, enhancing its competitiveness in global markets (APO, 2021).

Impact of GSC on Lao PDR

Sectoral Coverage

As a landlocked Southeast Asian country, Lao PDR has been steadily working toward global economic integration. The country's exports and participation in the global supply chain are primarily driven by hydropower, mining and natural resources, agriculture, the garment and textile industry, and tourism.

Agriculture is a key contributor to Lao PDR's global supply chain involvement. The main aspects of agriculture in the country and its contribution to the global supply chain are outlined:

Rice Production and Export: Rice is a major crop in Lao PDR, forming the backbone of the country's agricultural sector. The country contributes to the global rice supply chain by exporting rice to neighboring markets. As a staple food worldwide, Lao PDR's contribution to its production and export influences the dynamics of the global food market.

Coffee Production and Export: The Lao PDR is renowned for producing high-quality Arabica coffee, a significant export. Lao coffee has become well-known in international markets, making the coffee sector a vital part of the global supply chain.

Rubber Industry: Lao PDR actively contributes to the global supply chain by producing natural rubber, an essential raw material used in manufacturing and the automobile sectors.

Tea Industry: The country is also involved in the global tea market, with Lao PDR becoming more prominent in international trade. Known for its distinct flavors, Lao tea exports are strengthening the country's presence in the global tea industry.

Garment and Textile Industry: Lao PDR has significantly integrated its textile and apparel sectors into global and regional value chains. This entails establishing partnerships with neighboring nations and engaging in regional economic initiatives to strengthen connections between production and trade. Focusing on supplying goods to international markets, the garment and textile sector in Lao PDR has become progressively more export-oriented. It includes manufacturing apparel, textiles, and other merchandise for international trade.

In terms of investment, the textile and apparel industries have garnered FDI in Lao PDR. Capitalizing on the comparatively affordable labor force and the government's endeavors to foster industrial progress, foreign corporations have commenced activities within the country. In terms of the GVC, Lao PDR-based companies may participate in sourcing raw materials, manufacturing, and distribution, among other stages of production. The industry's integration into global supply chain networks necessitates collaboration with international retailers and trademarks.

Impact of New GSC Trends on Aggregate Productivity and Economic Development

Research and Development Expenditure as a Percentage of GDP

The Government of Lao PDR has been encouraging R&D to contribute to economic growth and address various societal challenges. As a developing country, there is no direct data on R&D compared to GDPs. However, social scientists have begun to play an essential role in providing scientific-based policy recommendations for ministerial-level policymakers. The government allocates 0.04% of GDP to scientific and technology R&D funds (Govt. of Lao, 2021). The policy brief and journal are regularly published on social media channels and circulated to researchers and policymakers in related fields.

Although Figure 2 depicts a fluctuating GDP growth per capita trend, Figure 3 indicates a discernible upward trajectory in GDP per capita during 2005–22. This consistent rise suggests that the economy has been steadily expanding. Consequently, it is reasonable to anticipate that the government will allocate more funding towards research initiatives. This could be attributed to the overall growth and stability of the economy, which often prompts increased investment in R&D to further bolster economic progress and innovation.

R&D activities and government funding for research have a complicated and multifaceted relationship that affects innovation, technological advancement, and economic growth. Government funding serves as an engine for innovation by furnishing the essential resources required for the investigation and advancement of innovative ideas and technologies. Governments can mitigate the risks associated with costly and high-failure-rate projects through investments in R&D. This facilitates the pursuit of ambitious projects by businesses and researchers that might not immediately garner private sector funding due to perceived risks or prolonged development timelines. Allocating financial resources to R&D helps the economy grow by encouraging new ideas that create new goods, services, and industries. R&D funding plays a vital role in education and training for researchers, engineers, and other professionals, contributing to developing a skilled workforce.

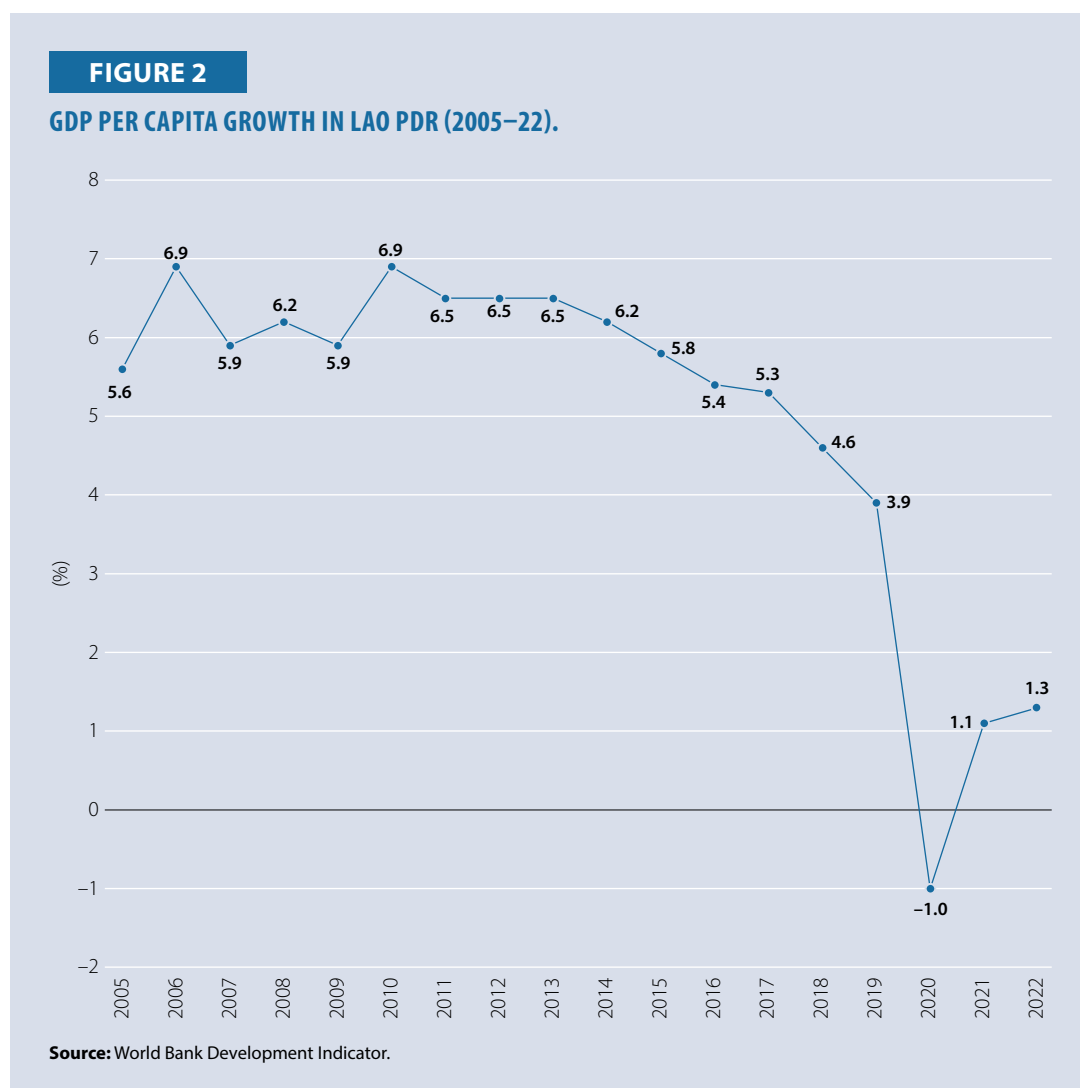
Most Lao ministries have a dedicated research institute or unit, indicating the integral role of social scientists in shaping policy recommendations at the ministerial level. These researchers provide evidence-based insights essential for policymakers to make informed decisions. The resulting policy briefs and journals are regularly shared across social media platforms, serving as valuable resources for researchers and policymakers in the relevant fields. This dissemination strategy ensures widespread access to valuable research findings, fostering informed discussions and potentially influencing policy directions in Laos. However, not all policy recommendations have been implemented by policymakers. Many research topics are influenced by the interests of researchers, funding organizations, and partner institutes. Similar to other countries, policy-oriented research in Laos faces several challenges.

The issues include a lack of communication between policymakers and researchers. In other words, policymakers are not always informed about the research outcome, whereas researchers or social scientists do not have adequate knowledge of the most pressing policy questions. Regardless of the capability, universities are not in a position to engage with policymakers. Policymakers usually see the importance of research conducted by their technical experts, international organizations, international research institutes, or diplomatic missions as sources of information for policy inputs (UNCTAD, 2006).

The most critical linkage between policymakers and social scientists is the direct contact or communication throughout the research process. This linkage creates legitimacy, a culture of trust, and openness (Petticrew et al., 2004). Communication between the two parties refers to ‘knowledge transfer,’ in which the use of genuine knowledge requires productive interaction between social scientists and decision-makers

Annual GDP Per Capita Growth

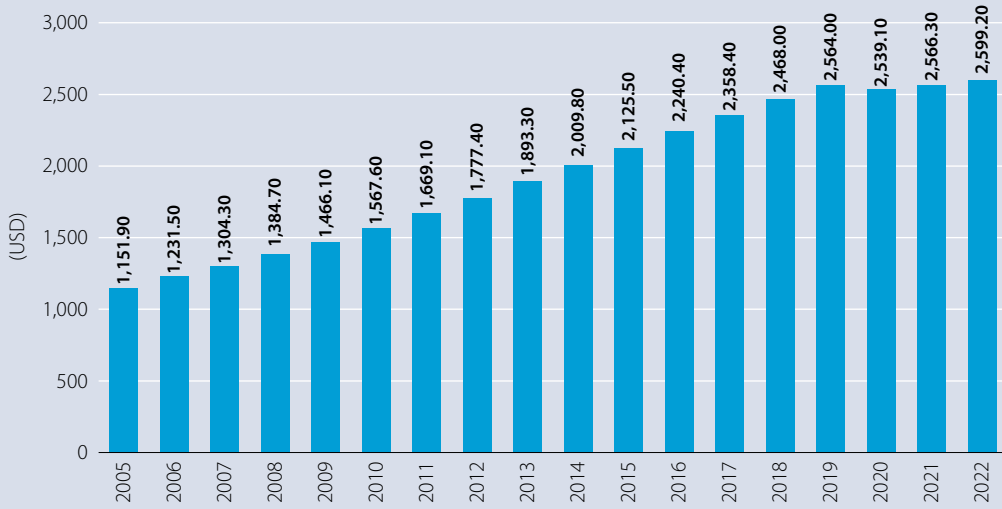
Information provided in Figure 2 indicates that the country’s GDP per capita growth rate fluctuated between 5.6% and 6.9% during 2005–10. The growth rate marginally decreased from 6.5% to 3.9% in 2019. The COVID-19 pandemic resulted in the GDP growth rate reaching the lowest -1% in 2020. After the end of the travel restriction, the GDP per capita growth slowly recovered to 1.1% and 1.3%, respectively, in 2021 and 2022.



GDP Per Capita

According to the World Bank Development Indicator, Laos’ GDP per capita increased from USD1,151 in 2005 to USD2,564 in 2019. Due to the impact of COVID-19, the values dropped to USD2,539.10 in 2020. Since then, the GDP per capita has gradually recovered, increasing to 2,566.30 in 2021 and 2,599.20 in 2022.

FIGURE 3
GDP PER CAPITA CONSTANT 2015 USD (2005–22).

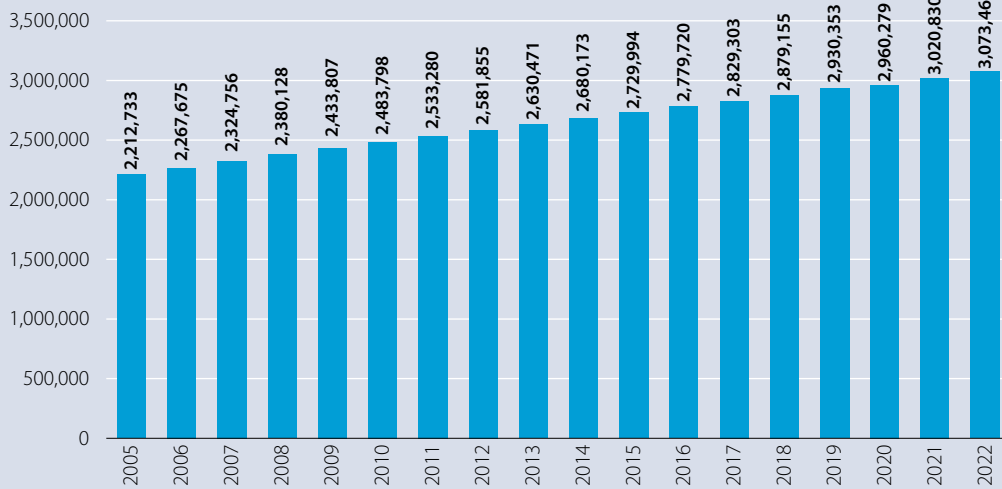


Source: World Bank Development Indicator.

Labor Force in Lao PDR

Figure 4 shows a gradual increase in the total labor force in Lao PDR from 2005 to 2022. This has resulted from several factors, including demographic shifts, economic growth, and shifts in the labor market, with a growing number of people actively seeking employment. Laos has a relatively young population, 59% being children and young people below the age of 25, in the working age. This demographic trend contributes to a growing labor force as more youths enter the workforce each year (Unicef, 2024).

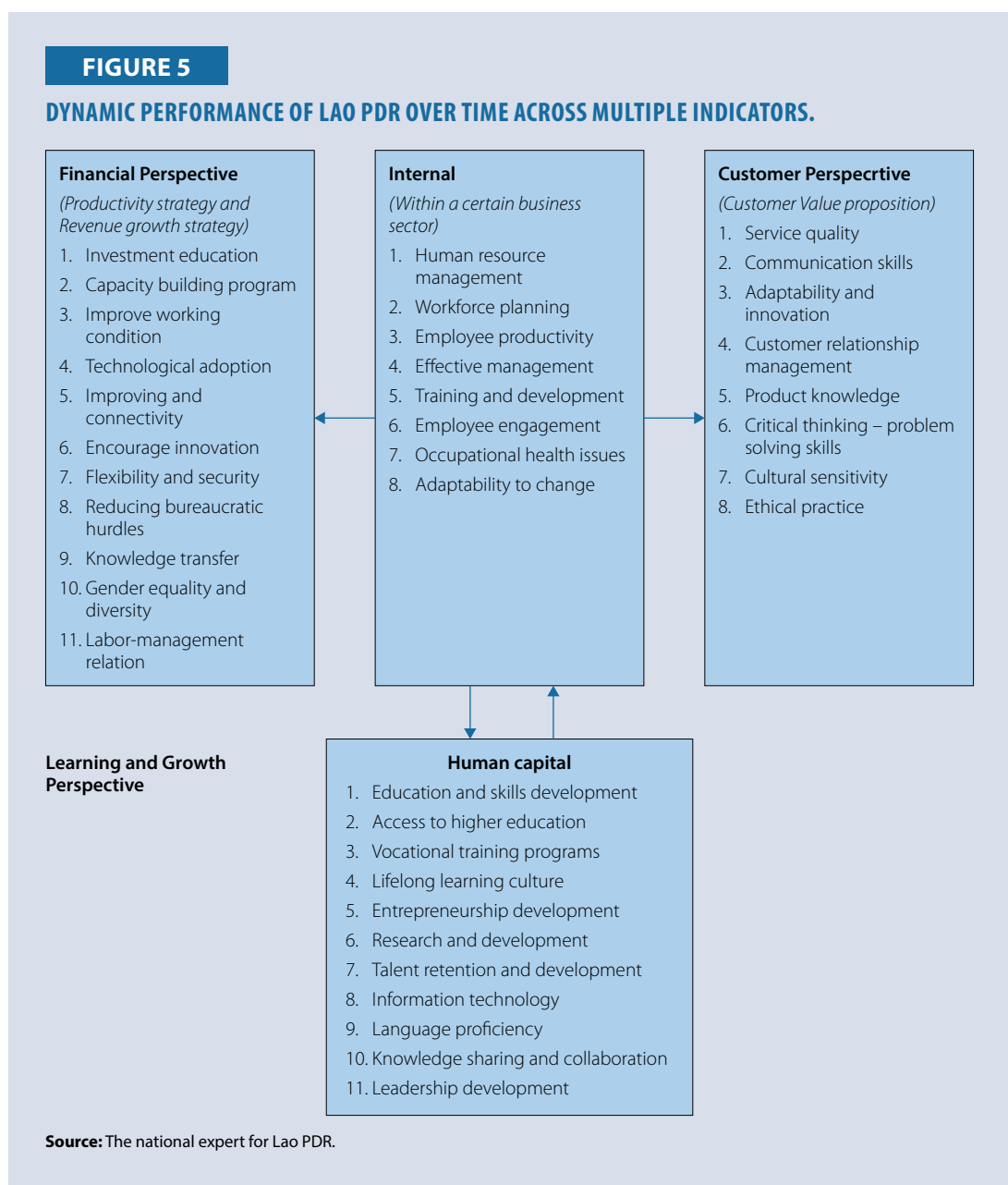
FIGURE 4
TOTAL NUMBER OF LABORS IN LAO PDR (2005–22).



Source: World Bank Development Indicator.

The Lao government has prioritized creating jobs and increasing labor force participation in the policy agenda. These policies are designed to stimulate economic growth, improve productivity, and promote social stability by fostering job opportunities and encouraging active participation in the workforce. The government aims to improve the overall standard of living while reducing poverty and inequality through a strong focus on job creation. Increased labor force participation empowers people, improves their skill set, supports inclusive growth, and contributes to sustainable economic development.

Figure 5 illustrates the factors driving the dynamic performance of Lao PDR over time, measured through multiple indicators. Firstly, advancements within specific business sectors can be directly attributed to internal organizational improvements. Effective human resource management, strategic planning, attention to social welfare issues, and adaptability to change are pivotal in enhancing organizational efficacy.



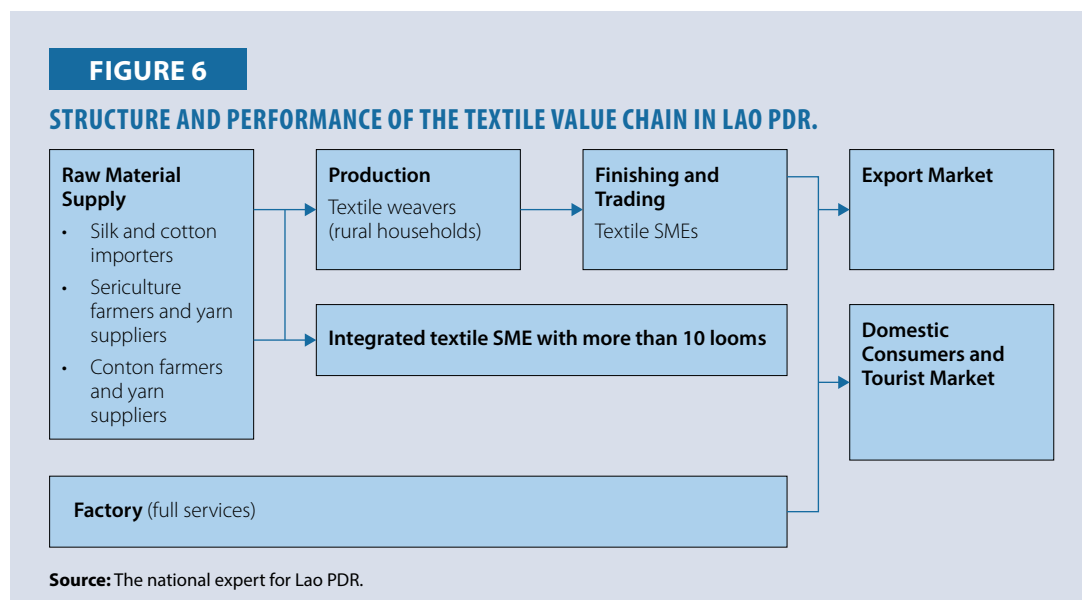
Furthermore, companies’ performance can be bolstered by focusing on key perspectives, including financial, customer, and human capital management. Strengthening the financial perspective involves implementing strategies to boost productivity and foster revenue growth. Conversely, the customer perspective entails initiatives to enhance customer satisfaction, encompassing service quality, communication skills, and customer relationship management. By addressing these factors comprehensively, businesses in Lao PDR can drive sustainable growth, foster competitiveness, and contribute to the country’s overall economic development.

Case Study

The garment and textile industry is vital to the economy of Lao PDR. Ready-to-wear garments from Lao PDR are exported to forty-two countries. As a developing country, categorized as one of the 49 least developed, Lao PDR receives the Generalized System for Preferences (GSP). This trade preference program grants developing countries preferential tariffs on their exports to stimulate economic growth. The GSP provides duty-free and quota-free market access to specific developed countries for Lao PDR (Thephavong et al., 2005).

According to the Association of Lao Garment Industries (ALGI), garment and textile factories in Lao PDR employ roughly 25,000 people, of which 90% are female. These factories produce a wide range of products, including uniforms, shirts, T-shirts, polo shirts, office attire, coats, jeans, blankets, shoes, and other items. Lao PDR’s exports are primarily destined for Europe (80%), followed by Japan (9%), the United States (4%), and Canada (2%). The total annual export value of these products is estimated at approximately USD200 million (Visapra, 2022).

Figure 6 illustrates an overview of the textile value chain in Lao PDR. It consists of four major processes involving multiple stakeholders. Raw materials are sourced from (1) silk and cotton importers, (2) sericulture and yarn suppliers, and (3) local cotton farmers and yarn suppliers. Textile weavers, integrated textile SMEs, and factories then process the raw materials.



The finishing and trading stage involves three key players: (1) textile SMEs, (2) integrated textile SMEs, and (3) factories, with integrated textile SMEs and factories participating in more than one

process. Finally, the finished products are distributed to export markets, domestic consumers, and tourist markets (Thippavong et al., 2018).

Varitha Huaan Ando Lao

Company Introduction and GSC Plans

Ando Co. Ltd. was established in Japan in July 1923 with a capital investment of JPY50,000,000. The company employs 55 people in Japan, with an additional 228 people working overseas. The primary business activity is manufacturing, focusing on products related to yukatas, unique Japanese items, and kimono accessories. The company is supported by four overseas partners: three in China—Shandong Huaan Silk Dress Co. Ltd., Zhejiang Zhuji Huaan Arts Co. Ltd., and Laiyang Huaan Arts Co. Ltd.—and the fourth in Lao PDR, under the name Varitha Huaan Ando Lao Co. Ltd. (VHA Lao). The company's products are sold through trading firms, wholesalers, and retailers in Japan and internationally.

Established in December 2013, VHA Lao manufactures accessories for kimono, a traditional Japanese dress, which are exported to Japan. It is a joint venture company, with 70% ownership held by Japan and 30% by Lao PDR. The Lao partner made a capital investment of USD one million as part of the initial investment. In addition to purchasing from nearby farmers, the company was granted an eight-hectare land concession by the government for a maximum of 30 years, which allowed it to develop its silk farm to supply the factory. Production is based on orders from the company's Japanese business partner, Ando Co., which ensures a seamless supply of kimono accessories to the Japanese market.

To establish a benchmark for Japanese-style manufacturing on a global scale, the Ando headquarters have developed a production system and quality management team to guarantee that products are manufactured proficiently and subject to stringent quality control measures, both in domestic and overseas factories. Quality control emphasizes product testing to detect manufacturing defects and guarantee the highest levels of customer service regarding the dyes' quality, durability, and safety.

VHA Lao implemented the identical concept from its headquarters to its local factory. The factory adheres to the standards set by the parent company to comply with market standards. It enables exports to Japan, primarily traditional Japanese accessories and kimonos, using silk as its primary raw material. Should the company's internal markets and staff quality continue to increase, and demand remains high, the factory may consider expanding its production line.

GSCs have become more critical in the global economy in recent decades. This is due to several factors, including falling trade costs made possible by fast progress in logistics and telecommunications and the opening up and loosening of international trade and investment rules. Offshoring and outsourcing, which allow companies to extend their supply chains overseas in search of efficiency, market access, and new resources, also helped the growth. Local suppliers are becoming more involved in the supply chains of foreign buyers, especially in developing economies (OECD, 2013).

In the case of VHA Lao, the global supply chain system structure can be divided into raw material, component supplier, distributor, and marketing.

Raw Material

VHA Lao manufactures kimonos and a few accessories. Silk is domestically sourced and imported from neighboring countries like China and Thailand.

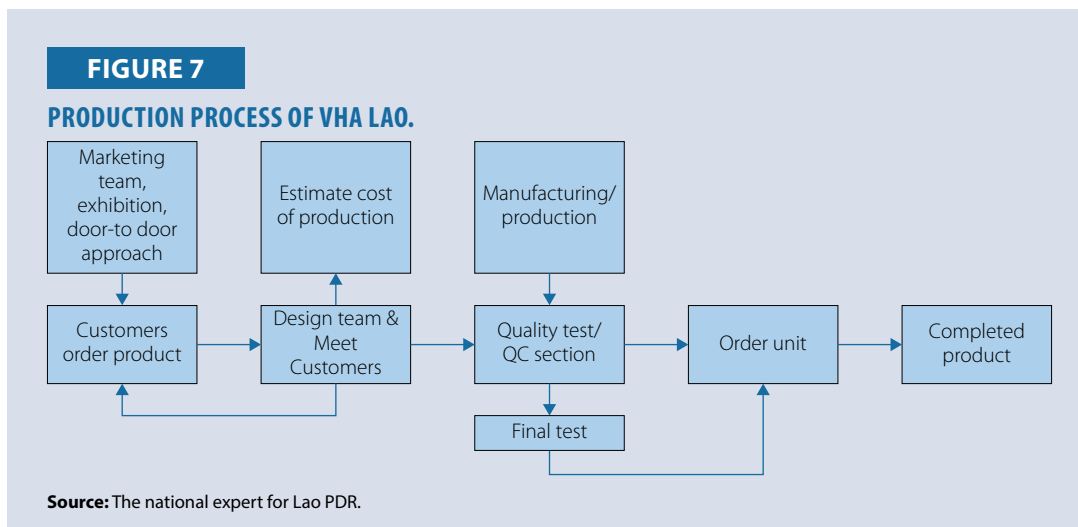
Component Supplier

They are part of the larger supply chain and act as intermediaries between raw materials producers and finished goods manufacturers. VHA Lao produces traditional Japanese kimonos, which follow a relatively simple process compared to manufacturing in other industries. This firm directly purchases raw materials from firms in Lao PDR and other suppliers in neighboring countries.

Distributor and Marketing

Due to the distinctiveness and divergence of Japanese traditional dress from other dress styles, the product’s target market is more specialized. The products are displayed and sold in specialty markets and shops owned by the parent company in Japan. The accessories manufactured in Lao PDR, China, and Vietnam are exported to the parent company for distribution and exhibition on domestic and global markets. It also provides manufacturing partners with product specifications and dispatch quality control and instruction specialists before exporting to Japan. The outcome of this finding is in tandem with the previous literature, which found that most of the textile and clothing firms in Lao PDR are categorized as small and medium firms, which operate as sub-contractors engaged in simple cut, make, and trim implementation (ALGI, 2018).

Figure 7 illustrates the steps involved in a product’s lifecycle from marketing to delivery. It begins with marketing strategies such as a marketing team, exhibitions, and door-to-door approaches. Once customers order a product, the design team meets with them, and then the cost of production is estimated. The next phase is manufacturing or production, followed by a quality test/QC section, which involves a final test. The order unit is the penultimate step before the final inspection, which leads to the completed product.



Potential Impacts

Supply chains consist of interconnected activities that connect the inception, various stages of production, and ultimate distribution of a product or service to consumers. GSCs are thus concerned with the impacts on labor and business productivity, among other productivity indicators.

Significant disruptions in supply chains have been documented by many companies, especially within the SME sector, during the COVID-19 pandemic. Approximately two-thirds of SME operations have been significantly impacted by supply chain disruptions, compared to 40% of larger businesses. However, even among SMEs, the disruptions in the supply chain have had an

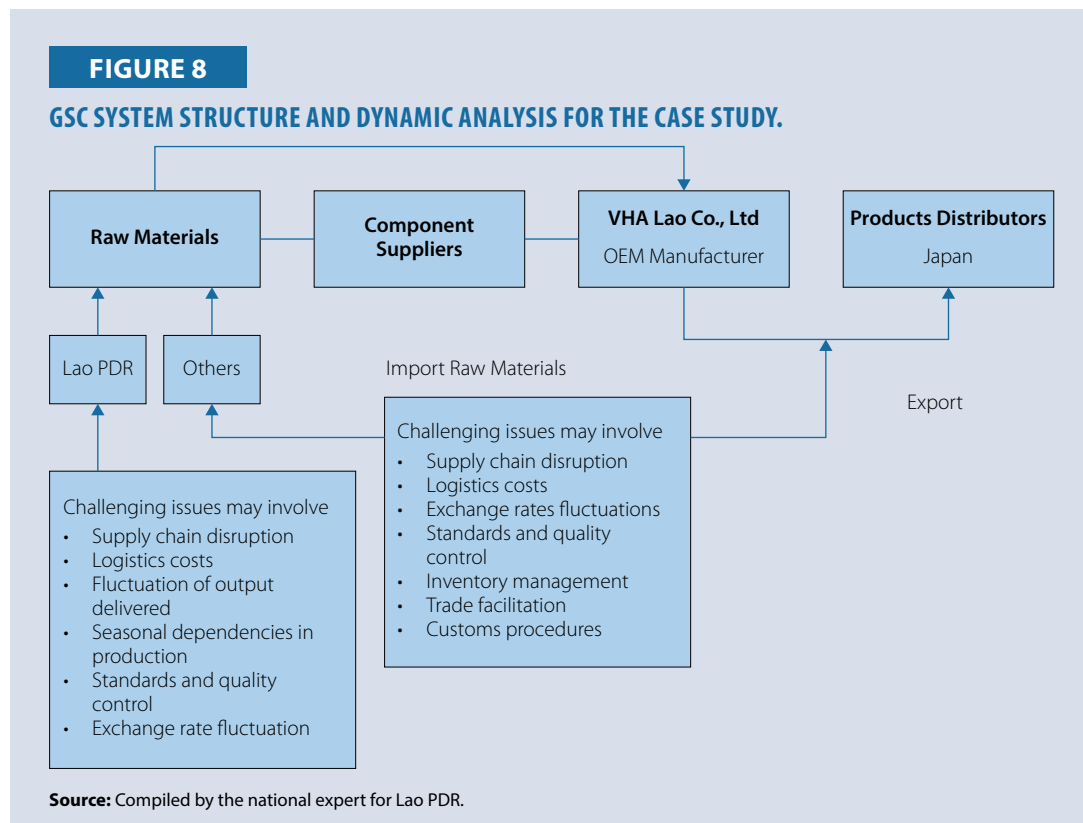
uneven effect on operations, with specific industries being more susceptible to supply chain risks. This includes the textile sector GSC (Gurbuz, 2024).

The border was reopened on 7 May 2022, following the Lao government’s COVID-19 relaxation policy. The data collected during the COVID-19 pandemic reveals an organization’s ten most significant concerns: inflation, exchange rate volatility, production network issues, employee job hopping, disciplinary matters, logistics expenses, wage hikes, labor force shortage, electricity fees, and logistics costs.

The outcome after the COVID-19 pandemic, however, exhibited specific alterations: a reduction in sales, an increase in oil prices, a surge in the cost of raw materials and components, production expenses, unskilled labor force, and wages, which constituted the top ten challenges during the transition from the lockdown to relaxation period. Although the firm encountered four out of ten issues before and after the COVID-19 pandemic, these issues persist. The concern gap has been observed to be widening. By adopting GSC System Structure and Dynamic Analysis, a company conducting business in Lao PDR will continue to face challenges beyond May 2023.

Figure 8 highlights the global supply chain dynamics for VHA Lao, demonstrating the company’s ability to directly access raw materials from suppliers within Lao PDR and other countries. Alternatively, it can procure raw materials from importers, also known as component suppliers. When sourcing from local suppliers, the company encounters several challenging issues, including disruptions in the supply chain, logistical expenses, quality control difficulties, exchange rate fluctuations, and other operational difficulties.

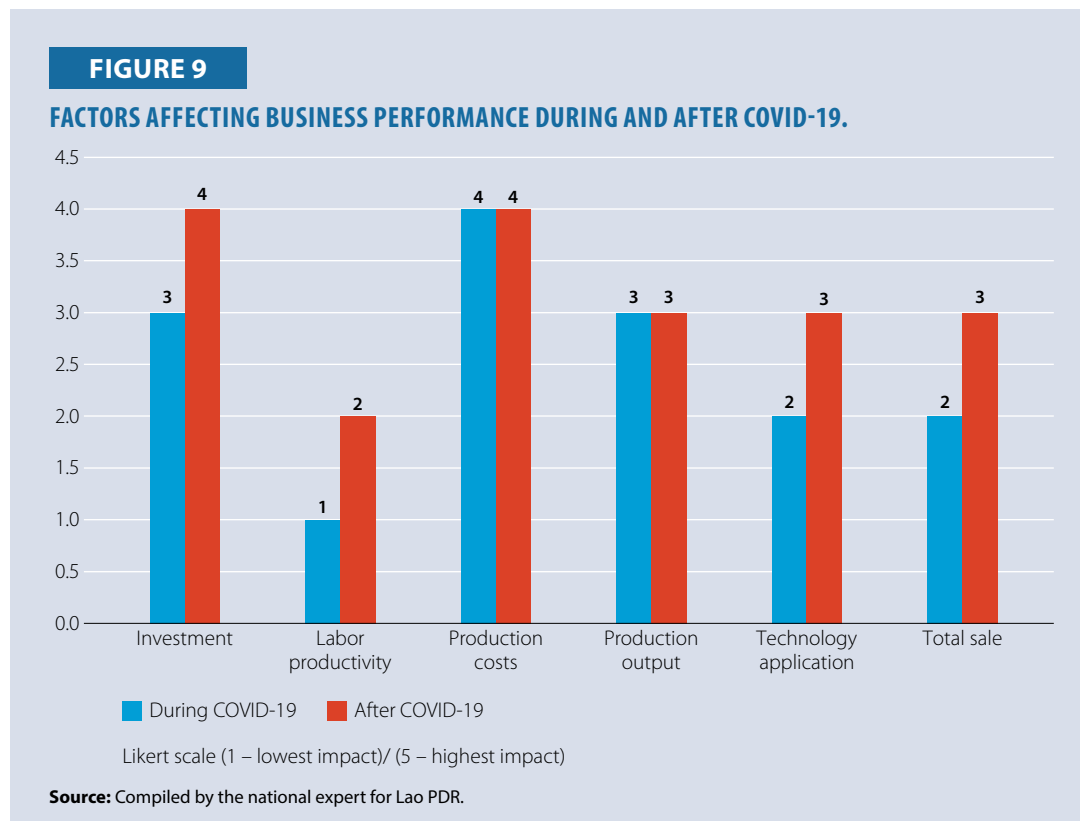
Similarly, relying on foreign suppliers presents comparable challenges and additional complications related to trade facilitation, customs procedures, and inventory management.



Navigating these complexities in the supply chain is critical for VHA Lao to ensure consistent access to high-quality raw materials, optimize costs, and maintain operational efficiency. Strategies aimed at mitigating risks and enhancing collaboration with suppliers, both domestic and international, are essential for sustaining the company’s competitive edge in the marketplace. Moreover, employing robust inventory management systems and streamlining customs procedures can further bolster the company’s resilience and adaptability to dynamic market conditions.

Business Performance and Labor Productivity

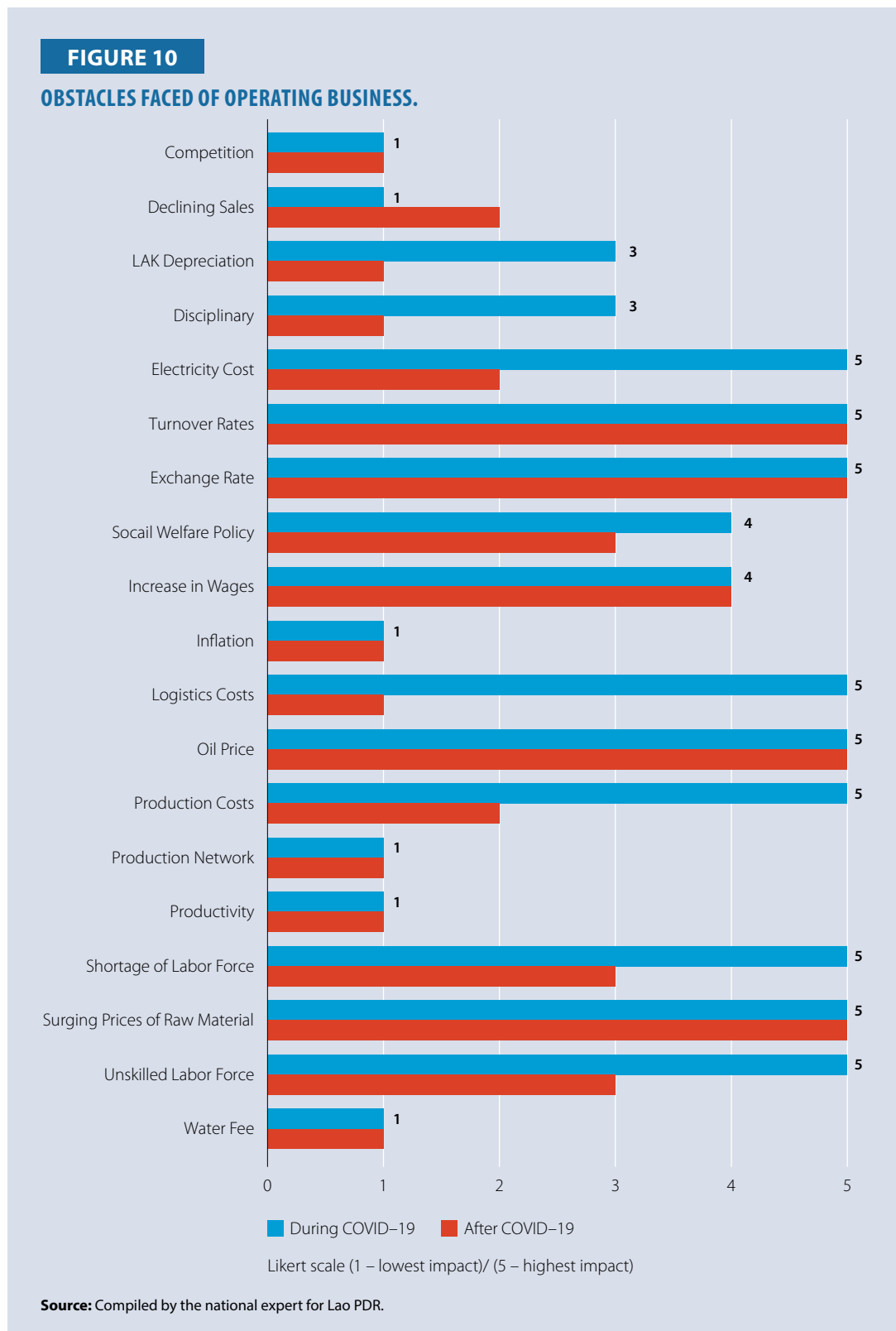
Figure 9 presents a comparative analysis of various factors related to business operations and their perceived impact during and after COVID-19, using a Likert scale from 1 (lowest impact) to 5 (highest impact). The blue bars represent the period during COVID-19, while the orange bars represent the post-COVID-19 period.



It can be seen that the scales for production costs and production output were comparable at the rate of 4 and 3, respectively. On the other hand, investment, labor productivity, technology application, and total sales seemed more significant in the post-COVID-19 pandemic. In other words, the post-COVID-19 pandemic landscape has underscored the critical role of investment, labor productivity, technology application, and total sales in driving economic recovery and fostering long-term growth. Businesses prioritizing these factors are better positioned to navigate uncertainties, capitalize on emerging opportunities, and thrive in the evolving business environment.

Figure 10 compares various challenges businesses faced during and after the COVID-19 pandemic using a Likert scale ranging from 1 (lowest impact) to 5 (highest impact). There are several notable points. Turnover rates, exchange rates, oil prices, and increasing prices of raw materials were considered problematic for business operations. On the other hand, some challenges deemed

significant during COVID-19 have lessened post-COVID-19, indicating an improvement in those areas. Those areas were social welfare policy, logistic costs, and other issues. Conversely, a few challenges have higher bars post-COVID-19, suggesting that these issues have become more pressing after the period of the pandemic.



Conclusion

The COVID-19 pandemic, geopolitical challenges, and new industry standards have reshaped GSCs. Following the pandemic, manufacturers are under political and competitive pressure to increase domestic output, create employment opportunities in their home countries, reduce or eliminate their reliance on risky sources, and reconsider lean manufacturing practices that minimize inventory levels in international supply chains. The Lao government has implemented various measures to address the challenges posed by COVID-19 and other external factors. These include efforts to reduce reliance on single-origin supplies, promote digitalization, strengthen partnerships through trade agreements, and boost transportation by developing infrastructure. These initiatives reflect essential policy actions to improve resilience and ensure sustainable growth. This study seeks to explore the new dynamics of GSCs and assess their impact on productivity.

To fulfill the research objective, the research team followed the proposed research framework and guidelines for national experts, adapting them for application in Lao PDR. The descriptive data analysis utilized secondary data from the World Bank Development Indicator. Additionally, an interview session was conducted with a company operating in the textile industry to understand the pre and post-COVID-19 impact in recent years.

Structured and open-ended questions were used during the interview to gather information from the case study firm. The findings indicate that labor productivity declined significantly during the COVID-19 pandemic. However, after the reopening of borders, labor productivity showed marginal improvement, positively influencing the firm's overall performance.

Several factors contribute to the below-par performance of the firms in developing countries, including inadequate education and skills, limited access to technology, the dominance of the informal economy, challenges in ease of doing business, trade facilitation issues, and other external factors.

Recommendations

A multifaceted approach is essential for formulating policy recommendations for the Government of Lao PDR to address the evolving dynamics of GSCs and enhance productivity. The following suggestions are proposed:

- **Infrastructure Development:** Improvements are needed across all aspects of transportation infrastructure, including airports, ports, and roads, to reduce transportation expenses and transit times and enhance the nation's attractiveness to participants in the global supply chain. Digital infrastructure is equally important, improving digital connectivity to streamline the information flow, reduce transaction costs, and enhance overall operational effectiveness. This includes ensuring a reliable digital infrastructure and expanding access to broadband services.
- **Trade Facilitation Issues:** Modernizing and streamlining customs procedures should facilitate the cross-border movement of goods. Implementing technological solutions for customs clearance can significantly reduce delays and costs. Participation in and actively pursuing trade agreements that reduce trade barriers and provide access to new markets is essential. Expanding the supply chain network in this manner has the potential to bolster the resilience of Lao PDR's economy.

- **Skill Development:** Investing in training and education is necessary to develop a skilled labor force capable of meeting the demands of sectors engaged in GSCs. This includes training in technology, logistics, and related fields. For innovation, R&D in critical sectors must be promoted to facilitate innovation and the integration of cutting-edge technologies that have the potential to enhance efficiency. Additionally, promoting environmentally conscious and sustainable practices throughout the supply chain can attract eco-conscious consumers and businesses, aligning with global sustainability patterns.
- **Promoting SMEs:** The government needs to improve SMEs' access to finance and implement policies that streamline the financing process for these enterprises, which play a crucial role in regional and local supply chains. Training programs and technological access should also be provided to strengthen SMEs' capabilities for participating in GSCs. Government support and resource allocation are essential to achieving this goal.
- **Management of Risky Issues:** Diversifying sources and markets across multiple sectors is essential to reduce dependence on single sources and mitigate risks associated with disruptions in the global supply chain. Businesses should be encouraged to develop continuity and resilience strategies, including approaches to managing the impact of geopolitical events, natural disasters, and pandemics.
- **Promoting Public-Private Partnerships:** The government should promote partnerships between the public and private sectors to foster cooperation between the public and private sectors. Such collaboration can help address challenges, improve the business environment, and create more favorable conditions for participants in the global supply chain.

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MALAYSIA

GSC Diversification and Relocation Strategies

A Global Perspective

GSC involves allocating resources, production processes, and the worldwide distribution of goods and services, fostering essential interconnection between companies, suppliers, and organizations. Recognizing the risks to protect the business from possible risks and future threats, firms are increasingly adopting supply chain diversification strategies. By expanding their pool of suppliers, companies not only aim to reduce costs but also to enhance production efficiency. This strategic diversification strengthens businesses, enabling them to proactively respond to unforeseen risks, bolstering their resilience and adaptability in the face of future challenges.

The COVID-19 pandemic sent shockwaves through GSCs. Forecasts by the World Trade Organization for 2023 predicted a 1.7% expansion in global trade. However, UNCTAD in 2022 unveiled a substantial 12% drop in FDI. Global trade growth and decline in FDI can be directly linked to the consequences of COVID-19, intensified by simultaneous global challenges such as the Ukraine-Russia conflict, elevated commodity prices, and surges in public debt.

In addition to diversifying their supply chains, businesses are adopting relocation strategies to enhance their resilience against future disruptions. Some firms are restructuring their supply chain networks or shifting operations to more favorable locations. According to KPMG (KPMG, 2021), Malaysia's competitive manufacturing costs, robust infrastructure, favorable trade regulations, steady economic progress, and effective pandemic management position it among the top choices for firms seeking to expand or relocate their supply chain operations.

The decision to relocate carries inherent risks, such as losing competitiveness due to longer timelines and higher costs. However, some companies are willing to take these risks, driven by key considerations such as labor and logistical costs, proximity to resources and raw materials, and political and cultural influences.

According to the IMF (Sahay et al., 2015), companies can enhance their supply chains and mitigate relocation risks by shifting their focus upstream. This strategic move can prove advantageous for the firm, as it enables the incorporation of additional value within the new location. Upstreaming the supply chain involves leveraging advanced technology and substantial R&D investments.

Faced with a convergence of global crises, companies have taken proactive steps to consider relocating their operations. Among these challenges, the COVID-19 pandemic had a particularly disruptive impact on supply chains. Few international organizations have conducted large-scale studies on key global supply chain dynamics trends, as summarized in Table 1. According to a survey by Allianz (Allianz, 2020), nearly 94% of participating companies experienced substantial negative impacts due to the outbreak. To manage these risks, 52% of businesses proactively revamped their supply chains and safeguarded against potential setbacks through insurance.

According to a McKinsey report (Alicke et al., 2020), 73% of supply chain leaders faced challenges related to their supplier footprint, prompting them to implement changes in future production strategies. These leaders have identified three key priorities for establishing the new standard in supply chains: enhancing resilience across the entire supply chain network, increasing investments in digital supply chain technologies, and centralizing operations through advanced analytics.

The European Central Bank (ECB) (Attinasi et al., 2023) outlines five key factors influencing decisions to relocate production. First, companies consider politically stable regions to ensure smooth operations. Second, they look for climate-resilient areas to set up production facilities sustainably. Third, a favorable regulatory environment is crucial for streamlined processes and business growth. Fourth, managing transportation costs is critical to optimizing overall expenses and staying competitive. Lastly, financial incentives often influence the selection of new production locations. A popular strategy among companies is to relocate production to nearby countries and diversify the global supply chain, reducing risks and improving efficiency.

Also, sourcing materials beyond the EU has become necessary. While these changes may not directly impact EU economic activity, they significantly affect regional employment. The shift in production locations and sourcing has contributed to higher prices, but forecasts suggest price stability over the next five years. Striking a balance between cost-effectiveness, risk management, and a robust supply chain is essential for navigating these decisions. These insights are based on a survey conducted in 2023 within the EU involving 65 respondents, providing a valuable snapshot of the prevailing sentiments and considerations among businesses regarding the relocation of production. These insights are crucial in understanding the nuanced dynamics that influence decision-making in the ever-evolving landscape of global business operations.

Similarly, an EY survey conducted during the pandemic highlighted the adverse impact on supply chains, prompting executives to rethink and enhance their strategies. The disruptions catalyzed companies to invest in new technologies, recognizing the need for innovation to strengthen their supply chains. In response to the crisis, businesses adopted measures to reduce workforce contact and exposure, thereby contributing to the containment of the pandemic.

In the post-pandemic era, supply chains have undergone significant transformations, requiring companies to reskill their labor force to improve efficiency and enhance organizational resilience in the face of unforeseen challenges. There has also been a notable shift in companies' approaches toward supplier relationships, moving away from dependence on a single supplier. This strategy is intended to mitigate risks and increase resilience, especially in the face of future uncertainties.

A survey by PwC identified five crucial factors for strengthening organizations in the Asia-Pacific region. First, rebuilding trust and bolstering supply chain resilience are essential post-disruptions. Second, fostering regional enterprise growth supports sustainable development. Third, embracing digitalization enhances adaptability in the evolving technological landscape. Fourth, prioritizing workforce upskilling prepares organizations for the dynamic job market. Together, these factors provide a foundation for a robust and future-ready organizational framework, enabling businesses to navigate the complexities of the Asia-Pacific business landscape.

TABLE 1

KEY TRENDS OF GLOBAL SUPPLY CHAIN DYNAMICS IN MALAYSIA.

	Key Trends	Study Coverage
Allianz	<ul style="list-style-type: none"> Relocate production to their home countries or regions nearer to the headquarters. Most companies conduct upskilling programs for their labor and invest in technology and R&D because they believe these strategies can help mitigate risks and enhance the company's resilience. Improve vertical production instead of depending on other suppliers, which can be better for controlling quality and reducing risks and costs. 	The survey conducted in 2020 involved 1,181 companies in IT, tech and telecoms, machinery and equipment, chemicals, energy and utilities, automotive, and agrifood sectors. These companies operated in the US, UK, Germany, France, and Italy.
McKinsey	<ul style="list-style-type: none"> Relocate the production near to the end consumer. Reskilling the labor force Enhance the regional supply chain while widening the supplier base. Regionalization of the supply chain would help reduce costs and might be an emerging trend in the future of the supply chain. 	The survey was conducted in 2020, and 60 senior supply chain executives participated.
Ernst & Young	<ul style="list-style-type: none"> Reskill the labor force to improve efficiency and resilience. Invest in new technologies to improve their supply chain. Companies needed to diversify their suppliers. 	The survey, conducted in late 2020 and 2022, received responses from over 200 senior-level supply-chain executives.
European Central Bank	<ul style="list-style-type: none"> Relocate to nearby countries and diversify the global supply chain. Five critical factors for moving production include geopolitical risk, climate change, regulation, transport cost, and financial incentives. Changes in production location and cross-border sourcing of inputs led to higher prices, which are forecasted to remain stable within the next five years. 	The survey was conducted in 2023 and participated by 65 respondents from companies operating in the EU.
PwC	<ul style="list-style-type: none"> Five key factors to strengthen the organizational foundation are rebuilding trust, enhancing resilience, fostering regional enterprise growth, embracing digitalization, and prioritizing workforce upskilling to address the dynamic job market. 	Asia Pacific

Source: Compiled by the national expert for Malaysia based on different research reports (Allianz, 2020; Alicke et al., 2020; Attinasi et al. (2023); Harapko, 2023; and PwC, 2022).

Local Context

Malaysia actively pursues a diversification and supply chain relocation strategy driven by social dynamics, geography, and government policy considerations. As the country transitioned from an agriculture-based economy to one focused on export-oriented industrialization, it facilitated Malaysia's integration into the GSC network, mainly in the manufacturing sector, led by Multinational Corporations (MNCs)

According to extensive market surveys and research by the New Straits Times, discussed by Malaysia Investment Development Authority in 2021 (New Straits Times, 2021), the US-China Trade War and the COVID-19 pandemic have positioned Malaysia as an alternative destination for Chinese companies and MNCs. The country offers a strategic solution to reduce the risks linked to supply chain disruptions. China has consistently ranked among the top five countries for approved FDI in manufacturing, services, and primary sectors, with investments increasing from MYR1.06 billion in 2016 to MYR18.1 billion in 2020. Besides, Malaysia has become a preferred location for relocation and diversification strategies of GSCs, mainly from the larger economies, including China and the United States.

Although Malaysia is a favored destination for MNCs from China, other MNCs are also actively exploring relocation strategies, extending their global supply chain to Malaysia and increasing the net flow of FDI. The Department of Statistics Malaysia (DOSM) report indicates that in 2022, Hong Kong, Singapore, and the United States were the primary contributors to investments amounting to MYR875.1 billion. The manufacturing sector accounted for the largest share of this investment, followed by services and wholesale and retail industries. These trends highlight Malaysia's growing role in the global supply chain landscape, attracting investments from different countries and sectors and showcasing its ability to adapt to the changing global economic conditions.

While Malaysia's openness to FDI in manufacturing has been relatively high, the Asian Development Bank Institute (DOSM, 2023) noted that ASEAN countries, including Indonesia, Malaysia, the Philippines, and Thailand, remain less open to FDI than the Republic of China (ROC). By focusing on developing service inputs such as finance, transportation, and telecom, Malaysia can position itself as an even more attractive destination for businesses looking to participate in GSCs.

The US-China trade war has prompted many companies to reduce their dependence on China (Kawai, 2015) through strategies like China Plus One (ROC+1), encouraging diversifying and expanding trade partnerships beyond China. Although the strategy gained attention before the COVID-19 pandemic, the ongoing trade tension between the United States and China has further accelerated its adoption. Malaysia's neutral stance in global geopolitics, including economic relations, positions it to maximize benefits from this trade tension.

Herrero (Garcia, 2023) reports that several Asian countries, including Malaysia, Taiwan, and Vietnam, have increased electronics exports to the US, emerging as alternative sourcing destinations to China. Since 2018, Malaysia's electronics exports to the US increased by 112%, while China's exports to the US in the same sector have declined. This shift indicates a positive trend for Malaysia's electronics industry.

The relocation of production for critical products such as telecom equipment, semiconductors, computers, and agricultural machinery from China to other developing Asian economies, including

Malaysia, further reflects this trend. However, in some categories that China specializes in, the country showed a significant rise in exports to the US, particularly in labor-intensive products such as furniture, toys, sporting equipment, and cell phones. At the same time, many ASEAN countries, particularly Malaysia, Thailand, and Vietnam, have benefitted from the spillover effects, expanding their production lines in electronics manufacturing and replacing China in several product categories.

Government Policies on Industry and Productivity Growth

The Government of Malaysia has implemented medium- and long-term policy measures to enhance industry performance and productivity growth in response to the global supply chain dynamics. The Twelfth Malaysia Plan (12th MP) is a medium-term policy framework to transform Malaysia into a sustainable, prosperous, and high-income nation (EPU, 2021). It focuses on sectoral growth, trade resilience, talent development aligned with industry needs, and empowering MSMEs to compete in the global market through technological transformation.

To further promote sectoral growth, the government introduced the New Industrial Master Plan 2030 (NIMP 2030), prioritizing innovation, technology, and human capital development. Covering 21 sectors and new growth areas like advanced materials and electric vehicles (EVs), NIMP 2030 addresses the country's role in the GSC. It underscores the importance of domestic linkages, local player participation, and strategic policies to enhance Malaysia's competitiveness amidst global trends, supply chain disruptions, and geopolitical shifts. Notably, the plan seeks to balance economic efficiency with economic security, highlighting the lessons learned from the post-pandemic period and US-China trade tensions.

The Malaysia Productivity Blueprint (MPB) aims to raise national, sectoral, and enterprise productivity. It promotes technology's transformative role in enhancing supply chain efficiency and calls for upskilling the workforce to meet the demands of a technologically advanced industrial landscape. Moreover, the plan encourages enterprises to transition toward high-value-added products, fostering growth and facilitating downstream partnerships for a more integrated and strategic industrial positioning.

12th MP and Its Mid-Term Review

Malaysia has proactively implemented various strategic initiatives to foster economic growth and enhance global competitiveness. The formulation of the 12th MP and its subsequent mid-term review, collectively referred to as the 12th MP, are designed to harness Malaysia's capabilities while aligning with the SDGs. This comprehensive approach reflects Malaysia's commitment to achieving sustainable and inclusive development on national and global fronts. The 12th MP focuses on transforming Malaysia into a sustainable, prosperous, high-income nation.

Envisioned as a catalyst for revitalizing the economy, especially in the aftermath of the COVID-19 pandemic, the plan addresses key challenges through a strategic framework. The government places significant emphasis on two critical factors for economic growth: refining governance and institutional frameworks and enacting anti-corruption legislation. These two pillars are expected to enhance the efficiency of public service delivery and steer the nation toward its development goals.

The 12th MP concentrates on three core domains to support its overarching objectives: fortifying sustainability, fostering a prosperous society, and attaining the status of a high-income nation. The

plan is structured around Seventeen Big Bolds and supported by 71 strategic initiatives designed to propel these objectives forward. One notable Big Bold is the 'Future-Ready Talent' initiative, which reflects the government's commitment to enhancing the skills of its citizens. This initiative aims to elevate the current skill set of the workforce and instill a culture of continuous upskilling among citizens, ensuring that Malaysians are well-prepared to meet future challenges and seize opportunities that lie ahead.

Aligned with this vision, Malaysia's Budget 2024, introduced by the Prime Minister, includes a progressive tax relief measure to incentivize taxpayers (Ministry of Finance, 2023). Those actively participating in upskilling programs or delving into new skills through workshops or courses are eligible for tax relief of up to MYR2,000. In addition, the government has allocated MYR1.6 billion to support and facilitate 1.7 million training opportunities, fostering collaboration with Government-Linked Companies and private companies to ensure a comprehensive and impactful upskilling ecosystem.

Another critical strategic initiative centers around empowering MSMEs and Social Enterprises. The unexpected onslaught of the COVID-19 pandemic in 2020 significantly disrupted GSCs, particularly affecting import and export processes and increasing costs. As a result, many enterprises were forced to reconfigure their supply chains. Recognizing the need for adaptability and resilience, this strategy aims to strengthen enterprises and ensure they are well-equipped to navigate and withstand any unpredicted future challenges.

The primary strategy is the seamless integration of MSMEs into domestic and global supply chains. Additionally, there is a concerted effort to support social enterprises by facilitating their participation in innovative social entrepreneurship projects. Additionally, the strategy prioritizes accelerating productivity growth by promoting the widespread adoption of technology. These multifaceted approaches aim to strengthen the position of MSMEs in supply chains while empowering social enterprises to contribute innovative solutions. The plan also emphasizes harnessing the transformative potential of technology for accelerated productivity growth.

New Industrial Master Plan 2030

Malaysia's initiative in fostering innovation, embracing technology, supporting entrepreneurship, and investing in human capital through the Industrial Master Plan 3 has positioned the country as a leader in several critical sectors. Notably, Malaysia has emerged as a leader in the electrical and electronics (E&E) industry, petrochemicals, palm oil, and the Halal industry. The NIMP 2030, launched by the government in August 2023, is the successor to the industrial planning document, following the Third Industrial Master Plan 2006–20.

The NIMP 2030 is designed to drive industrial development by encouraging collaboration between the government as policymakers and the private sector as industrial players over the next seven years. The primary objectives of the NIMP 2030 are to provide strategic national direction, lead industrial development policies, provide reference points for investors and other economies on Malaysia's position and direction, and highlight the role of the Malaysian government in shaping the economy. The plan emphasizes expansion and growth of the manufacturing sector and related services while striving to position Malaysia as Asia's economic leader by developing an innovation-based economy. It also aims to improve the quality of life by focusing on the well-being of people, enabling high-income jobs, equal opportunities, and comprehensive social welfare.

The NIMP 2030 outlines 21 strategies covering 21 sectors, with an additional focus on four new growth areas: advanced materials, EVs, renewable energy, and carbon capture, utilization, and storage. It provides sector-specific policies, including the Aerospace Industry Blueprint 2030, Chemical Industry Roadmap 2030, Malaysia Plastics Sustainability Roadmap 2021–30, E&E Roadmap 2021–30, and Malaysian National Medicines Policy.

The plan focuses on five primary industries: aerospace, chemicals, E&E, pharmaceuticals, and medical devices. These industries are expected to impact the Malaysian economy significantly and contribute to its future growth, with guidance from relevant ministries. However, other key sectors, such as banking and insurance, tourism, and food and beverages, are not covered in the NIMP 2030, though their contributions remain essential for Malaysia's economic growth.

The NIMP 2030 supports industry transformation by addressing global trends, responding to supply chain disruptions, navigating the geopolitical landscape, embracing digitalization, and integrating ESG principles. Malaysia's proactive approach in responding to these trends acknowledges the need to act swiftly to enhance competitiveness on the global economic stage. The NIMP 2030 places significant emphasis on GSC, shifting the focus from economic efficiency to economic security. This adjustment is crucial to minimize the risks of supply chain disruptions, as evidenced by the challenges during the COVID-19 pandemic and the US-China trade war.

Several policies outlined in the plan address supply chain management within the geopolitical context, including nearshoring (investing closer to the investors' country of origin) and friendshoring (preferring to set up manufacturing facilities in countries that are political and economic allies). ASEAN countries, including Malaysia, have become alternative locations for the 'Plus One' strategy due to their strategic location, track record in industrial development, investment management, and macroeconomic and political stability.

A key vision of NIMP 2023 is to strengthen domestic linkages by enhancing the participation of local players, including SMEs, to improve connectivity within the GVC. This approach aims to improve supply chain security and dynamism, ensuring Malaysia's integration into global networks and enhancing its resilience in the face of future challenges.

Malaysia Productivity Blueprint

The MPB, introduced during the 11th Malaysian Plan, is a forward-looking initiative to enhance labor productivity and promote technological advancements. It operates at three distinct levels: national, sectoral, and enterprise. The MPB serves as a strategic roadmap to address macroeconomic challenges, propelling Malaysia towards its goal of becoming a high-income nation. A vital aspect of this plan is its focus on elevating productivity levels across various sectors, including managing supply chains. The MPB takes a comprehensive and multifaceted approach, charting the path for the government to optimize productivity throughout the Malaysian economy.

In its efforts to boost industrial productivity within supply chains, the blueprint outlines six strategic steps to address critical challenges. According to the MPB, 63% of chemical enterprises encountered difficulties due to a lack of partnerships with international firms. Additionally, 52% reported inadequate participation in the high-value-added segments of the value chain. To address these gaps, the first step in the blueprint entails facilitating collaboration among enterprises, strengthening knowledge-sharing among stakeholders, and aligning operations with supply chain

dynamics. This involves establishing robust links between downstream demand and upstream supply, fostering a more integrated and responsive industrial ecosystem.

The blueprint emphasizes technological advancement and innovation to bolster productivity within the supply chain, making it more dynamic and efficient. Furthermore, the government underscores the importance of upskilling the workforce to build higher competencies and instill a culture of enhanced productivity. This dual approach of harnessing the power of technology and developing workforce skills aims to create a more robust and forward-thinking industrial environment. Another proactive initiative outlined in the MPB involves supporting enterprises transitioning towards high-value-added components within the value chain. The government envisions fostering the growth of promising enterprises by facilitating downstream partnerships and encouraging vertical integration. Through vertical integration, enterprises can align their operations with different stages of the value chain, ensuring a more integrated and strategic positioning for sustained success.

Impact of GSC on Labor Productivity

The study offers a comprehensive overview of Malaysia's economic dynamics, intricately examining the interplay between sectoral coverage, trade trends, and labor productivity within the GSC context. The analysis of sectoral coverage is conducted through import and export data, the Herfindahl-Hirschman Index (HHI) for diversification, and the GVC participation indicator. The study highlights the pivotal role of the E&E sector, underscoring Malaysia's robust integration into GVCs particularly within the E&E domain. This underscores the country's strategic positioning in global trade.

Spanning 17 years, the study delves into trade dynamics, identifying the significant contributions of machinery, mechanical, and electrical products to Malaysia's economy. Notably, electrical machinery and equipment and parts (HS85) have emerged as a key driver of Malaysia's trade landscape. The findings show that despite the challenges posed by the COVID-19 pandemic, Malaysia maintained a positive trade surplus, reflecting the resilience of its GSCs. The study also explores labor productivity, uncovering the interconnected relationships between productivity trends, product diversification, and the country's evolving role in GVCs.

Sectoral Coverage

The determination of sectoral coverage relies on three indicators. First, trade import and export data by products are used to assess how the composition of manufactured goods contributes to national trade performance. A higher volume of imports and exports of a product reflects its importance to the economy.

Second, a diversification measure based on traded manufactured products is calculated using the HHI (Yusof, 2013). The HHI measures the degree of diversification of products in imports, ranging from 0 to 1. An index closer to 1 indicates less diversification and a higher concentration in a few products.

Third, sectoral coverage is determined using the GVC participation indicator, which assesses Malaysia's role in global production across various sectors. This indicator highlights how Malaysia participates in GSCs within specific industries.

Table 2 compares import volumes by product categories for 2005 and 2022. During the past 17 years, Malaysia's imports have been predominantly driven by machinery, mechanical, and electrical

products. Notably, electrical machinery and equipment and parts (HS85) stand out as the highest contributor, with imports increasing from MYR160.50 billion in 2005 and doubling to MYR374.98 billion in 2022. Similarly, nuclear reactors, boilers, machinery and mechanical appliances (HS84) have contributed substantially, with exports rising from MYR69 billion in 2005 to MYR113.92 billion in 2022. Additionally, mineral products, particularly those under mineral fuels, mineral oils and products of their distillation (HS27), show a substantial increase in import volume, surging from MYR34.94 billion in 2005 to MYR241.69 billion in 2022.

A comparative analysis of export volumes by product categories for 2005 and 2022 is shown in Table 3. Electrical machinery and equipment and parts (HS85) stand out as the top export category, doubling from MYR182.48 billion in 2005 to MYR564.43 billion, accounting for 36.4% of Malaysia's total exports in 2022. In contrast, the export of nuclear reactors, boilers, machinery, and mechanical appliances (HS84) demonstrated limited growth, from MYR103.11 billion in 2005 to MYR118.97 billion in 2022. Although mineral fuels, mineral oils, and products of their distillation (HS27) constituted 17.7% of total exports in the year 2022, the growth in export volume was not proportional to the increase in import expansion. Overall, imports under HS27 increased from MYR71.89 billion in 2005 to MYR264.82 billion in 2022.

Malaysia has consistently achieved a positive trade surplus for manufactured products since 2019, as illustrated in Table 2. The trade surplus has grown remarkably, from MYR145.7 billion in 2019 to MYR256.2 billion in 2022. Even during the COVID-19 pandemic in 2020, which disrupted the global supply chain, Malaysia maintained a positive trade balance of MYR183.3 billion for manufactured products.

When examining the trade balance by product categories, machinery, mechanical, and electrical products consistently exhibited a positive trend, contributing significantly to the overall trade surplus. In 2022, this category recorded a trade surplus of MYR194.50 billion, with electrical machinery and equipment and parts (HS85) contributing MYR189.45 billion to the total. This underscores the resilience and strength of Malaysia's trade in these product categories, highlighting their importance in maintaining a positive trade balance.

TABLE 2

MALAYSIA'S TOP FIVE IMPORTS BY PRODUCT CATEGORY (MYR, BILLION).

Main Product Group	Product Code	2005	2022
Machinery, Mechanical, and Electrical Products	HS84	69.00	113.92
	HS85	160.50	374.98
Mineral Products	HS25	0.93	3.43
	HS26	1.13	17.08
	HS27	34.94	241.69
	HS28	2.72	16.89
Product of Chemical and Allied Industries	HS29	8.75	22.10
	HS30	2.14	9.76
	HS31	2.45	8.85

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Main Product Group	Product Code	2005	2022
Product of Chemical and Allied Industries	HS32	1.90	3.82
	HS33	1.61	5.92
	HS34	0.90	3.53
	HS35	0.39	1.90
	HS36	0.04	0.19
	HS37	0.42	0.56
	HS38	2.71	27.60
	Base Metals	HS72	13.83
HS73		8.19	15.72
HS74		5.75	19.07
HS75		0.19	1.41
HS76		4.25	21.23
HS78		0.20	0.69
HS79		0.82	2.04
HS80		0.95	0.97
HS81		0.39	1.02
HS82		1.35	2.33
HS83		0.66	2.15
Plastics and Rubber Articles	HS39	13.45	43.99
	HS40	3.77	18.77

Note: Product groups are aggregated according to the main product section of the Harmonized System. For a detailed description, refer to the Appendix.

Source: The national expert for Malaysia, based on trade data provided by the Department of Statistics Malaysia.

TABLE 3**MALAYSIA'S TOP FIVE EXPORTS BY PRODUCT CATEGORY (MYR, BILLION).**

Main Product Group	Product Code	2005	2022
Machinery, Mechanical, and Electrical Products	HS84	103.11	118.97
	HS85	182.48	564.43
Mineral Products	HS25	0.61	2.24
	HS26	0.10	9.20
	HS27	71.89	264.82
Animal or Vegetable Fats and Oils	HS15	23.02	103.96
Base Metals	HS72	4.21	31.87

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Main Product Group	Product Code	2005	2022
Base Metals	HS73	6.16	10.96
	HS74	2.58	13.26
	HS75	0.05	1.38
	HS76	2.53	32.72
	HS78	0.15	1.02
	HS79	0.17	0.98
	HS80	1.13	2.52
	HS81	0.05	0.30
	HS82	0.55	0.75
	HS83	0.67	1.87
Product of Chemical and Allied Industries	HS28	1.10	10.66
	HS29	10.28	26.88
	HS30	0.33	2.06
	HS31	0.93	6.88
	HS32	1.41	4.33
	HS33	0.53	2.02
	HS34	1.54	5.23
	HS35	0.16	1.06
	HS36	0.02	0.07
	HS37	0.40	0.72
HS38	6.89	31.07	

Note: Product groups are aggregated according to the main product section of the Harmonized System. For a detailed description, refer to the Appendix.

Source: The national expert for Malaysia, based on trade data provided by the Department of Statistics Malaysia.

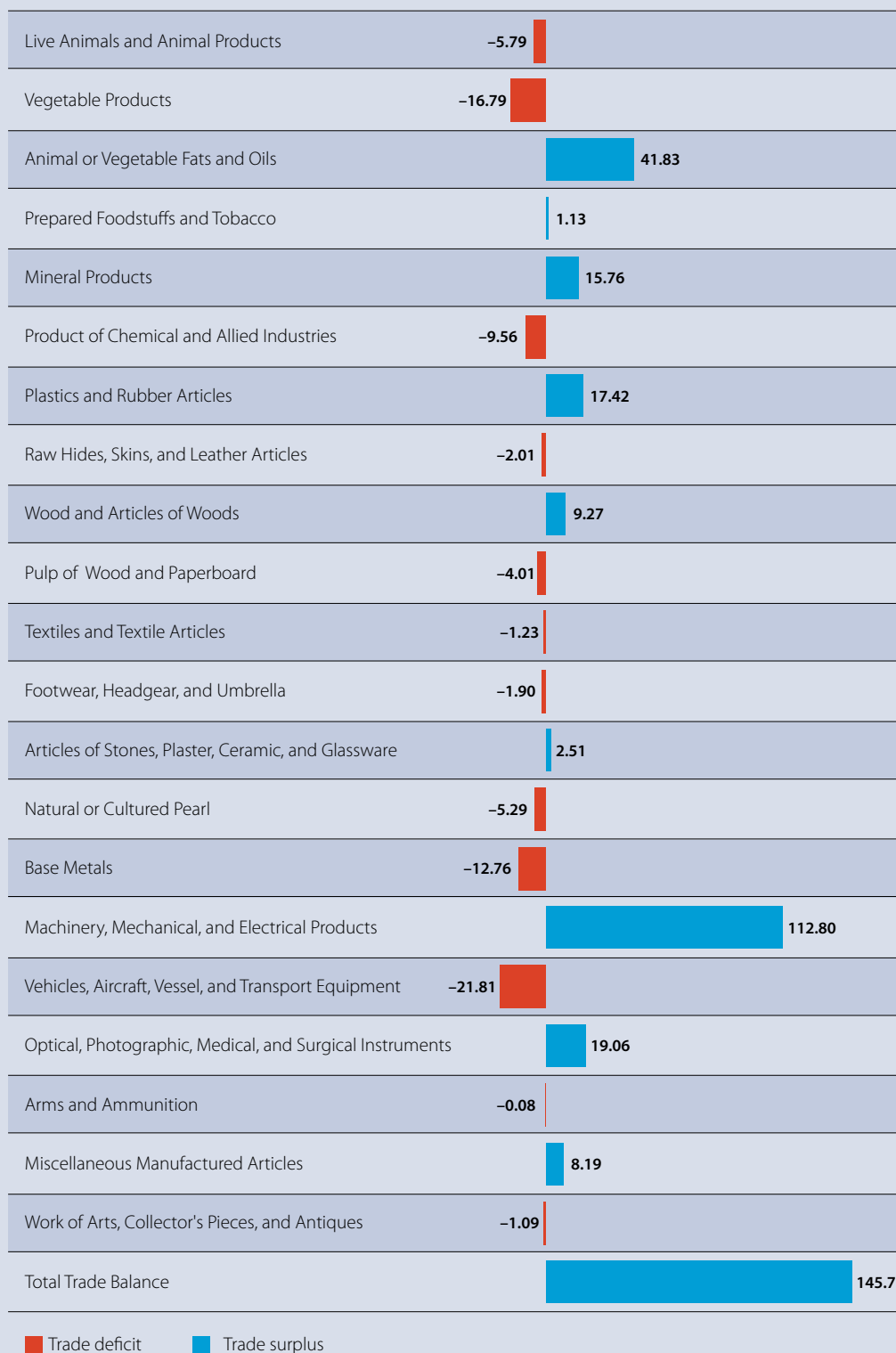
In 2022, electrical and machinery products (HS85) accounted for the largest share of total imports, constituting approximately 29.39%, as shown in Table 3. The HHI index for this category, at 0.142, indicates a low level of market concentration, suggesting a higher degree of diversification within the industry. Notably, a gradual trend toward greater diversification was observed between 2005–22. Additionally, mineral products (HS27) and nuclear reactors (HS84) comprised significant shares of total imports. Mineral products accounted for 18.94% of imports, while nuclear reactors constituted 8.93% of the total import value. The HHI values for mineral products and nuclear reactors were 0.098 and 0.187, respectively, indicating low levels of market concentration.

Although mineral products emerged as a major import category in 2022, the data reveals an increase in the HHI value during 2005–22, suggesting a surge in market concentration and a decline in diversification within the import structure of mineral products.

FIGURE 1

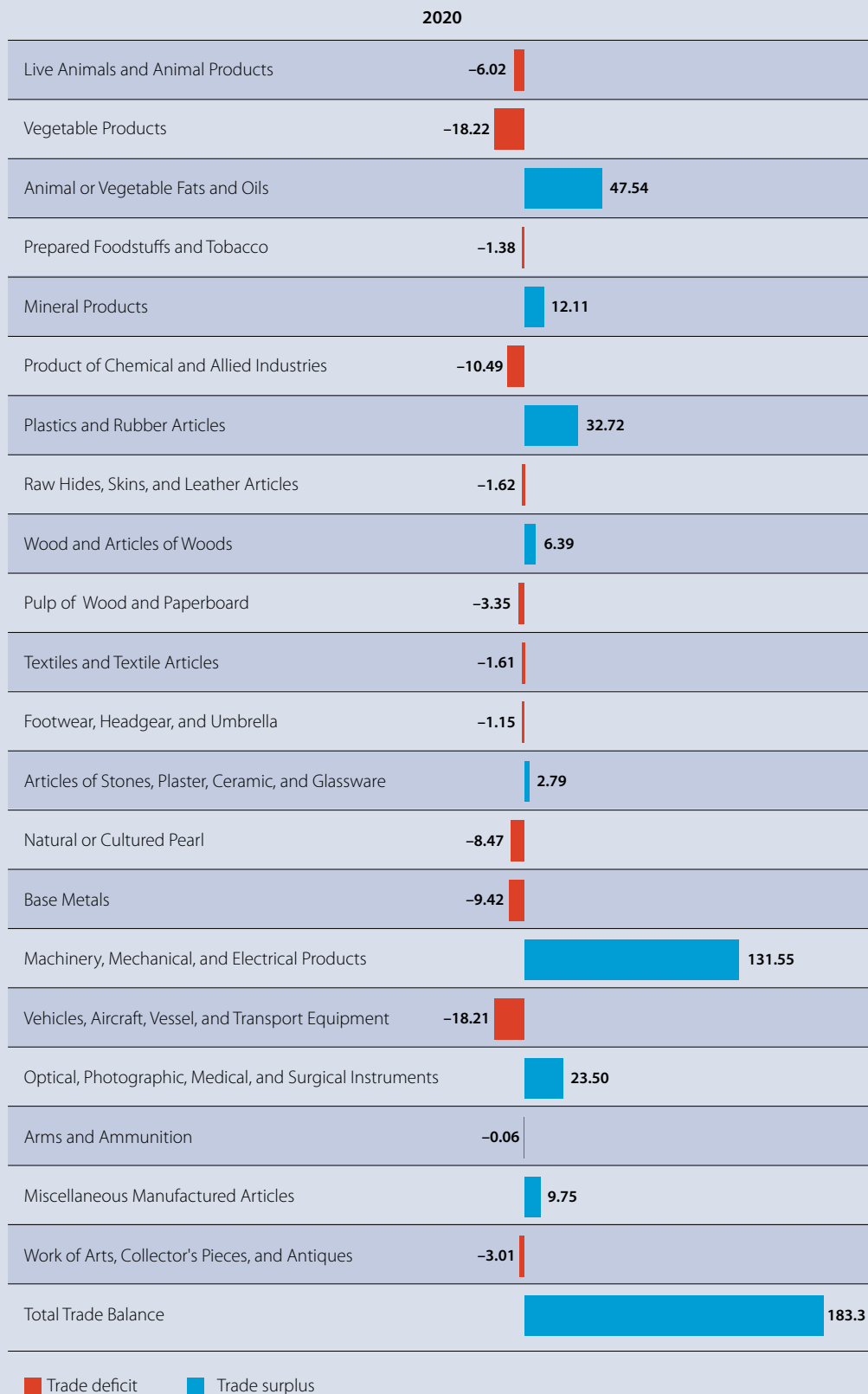
MALAYSIA'S TRADE BALANCE BY PRODUCT CATEGORY (2019–22).

2019



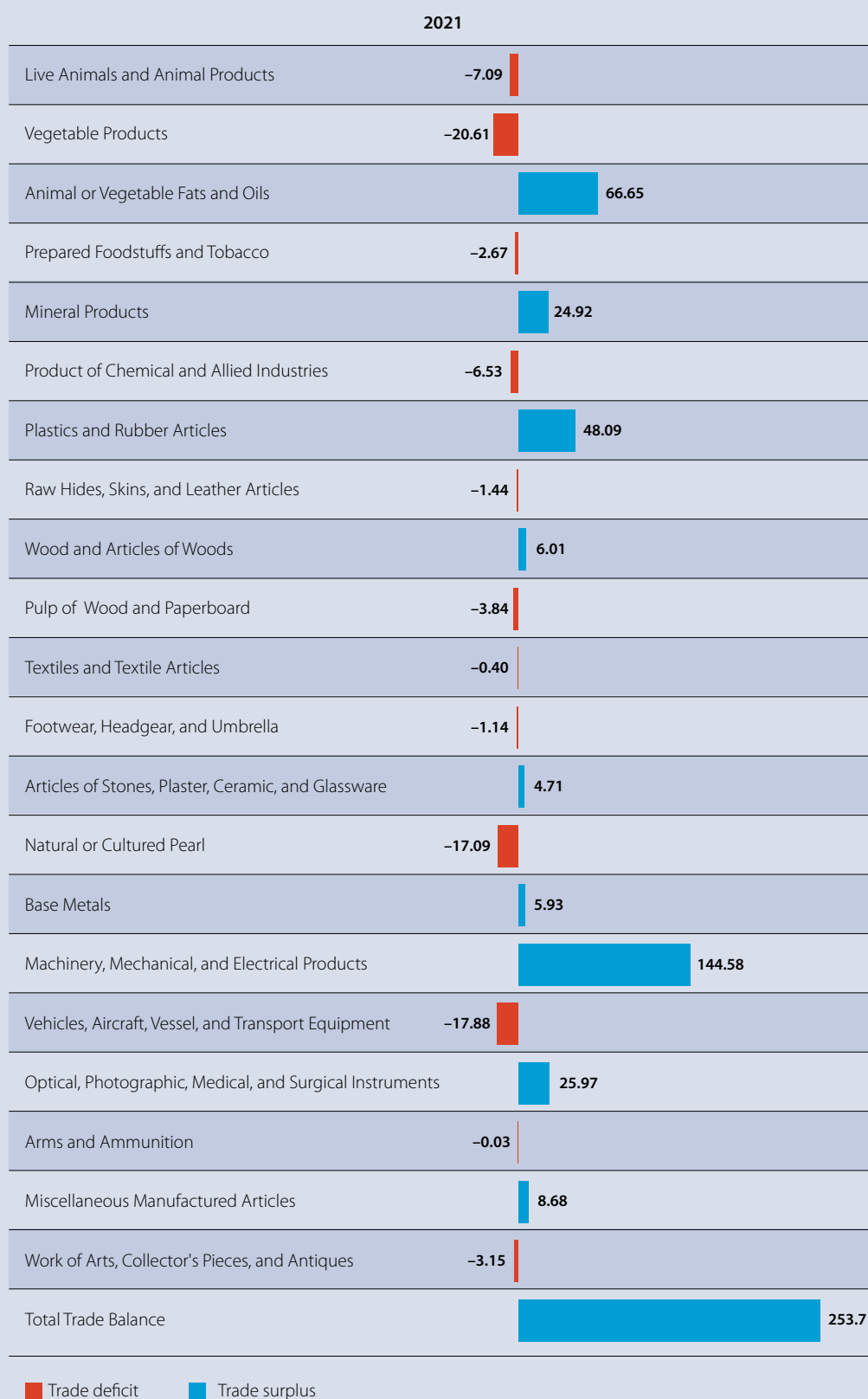
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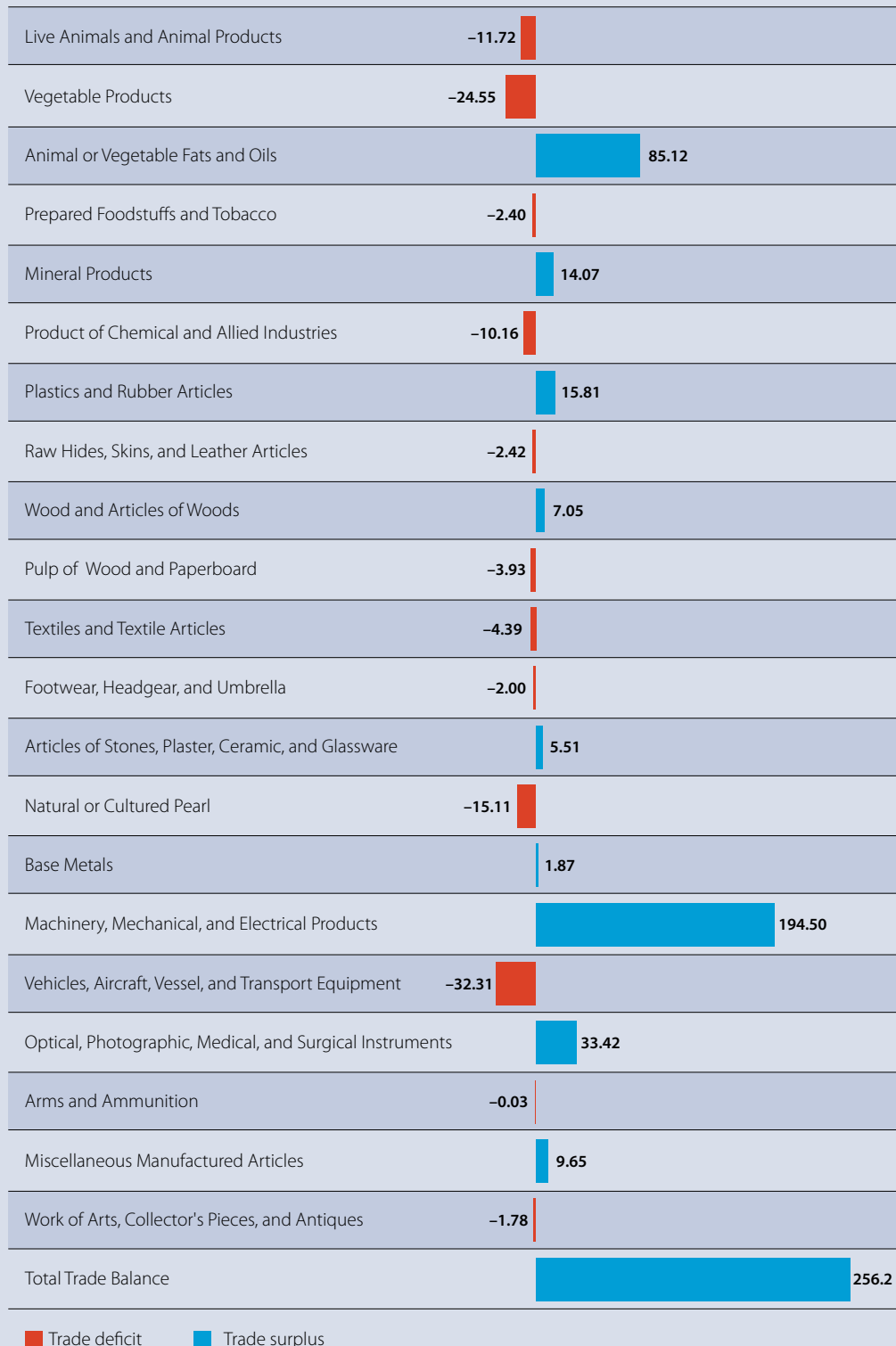
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2022

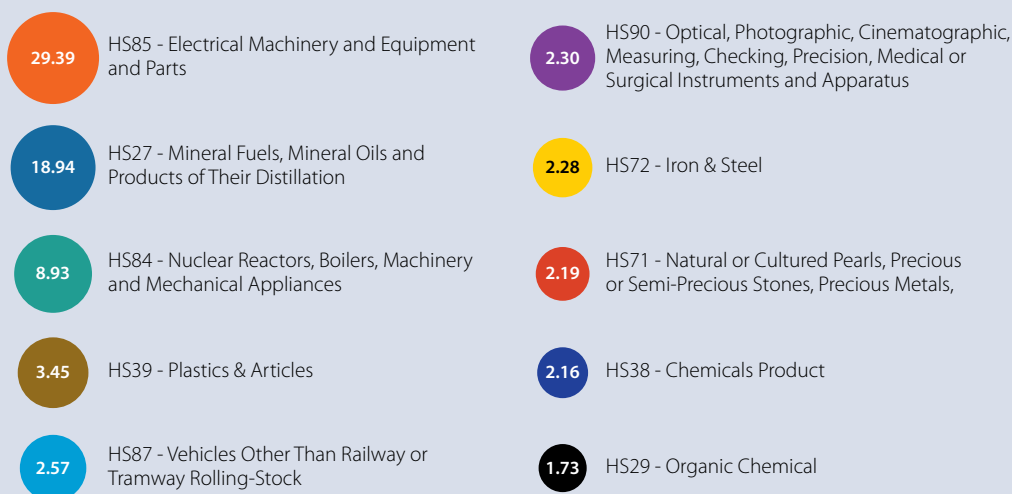
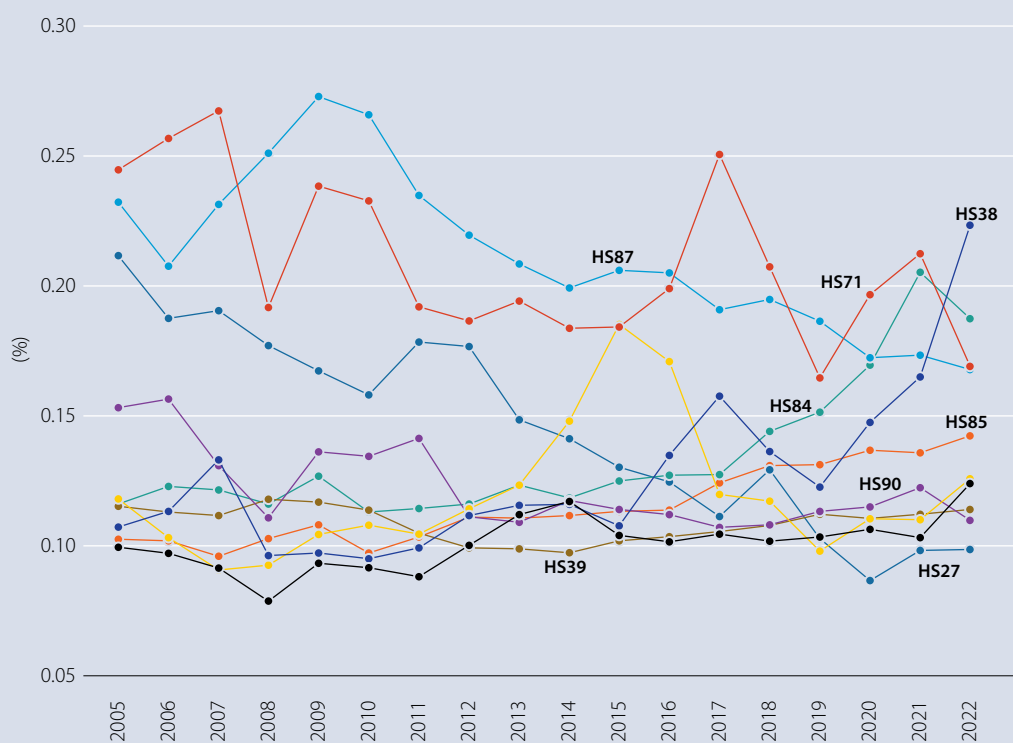


Note: Product groups are aggregated according to the main product section of the Harmonized System. For a detailed description, refer to the Appendix.

Source: The national expert for Malaysia, based on trade data provided by the Department of Statistics Malaysia.

FIGURE 2

HHI INDEX TRENDS FOR THE TOP 10 IMPORTED PRODUCTS (2005–22).

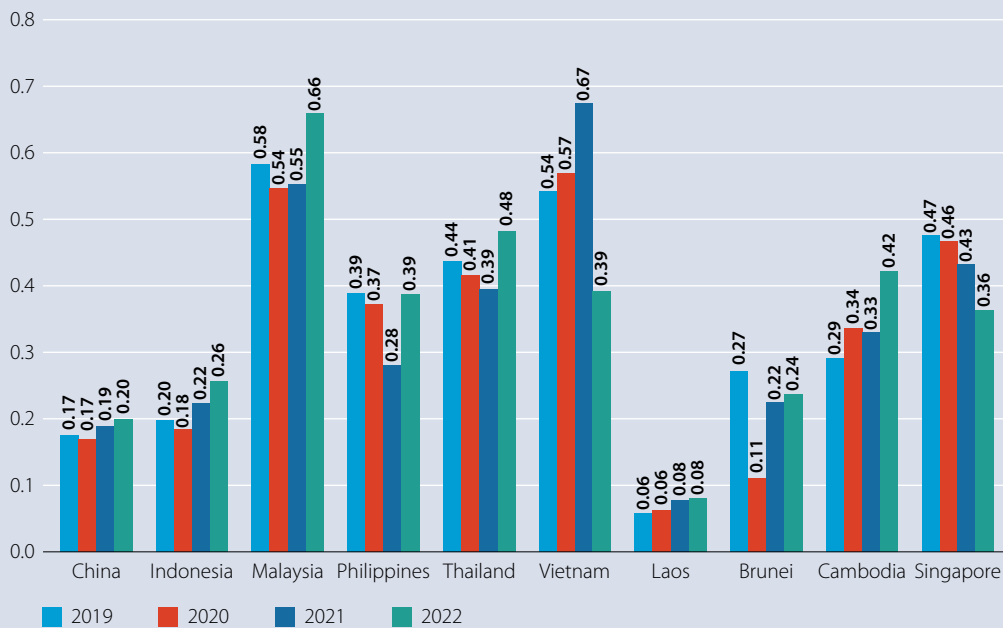


Source: The national expert for Malaysia, based on trade data provided by the Department of Statistics Malaysia.

The substantial proportion of imports within the E&E sector highlights its pivotal role in Malaysia’s trade dynamics. Furthermore, the E&E sector plays a crucial role in the GVC specific to this industry. Malaysia’s involvement in the GVC for the E&E sector is remarkably high, as evidenced by its impressive score on the GVC Participation Index. Figure 3 illustrates Malaysia’s position, with one of the highest scores on this index, underscoring the nation’s robust integration and influence within the GVC for electrical and electronic products.

FIGURE 3

GVC PARTICIPATION INDEX FOR MALAYSIA'S ELECTRICAL SECTOR.



Note: The index is calculated based on aggregated industrial information. The ADP developed Multi-Regional Input-Output Tables, which include 35 sectors and 63 economies worldwide. The ADB derives GVC indicators in the database. The electrical industry includes the manufacture of office, accounting, and computing machinery (D30); manufacture of electrical machinery and apparatus n.e.c. (D31); manufacture of radio, television and communication equipment and apparatus (D32); and manufacture of medical, precision and optical instruments, watches and clocks (D33); that are based on ISIC version 3.1.

Source: ADB. (2023). Key indicators database: GVC indicators. Asian Development Bank, Manila.

Impact of New GSC Trends on Aggregate Productivity and Economic Development

This section presents two analyses to assess aggregate variables’ influences on labor productivity. First, a correlation analysis examines the potential impact of the chosen aggregate variables on labor productivity, providing insights into their potential influence. Next, the study explores the impact of the GSC dynamics on labor productivity. In this context, the GSC is characterized by two key indices: the product diversification index and the GVC Participation Index. This dual approach offers a comprehensive understanding of how individual variables and broader GSC dynamics contribute to or correlate with variations in labor productivity.

Potential Impacts of Aggregate Variables on Labor Productivity

This section presents a correlation analysis of aggregate variables and labor productivity in Malaysia. The study aims to identify the potential impact of these variables, with further validation carried out in the subsequent analysis.

Product Diversification Enhances Labor Productivity

Product diversification in trade broadens a country’s range of exported goods and services, moving beyond a limited selection to include a more diverse export portfolio. Besides, the government implemented policies that swiftly boosted the manufacturing and services sectors, reducing dependency on the primary sector and fostering diversification of the economy (Bank Negara Malaysia, 2014). Additionally, these efforts have extended the economy’s diversification along the commodities value chain, progressing from upstream to downstream activities. Figure 4(a) shows

a positive correlation between labor productivity and product diversification, suggesting that increased product diversification is associated with increased labor productivity. Thus, product diversification plays an important role in enhancing productivity.

Labor Force Growth Drives Higher Labor Productivity.

According to DOSM (DOSM, 2022), Malaysia's labor market has steadily improved due to sustained economic operations and social engagements. In 2022, the labor force grew by 2.5% year-on-year, reaching 16.54 million, with the labor force participation rate rising by 0.8 percentage points to 69.5%, surpassing Q4 2019 levels. Additionally, labor productivity rebounded by 1.8%, rising from MYR41.0 per hour in 2021 to MYR41.7 per hour in 2022. As illustrated in Figure 4(b), labor productivity tends to increase with the expansion of the labor force, demonstrating a positive correlation between labor force growth and productivity at the aggregated level.

Contribution of R&D to Labor Productivity Growth

Malaysia shifted to the efficiency-driven stage of development in 1992 and advanced to the innovation-driven stage in 2011, a transition that spanned 19 years. During this period, productivity grew at an average annual rate of 2.7%, reflecting a steady progression. As shown in Figure 4(c), there is a positive relationship between labor productivity and R&D expenditure. However, the slope suggests a moderate impact on productivity growth, indicating that R&D expenditure contributes to productivity increases at a slower pace.

According to Malaysia's Ministry of Economics, under the strategy of Unlocking the Potential of Productivity, despite improvements in productivity over time, the country's productivity growth remains relatively slower compared to international benchmarks, emphasizing the need for enhanced investments in R&D to accelerate future progress.

Higher Labor Productivity with Increasing GDP Per Capita

An increase in GDP per capita reflects improved living standards for individuals and higher levels for employees and households. Figure 4(d) illustrates a positive relationship between GDP per capita and labor productivity, suggesting that an increase in GDP per capita enhances labor productivity.

According to the Malaysia Productivity Corporation (MPC), the country's GDP per capita surged 8.4% during 2021–22, driven by economic recovery, while labor productivity increased by 5.4%. However, this GDP growth was primarily driven by population growth rather than productivity growth.

Potential Negative Relationship between Labor Productivity and GVC Participation Index

Malaysia plays a significant role in GVCs, primarily focusing on the final stages of the production process, commonly referred to as 'backward linkage.' This specialization suggests that Malaysia is involved in activities such as assembly, manufacturing, or refining that occur toward the end of the production cycle.

As illustrated in Figure 4(e), the GVC Participation Index shows a negative correlation with labor productivity in Malaysia. This suggests that while Malaysia actively engages in the final stages of the production process within GVCs, such participation may not necessarily translate into higher labor productivity. The reasons for this negative correlation could be multifaceted. Contributing factors could include the nature of tasks performed in the later stages of production, technological constraints, or the overall efficiency of the production processes in these stages.

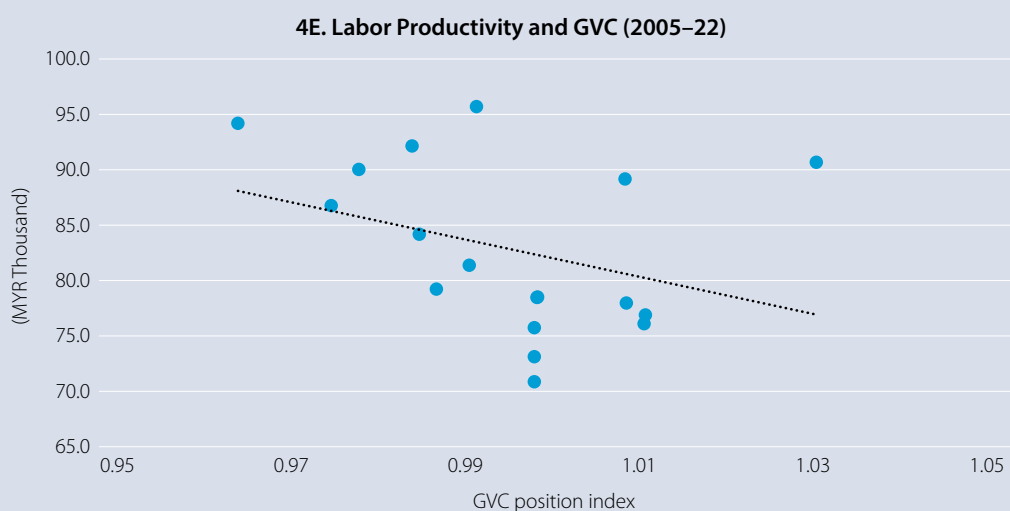
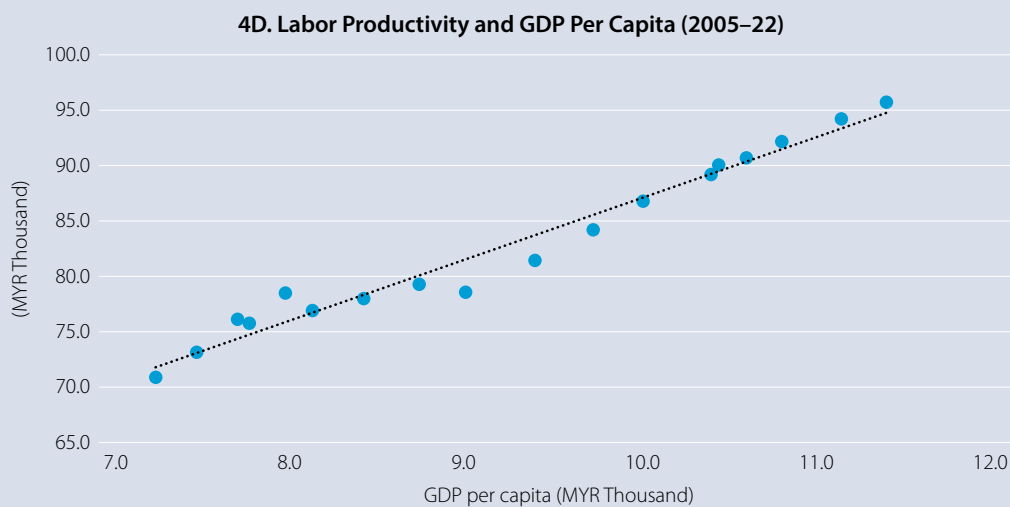
FIGURE 4

CORRELATION OF AGGREGATE VARIABLES AND LABOR PRODUCTIVITY.



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Source: The national expert for Malaysia, based on trade data from the Department of Statistics Malaysia.

Impact of GSC Dynamics and Aggregate Variables on Labor Productivity: Evidence from Empirical Models

This section presents the results of the impact of aggregate variables on labor productivity. Four empirical models are used to assess labor productivity determinants, including R&D as a percentage of GDP, GDP Per Capita, GVC Participation, HHI Product Import (HHIPI), and FDI. The general model used for the analysis, which is adapted from Gollop and Bassanini et al., is specified as follows:

$$LP_t = \alpha_0 + \alpha_1 R\&D_t + \alpha_2 GDPPC_t + \alpha_3 X_t + \varepsilon_t$$

Model 1 is a baseline model that measures the relationship between R&D, GDP Per Capita, and Labor Productivity. Model 2 and Model 3 include GVC and HHIPI to measure global supply chain impact on labor productivity, respectively, by replacing the X_t variable in the baseline model. In

addition, Model 4 is estimated to measure the impact of FDI on labor productivity, and the result is taken as a comparative assessment. The results are tabulated in Table 4.

Model 1 assesses the impacts of R&D and GDP Per Capita on Labor Productivity. The analysis reveals a statistically significant negative relationship between R&D and labor productivity. This is, however, not aligned with the correlation analysis illustrated in Figure 4(c), which indicates a positive relationship between both variables. There are two explanations for this finding. First, Parham (2006) argues that R&D spending should be treated as an investment, and the impact on productivity shall be measured based on long-term outcomes to establish its relationship with productivity accurately. Secondly, according to the Malaysia Science and Technology Centre data, the R&D expenditure for private entities stood at 43.9%, compared to government-related entities, which accounted for 56%. This data suggests that R&D expenditure is public-driven, and commercializing R&D products could be the main challenge (Taff, 2023).

In Model 2, GVC is added to the baseline model as an additional independent variable, representing the global supply chain dynamics concerning Malaysia's participation in the GVC. The result reveals a negative relationship between GVC and labor productivity, extending the trend of negative correlation observed in the analysis depicted in Figure 4(e). However, the result is not statistically significant to validate the relationship. Pahl and Timmer found evidence suggesting a negative association between GVC participation and employment growth, especially in countries near the productivity frontier. This finding supports the "mixed-blessing hypothesis," suggesting that although increased involvement in GVCs might boost productivity, it does not necessarily lead to higher employment generation in the manufacturing sector on average, and increased participation in GVCs might not consistently correlate with enhanced productivity.

In Model 3, HHIPI, representing the diversification of the GSC, is added to the baseline model. The result suggests that product diversification has a negative impact on labor productivity. Although the result is not statistically significant and is opposed to the correlation analysis depicted in Figure 4(a), evidence supports such an impact. For example, Gollop finds that a decrease in product diversification accounts for slightly more than 17% of annual productivity growth in the US manufacturing industry. A recent study conducted by Xuefeng and Yasar for Chinese firms suggests that diversification would increase sales for firms with reduced productivity due to cost adjustment, resembling a U-shaped relationship between diversification and productivity.

In Model 4, the FDI is introduced in the baseline model to compare the results from Model 2 and Model 3. FDI has a significant relationship with GSC in facilitating trade and contributes to TFP growth in the host economies (Newman, 2015; Apostolov, 2020). The result indicates that FDI exhibits a statistically significant negative relationship with labor productivity. However, the magnitude is somehow lower than the decreasing effect caused by R&D.

According to Ahmed, Malaysia's economic growth is input-driven and highly dependent on FDI investment. However, due to low-quality inputs used in Malaysia's economic activities, TFP growth, which measures how efficiently inputs are transformed into outputs, had a negative impact on the country's average annual productivity growth. This negative impact was observed when considering factors like human capital (skills and knowledge of the workforce), FDI inflows, and the absorptive capacity of FDI and human capital.

TABLE 4

IMPACT OF AGGREGATE VARIABLES ON LABOR PRODUCTIVITY IN MALAYSIA.

Variables	Model 1		Model 2		Model 3		Model 4	
	Coeff	S.E	Coeff	S.E	Coeff	S.E	Coeff	S.E
Dependent Variable: Labor productivity								
Constant	5.647	0.286	5.689	0.29	5.067	0.497	5.574	0.22
Research & Development	-0.401	(0.018)*	-0.044	(0.022)**	-0.03	0.026	-0.044	(0.019)*
GDP Per Capita	0.627	(0.031)*	0.622	(0.031)*	0.0668	(0.038)*	0.636	(0.024)*
Global Value Chain Participation	-	-	-0.167	0.219	-	-	-	-
HHI Product Import	-	-	-	-	-0.121	0.111	-	-
Foreign Direct Investment	-	-	-	-	-	-	-0.007	(0.001)*
R-Squared	0.972		0.972		0.974		0.977	

Note: Significant level denotes *p<0.05, **p<0.1, ***p<0.001, respectively. All variables are transformed into natural logarithms, interpreted as elasticity.

Source: The national expert for Malaysia, based on trade data from the Department of Statistics Malaysia.

Case Study

Overview of Malaysia's Electrical and Electronic Support System

The Malaysia Semiconductor Industry Association (MSIA) plays a crucial role in uniting individuals and companies within the country's E&E sector. With approximately 244 members, MSIA fosters synergy among professionals and businesses by providing diverse services related to the semiconductor industry's engineering, finance, legal, and other facets. Through collaboration and a dedicated platform for industry stakeholders, MSIA actively contributes to advancing the interests and fostering growth within Malaysia's semiconductor landscape.

In addition to the presence of the Malaysia Standard Industrial Classification, the Malaysian government, through the MPC, introduced the Electrical and Electronic Productivity Nexus, or EEPN. This strategic initiative focuses on technology, regulation, and talent development to enhance the E&E sector's contribution to economic growth. The technological front involves MPC's comprehensive plans, such as implementing plugfest, AI integration for SMEs, the EEPN Productivity Enhancement Program, and the Portal E&E Marketplace Malaysia.

On the regulatory front, the government actively promotes enforcement and adoption of industry standards and practices to strengthen the E&E value chain. To further invigorate the E&E industry, a targeted workforce approach is imperative. This includes initiatives like MyRESKILL Workforce, Academy in Industry, Robotics for University, and AI for University, collectively shaping a dynamic landscape for sustainable growth in the sector.

Company Introduction and GSC Plans

Amid the evolving landscape of the new normal, this research delves into a comprehensive study of two prominent semiconductor companies: Inari Amertron Berhad and ViTrox Corporation

Berhad (Inari, n.d.; Virtrox, n.d.). Both are listed on the Malaysian stock exchange and have strategically positioned themselves globally, adapting to the changing business environment. The primary focus of this research is an in-depth analysis of the GSCs of Inari Amertron Berhad and ViTrox Corporation Berhad. By scrutinizing their supply chain strategies, relationships, and operational frameworks, the study aims to unveil the key elements that have enabled these companies to navigate the complexities of the semiconductor industry on a global scale.

Both Inari Amertron Berhad and ViTrox Corporation Berhad have made significant diversification commitments by extending their reach to foreign markets. This strategic move, which reflects a concerted effort to broaden their horizons and tap into international opportunities, is a key aspect of their operations. By examining the nuances of their global presence, this research seeks to provide valuable insights into the adaptive strategies employed by these Malaysian semiconductor giants in the face of the new normal.

Inari Amertron Berhad

Core Activities

Inari Amertron Berhad, a prominent Malaysian enterprise, is a pivotal force in the semiconductor industry. Demonstrating a notable expansion strategy, the company has effectively extended its presence across key regions such as China, Malaysia, and the Philippines. Offering diverse services, Inari Amertron is at the forefront of providing technological solutions. Its service portfolio includes critical processes such as wafer probe and processing, intricate assembly involving Surface Mount Technology (SMT) and Multi-Chip Module on Board, as well as comprehensive package testing. The company's expertise extends to advanced assessments, including radio frequency testing up to 20GHz, optical sensor testing, and fiber LIV testing, reflecting its commitment to cutting-edge technologies and comprehensive semiconductor solutions.

Employment Trends at Inari Amertron Berhad

The workforce dynamics at Inari exhibit notable fluctuations over the years. In 2021, the company reported a total employee turnover of 1,288 individuals, including managers and above, executives, and non-executives. Fast-forward to 2022, and the company witnessed a slight uptick with 1,360 employees. However, 2023 saw a significant reduction, with the total employment turnover dropping to 1,056, the lowest level in three years.

Despite a reduction in headcount, Inari remains focused on attracting high-quality talent. The company emphasizes hiring skilled professionals capable of making impactful contributions to its operations. This deliberate focus on quality over quantity underscores the company's strategic approach to effectively navigate future challenges while driving innovation and sustainable growth. In essence, Inari Amertron Berhad prioritizes the caliber of its workforce, recognizing it as a critical driver for future success in an ever-evolving business landscape. As part of its commitment to workforce development, the company dedicated 44,129 hours to training initiatives in the fiscal year 2023, averaging seven hours of training per employee. This reflects its ongoing efforts to foster continuous learning and professional development across the organization.

Financial Performance and Economic Outlook

In 2019, Inari demonstrated strong financial performance, generating MYR1.152 billion in revenue and a PAT of MYR192.34 million. However, the onset of the COVID-19 pandemic led to an 8% decline in revenue and a substantial 22% drop in PAT. Undeterred by the challenges posed by the global crisis, the company displayed resilience, rebounding impressively. The company reported a

robust recovery in the subsequent fiscal period, achieving a total revenue of MYR1.428 billion. The PAT witnessed a substantial surge, reaching an impressive MYR330.71 million.

This upward momentum continued into 2022, with revenue increasing to MYR1.547 billion and PAT soaring to MYR391.193 million. This upward trajectory reflects the company's strategic resilience and adaptability, positioning it for continued success in dynamic economic conditions.

Strategic Relocation and Diversification

In a strategic move to sustain its growth and solidify its market position, the company expanded its operations into neighboring countries, especially China and the Philippines. While the company operates seven established plants in Malaysia, it also invested in a cutting-edge Amerton technology facility in China and two factories in the Philippines. To enhance operational efficiency and productivity, Inari Amertron Berhad entered a joint venture with its subsidiary, Inari MIT Sdn Bhd. This strategic initiative is designed to optimize the synergy between labor and machinery to reduce operational costs.

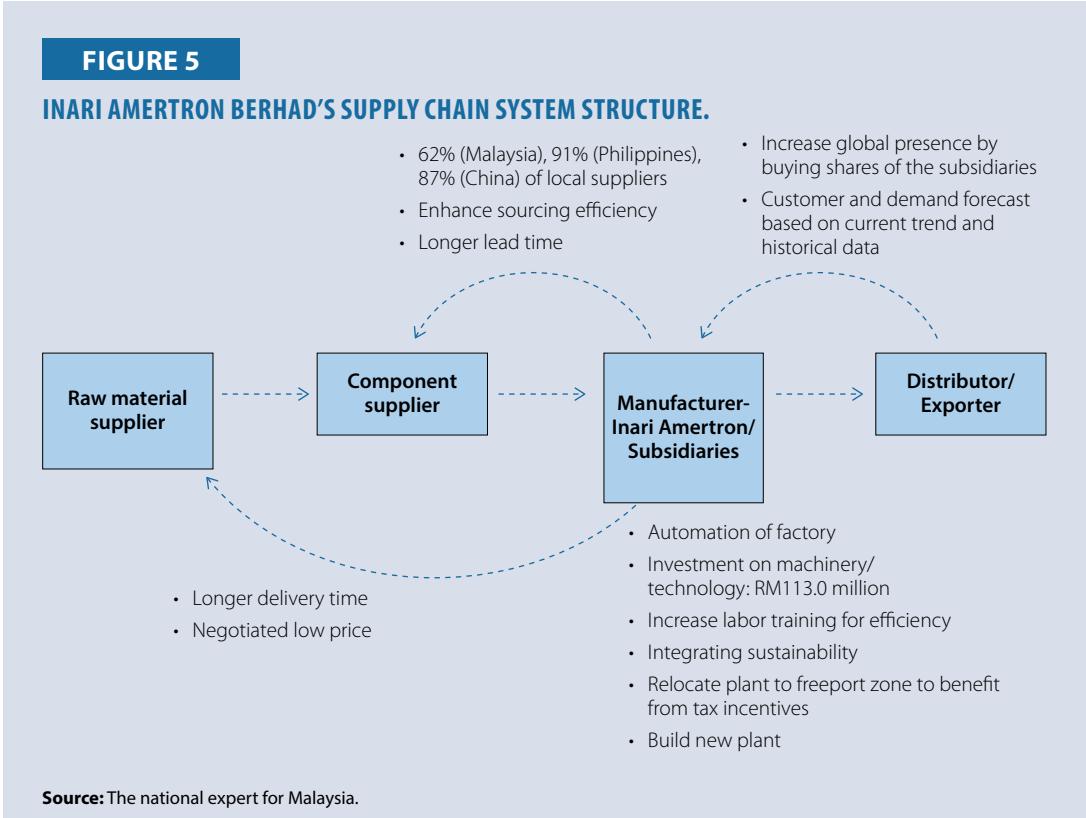
Moreover, the company has strategically acquired a 54.5% stake in Yiwu Semiconductor International Corp (YSIC). Positioned as a new and pivotal component of the company's expansion plan, YSIC is slated for completion in the fourth quarter of 2023. The construction project, valued at MYR650 million, holds substantial promise for contributing to Inari Amertron Berhad's overall financial growth. In alignment with this strategic expansion, Inari Amertron Berhad is committed to reinforcing its investment in the new subsidiary with an additional investment of MYR277.2 million. This forward-looking approach underscores the company's dedication to fostering innovation, strengthening its market presence, and ensuring sustained success in the dynamic landscape of the semiconductor industry.

As reported by The Edge, Inari Amertron Berhad is also planning to relocate operations within the Philippines, a move aimed at significant cost reduction. The impending relocation is envisioned to unlock substantial benefits for the company, mainly through advantageous tax incentives and pronounced savings in labor costs and lease expenses, projected to exceed MYR100,000 per month. This will ultimately enhance net margins and streamline operations for greater profitability.

Global and Local Supplier Strategy

The company manages a complex supply chain network with local and international suppliers across China, Malaysia, and the Philippines. In the fiscal year 2021, the company sourced 34% of its supplies locally in Malaysia, a substantial 90% in the Philippines, and 89% in China. However, in 2022, the percentage of supplies from local vendors declined as the company diversified its supplier network, incorporating more foreign suppliers.

The strategic shift continued into 2023, where a noteworthy transformation in the supplier landscape can be observed. The company witnessed a surge in supplies from local vendors (62%) in Malaysia, 91% in the Philippines, and 87% in China. This trend reflects the company's commitment to fostering domestic partnerships, potentially driven by considerations of proximity, efficiency, and strategic collaborations with local businesses. Inari Amertron Berhad's strategic adaptability in supplier dynamics underscores its agility in responding to market nuances and optimizing its global supply chain. Figure 5 below illustrates Inari Amerton Berhad's supply chain system structure.



ViTrox Corporation Berhad

Core Activities

ViTrox Corporation Berhad, a leading player in the semiconductor industry, distinguishes itself through its diverse array of services. The company excels in four core domains: back-end semiconductor solutions, SMT-printed circuit board assembly, integrated industrial embedded solutions, and cutting-edge Industry 4.0 Manufacturing Intelligence Solutions. Its global footprint spans China, Germany, Malaysia, and the United States, underscoring its commitment to providing cutting-edge semiconductor solutions and positioning itself as a leading player on the international stage. ViTrox’s extensive service offerings and global presence make it a dynamic force in the ever-evolving landscape of semiconductor technologies.

Employment Trends at ViTrox Corporation Berhad

ViTrox experienced a steady uptrend in its employee recruitment efforts. The company employed 629 individuals in 2019, growing 7.9% in 2020 to 679 employees. The momentum surged further in 2021, with the employee count reaching 799 at a growth rate of 17.7% compared to the baseline year of 2019. However, in 2022, while still marked by growth, the pace moderated slightly, resulting in a total workforce of 890, reflecting an 11.4% increase.

The company attributes this strategic variation to its dynamic response to the evolution of Industry 4.0. In alignment with this transformative era, ViTrox has prioritized investments in cutting-edge machinery and technology while concurrently optimizing its labor force. This strategic approach aligns seamlessly with the company’s overarching mission to establish itself as a technologically well-equipped entity, embodying a fully automated infrastructure. ViTrox’s commitment to staying at the forefront of technological advancements reflects its forward-looking stance and adaptability in an era of industrial innovation.

Throughout 2022, the company orchestrated a comprehensive array of learning opportunities, comprising 215 meticulously organized training programs and a diverse selection of 125 online courses. The commitment to fostering a culture of continuous learning extends beyond formal structures. Employees have the flexibility to engage in informal learning experiences through a variety of knowledge-sharing platforms. ViTrox conducted 991 sharing sessions across corporate, interdepartmental, and intradepartmental levels. This multifaceted approach to learning emphasizes the breadth of the company's training initiatives, underscoring its dedication to creating a dynamic and collaborative environment where knowledge flows seamlessly across all levels of the organization.

Financial Performance and Economic Outlook

In 2018, the company achieved MYR394.68 million in revenue with a PAT of MYR105.48 million. However, the onset of the COVID-19 pandemic marked a pivotal juncture, leading to a decline in revenue to MYR339.59 million and a PAT of MYR79.65 million. Undeterred by the challenges posed by the pandemic, the company exhibited resilience and embarked on a trajectory of consistent growth. By the end of 2019, the total revenue surged to MYR470.38 million, with the PAT reaching MYR105.62 million.

The company's growth momentum persisted into the subsequent year, with the total revenue climbing up 30% to MYR680.12 million and PAT increasing to MYR169.39 million, underscoring the company's strategic acumen and resilience. In 2022, ViTrox hit a record high of MYR750.24 million in revenue, a 47% increase from 2018, while PAT reached MYR200.32 million. The company's financial performance over these years reflects its adaptability, strategic foresight, and capacity to thrive amidst evolving economic landscapes.

In the fiscal year of 2022, ViTrox achieved a remarkable global footprint, with a diverse revenue distribution that underscores its widespread appeal. While 28% of its total revenues came from China, Malaysia contributed a substantial 20%, followed by Mexico at 15%. The United States played a pivotal role, accounting for 14% of the revenue, showcasing ViTrox's strong foothold in this key market. Taiwan and the Philippines made significant contributions, each contributing 10% and 4%, respectively, emphasizing the company's ability to resonate with customers across different Asian regions.

Venturing into the international arena, ViTrox demonstrated its prowess in Europe, securing a 3% revenue share. The company also garnered recognition in the vast Indian market, claiming a 2% slice. Thailand, Vietnam, and other markets collectively made up the remaining percentages, illustrating ViTrox's commitment to reaching customers in every corner of the globe. This diverse revenue distribution is a testament to ViTrox's strategic approach, successfully attracting clientele from various cultural and economic landscapes. It highlights the company's ability to navigate and thrive in a globally interconnected business environment, establishing itself as an international player.

Strategic Relocation and Diversification

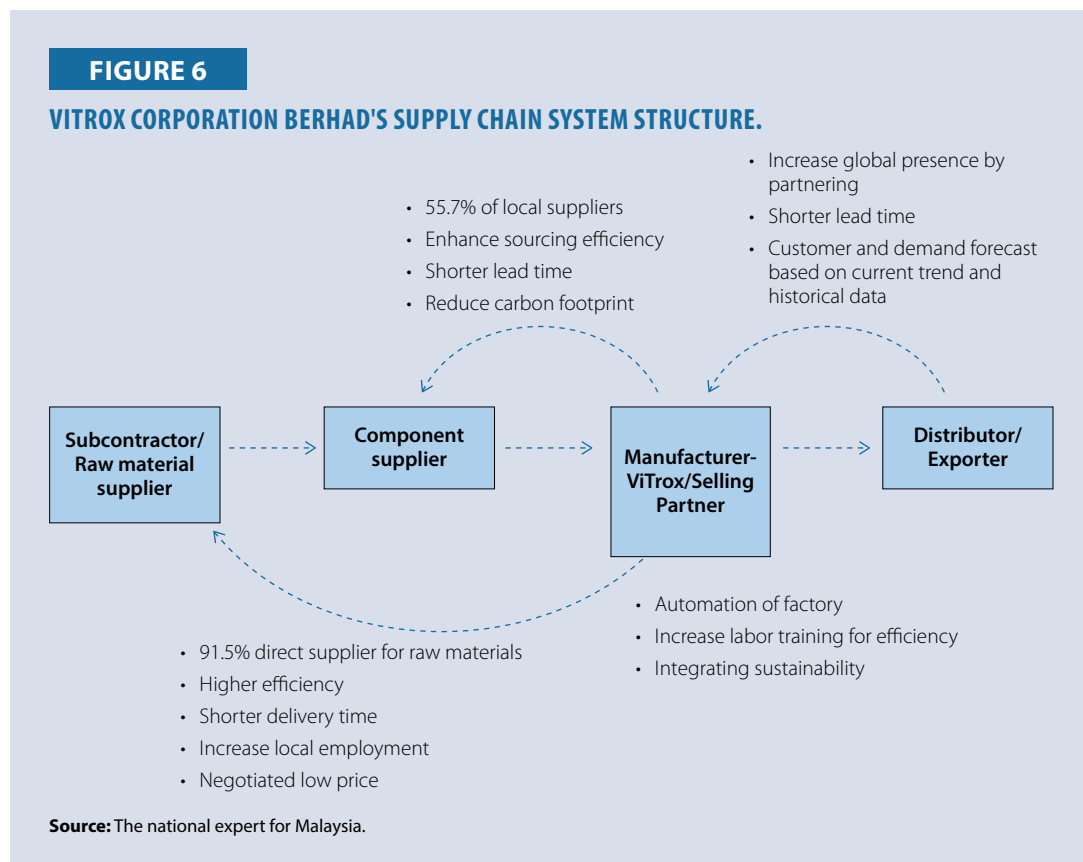
ViTrox has strategically expanded its operations across key regions worldwide to broaden its global footprint. The company executed a well-thought-out plan, acquiring 100% ownership in each region. The triumphant expansion began in 2006 with the acquisition in China, followed by Germany in 2019 and the USA in 2021. This strategic move not only solidified ViTrox's presence in these influential markets but also positioned the company for dynamic growth

and success on a global scale. Embracing a dedicated focus on diversification, ViTrox aspires to leverage its strategic initiatives to captivate a broader global audience. The company aims to resonate with customers worldwide by implementing these carefully crafted strategies. The intent is to attract more customers and establish ViTrox as a dynamic and sought-after presence in diverse markets. Through this commitment to expansion and adaptability, ViTrox envisions creating a magnetic appeal that transcends geographical boundaries, fostering a truly global connection with its customer base. This customer-centric approach underscores ViTrox’s dedication to meeting the evolving needs of a diverse and interconnected international clientele.

ViTrox, committed to cultivating talent, launched a diploma education program in 2018, relocating its education center to Bayan Lepas for increased resources. The program offers comprehensive training and upskilling, targeting the younger generation. This strategic move attracts and retains talent and positions ViTrox at the forefront of technology and innovation, contributing to a skilled workforce and community development.

Global and Local Supplier Strategy

ViTrox actively promotes the growth of local businesses in each country, emphasizing substantial local purchases of raw materials. In 2019, local purchases accounted for 61.6%, increasing to 66.1% in 2020. Despite a slight dip to 60.1% in 2021 and 55.7% in 2022, ViTrox is committed to supporting local suppliers. The company believes sourcing from local companies enhances supply chain efficiency and ensures shorter delivery times, aligning with its strategic approach to fostering effective partnerships within the communities it operates. Figure 6 illustrates ViTrox’s supply chain system structure.



Conclusion and Recommendations

The analysis of Malaysia's economic landscape reveals a multifaceted interaction between labor productivity and various influencing factors, such as R&D, GVC participation, product diversification, and FDI inflow. While these factors generally have the potential to drive economic growth, this study suggests that, in some cases, they may negatively impact labor productivity. It is essential, however, to interpret these findings cautiously. The aggregated nature of the analysis may obscure nuances, and the results could vary significantly under diverse circumstances or specific industrial contexts.

Turning attention to firms' responses to the evolving GSC dynamics, the study uncovers evidence of strategic shifts, including relocation and supply chain diversification, to support the firm's expansion. Despite the challenges posed by the global pandemic, including the decline in PAT, firms, particularly those in the E&E sector, demonstrated resilience by rebounding in revenues. Notably, these strategic maneuvers do not impede employment growth for the firms. Moreover, ongoing workforce enhancement initiatives, manifested through continuous learning and training programs, persistently improve labor productivity and nurture professional development.

Based on the preliminary analysis conducted for this study, key policy recommendations could be drawn, such as enhancing R&D investment, optimizing GVC participation, promoting local diversification, and enhancing talent development.

Enhance R&D Investment: Empirical evidence from this study suggests a negative impact of R&D expenditures on labor productivity growth. In Malaysia, R&D expenditures are primarily funded by the public sector, with relatively low involvement from the private sector, particularly among SMEs. Additionally, R&D outcomes are hardly translated to commercialization. To address this, there is a need to increase government and private sector investment in R&D and stimulate innovation and technological advancements.

Developing policies encouraging businesses to allocate a significant portion of their budget to R&D activities will foster innovation. Furthermore, strengthening collaboration between the government and private sector to facilitate the commercialization of R&D outcomes is crucial for establishing partnerships that promote the efficient use of R&D for productivity growth.

Optimize GVC Participation and Promote Local Diversification: Malaysia faces significant challenges in maintaining its position within the GVC. Despite its strong participation in GVCs, particularly in the E&E sector, increased competition from neighboring countries poses substantial risks.

Empirical evidence indicating a potential adverse impact of GVC participation and product diversification on labor productivity suggests that the government needs to reassess alternative approaches for Malaysia's GVC involvement. This reassessment is necessary to enable enterprises in Malaysia to focus their production activities beyond lower value-added segments of the global production network. Exploring options such as leveraging local product diversification becomes crucial, with a strategic focus on stimulating value-added activities, particularly prioritizing support for local SMEs.

Enhance Talent Development: Labor force growth could positively impact labor productivity. However, this must also align with the labor demand from industrial growth promoted by FDI. As

Malaysian economic growth is considered to be input-driven and highly dependent on FDI investment, a negative impact has been observed due to low-quality inputs used in economic activities, including human capital (skills and knowledge of the workforce), FDI inflows, and the absorptive capacity of FDI and human capital.

To address this, there is a need to promote demand growth through investment that is aligned with the available talent pool. Revising FDI-related policies, including strategies to enhance domestic human capital, is essential. To formulate such policies, a collaborative institutional setting could be established to connect existing or potential investors, the government, local players, and training institutions. Moreover, future efforts to attract FDIs should promote skill-intensive investment in high-value productions that boost labor productivity. Aligning education and skill development programs with industry needs is critical to ensuring a skilled and adaptable workforce.

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Appendix

TABLE A1

LIST OF HS CODE AND DESCRIPTION.

Section	2-Digit HS Code	Description
I	01	Live animals.
	02	Meat and edible meat offal.
	03	Fish and crustaceans, molluscs and other aquatic invertebrates.
	04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included.
	05	Products of animal origin, not elsewhere specified or included.
II	06	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage
	07	Edible vegetables and certain roots and tubers.
	08	Edible fruit and nuts; peel of citrus fruit or melons.
	09	Coffee, tea, mate and spices.
	10	Cereals.
	11	Products of the milling industry; malt; starches; inulin; wheat gluten.
	12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder
	13	Lac; gums, resins and other vegetable saps and extracts.
III	14	Vegetable plaiting materials; vegetable products not elsewhere specified or included.
	15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes.
IV	16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates.
	17	Sugars and sugar confectionery.
	18	Cocoa and cocoa preparations.
	19	Preparations of cereals, flour, starch or milk; pastrycooks' products.
	20	Preparations of vegetables, fruit, nuts or other parts of plants.
	21	Miscellaneous edible preparations.
	22	Beverages, spirits and vinegar.
	23	Residues and waste from the food industries; prepared animal fodder.
V	24	Tobacco and manufactured tobacco substitutes.
	25	Salt; sulphur; earths and stone; plastering materials, lime and cement.
	26	Ores, slag and ash.
VI	27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.
	28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.

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Section	2-Digit HS Code	Description
VI	29	Organic chemicals.
	30	Pharmaceutical products.
	31	Fertilisers.
	32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.
	33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations.
	34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.
	35	Albuminoidal substances; modified starches; glues; enzymes.
	36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations.
	37	Photographic or cinematographic goods.
VII	38	Miscellaneous chemical products.
	39	Plastics and articles thereof
VIII	40	Rubber and articles thereof
	41	Raw hides and skins (other than furskins) and leather.
	42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)
IX	43	Furskins and artificial fur; manufactures thereof.
	44	Wood and articles of wood; wood charcoal,
	45	Cork and articles of cork.
X	46	Manufactures of straw, of esparto or of other plaiting materials; basket-ware and wickerwork.
	47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard.
	48	Paper and paperboard; articles of paper pulp, of paper or of paperboard.
XI	49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans.
	50	Silk.
	51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric.
	52	Cotton,
	53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn.
	54	Man-made filaments.

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Section	2-Digit HS Code	Description
XI	55	Man-made staple fibres
	56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof
	57	Carpets and other textile floor coverings.
	58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery.
	59	Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use.
	60	Knitted or crocheted fabrics.
	61	Articles of apparel and clothing accessories, knitted or crocheted.
	62	Articles of apparel and clothing accessories, not knitted or crocheted.
	63	Other made up textile articles; sets; worn clothing and worn textile articles; rags.
XII	64	Footwear, gaiters and the like; parts of such articles,
	65	Headgear and parts thereof
	66	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof
	67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair.
XIII	68	Articles of stone, plaster, cement, asbestos, mica or similar materials.
	69	Ceramic products.
	70	Glass and glassware.
XIV	71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation, jewellery; coin.
XV	72	Iron and steel.
	73	Articles of iron or steel.
	74	Copper and articles thereof
	75	Nickel and articles thereof.
	76	Aluminium and articles thereof
	77	(Reserved for possible future use in the Harmonized System)
	78	Lead and articles thereof
	79	Zinc and articles thereof.
	80	Tin and articles thereof.
	81	Other base metals; cermets; articles thereof.
	82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal.
83	Miscellaneous articles of base metal.	

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Section	2-Digit HS Code	Description
XVI	84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof
	85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles,
XVII	86	Railway or tramway locomotives, rolling-stock and parts thereat railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds.
	87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.
	88	Aircraft, spacecraft, and parts thereof
	89	Ships, boats and floating structures.
XVIII	90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof
	91	Clocks and watches and parts thereof.
	92	Musical instruments; parts and accessories of such articles.
XIX	93	Arms and ammunition; parts and accessories thereof.
XX	94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like; prefabricated buildings.
	95	Toys, games and sports requisites; parts and accessories thereof
	96	Miscellaneous manufactured articles.
XXI	97	Works of art, collectors' pieces and antiques.
	98	Reserved for special uses by Contracting Parties
	99	Reserved for special uses by Contracting Parties

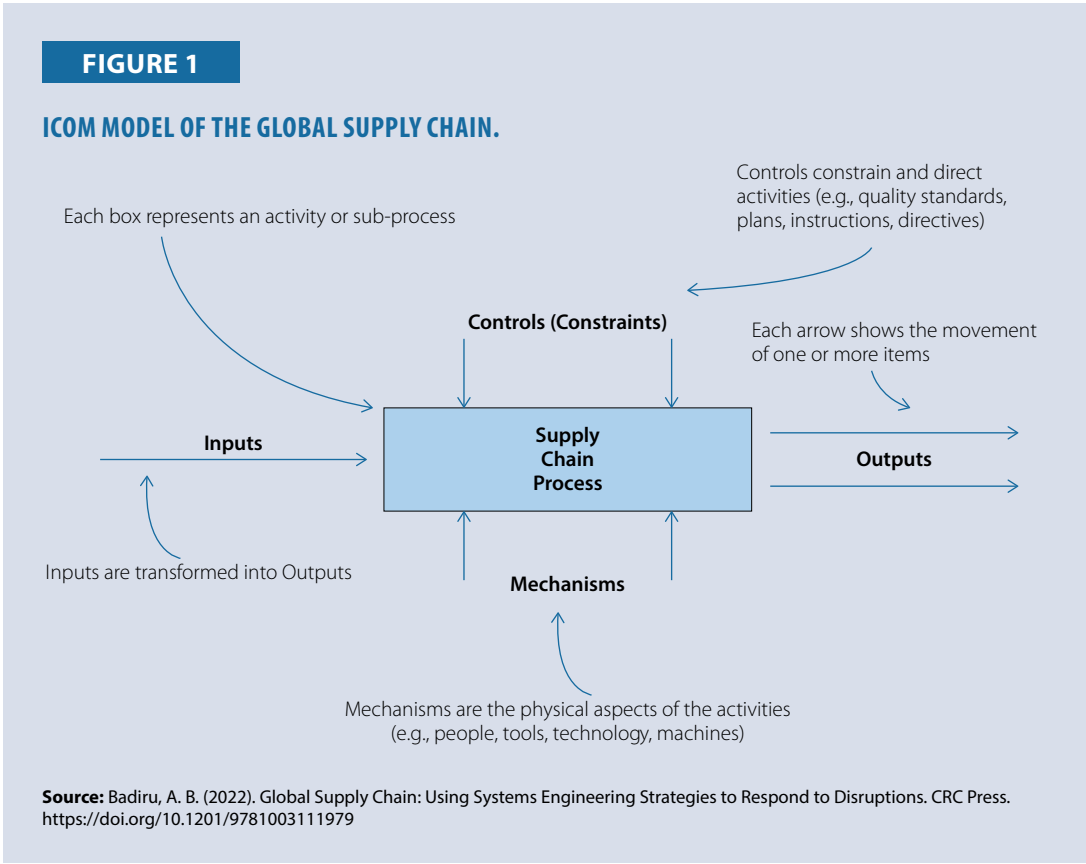
Source: United Nations. UN Statistics Wiki. The information for this table was retrieved <https://unstats.un.org/wiki/display/comtrade/HS+2002+Classification+by+Section>

PAKISTAN

Introduction

GSC is a network of organizations that link and supply materials worldwide. This system must deliver products at the right time, location, and quantity. Industrial researchers continuously seek better tools and techniques to analyze and improve GSC productivity. The GSC is a dynamic system that will continue evolving, with researchers developing new solutions to resolve issues through innovative instruments and industrial engineering methods. These include forecasting, learning curve modeling, supply chain issues, predictive statistics, quality certification, AI, big data analytics, engineering economic analysis, systems optimization, and IoT to address ongoing GSC challenges (Badiru, 2022). The Input, Constraints, Outputs, and Mechanisms (ICOM) model provides a framework to explain the GSC process (Badiru, 2022). The model shown in Figure 1 is adapted from Adedeji B. Badiru's book *Global Supply Chain: Using Systems Engineering Strategies to Respond to Disruptions* (Badiru, 2022).

The COVID-19 pandemic of 2020 exposed the fragility and flexibility of GSCs when faced with major disruptions. Although the Coronavirus was a natural phenomenon, the lockdowns and production halts implemented were human responses. The spread of viruses and the human response demonstrates that the normally efficient GSC can react more slowly and ineffectively



during such crises (Lin et al., 2021). This creates a challenging GSC environment. While customers may perceive supply chain issues as mere product shortages, the reality is more complex. Several factors contribute to disruptions, including product shortages, natural disasters, labor (Nagurney, 2022), political upheaval, accidents, hoarding, excessive demand vis-à-vis supply, transportation problems, workforce inequities, and sabotage (Badiru, 2022).

Given these complexities, this research aims to identify the critical factors influencing GSC productivity and examine the Pakistan government's role in addressing these challenges. Furthermore, Pakistan and China are collaborating on the China-Pakistan Economic Corridor (CPEC), which revives the ancient Silk Road under the One Belt, One Road initiative (Lin et al., 2021). This research will also explore the issues and challenges associated with CPEC.

GSC Diversification and Relocation Strategies

GSC diversification involves a company's initiative to distribute its activities across multiple industries and regions. These activities pertain to both suppliers and customers. The GSC diversification aligns with the old proverb, "Do not put all your eggs in one basket." Thus, organizations are encouraged to diversify their supplier and customer base. These diversification techniques have become increasingly important among industrialists and academicians as a means of mitigating unpredictability and uncertainty in the GSC environment (Lin et al., 2021).

Overview of the Government Approach

Pakistan's economy is facing several challenges related to the global supply chain. Rising energy costs are exerting significant pressure on the economy. The nation imports most of its fossil resources and witnessed a sharp increase in energy prices worldwide in 2023. As a result, the government has mandated early closure of marketplaces and commercial centers to conserve energy. Moreover, Pakistan depends heavily on foreign currency reserves, particularly US dollars, for energy imports. However, the nation's foreign exchange reserves have drastically declined, barely covering one month's worth of energy-related imports.

The administration has implemented additional measures to reduce energy consumption further. These include a 30% reduction in power usage across government agencies and a ban on manufacturing inefficient electric fans, effective from 1 July 2023.

Pakistan has struggled for years to stabilize its. For this purpose, Pakistan needs to improve its global supply chain. To this end, various stakeholders are working on different initiatives to improve the efficiency and resilience of the country's supply chain.

Trade Development Authority

The Trade Development Authority of Pakistan (TDAP) plays a vital role in facilitating and enhancing Pakistan's participation in the GSC. TDAP takes a comprehensive approach to global trade development beyond export promotion alone. With 14 regional offices, TDAP strives to lower administrative barriers, optimize procedures, and ensure seamless trade operations.

TDAP also supports exporters by strengthening their skills and capabilities. This entails promoting an export-friendly culture and encouraging foreign investment and joint ventures with an export focus. TDAP connects Pakistani exporters with international markets and customers, promoting Pakistani goods globally.

TDA has developed a Strategic Trade Policy Framework (STPF) for 2020–25 to further its goals. This framework aims to broaden the export base and boost domestic production by focusing on 18 crucial sectors, including emerging and established industries. These sectors include BPO engineering goods, fruits and vegetables, leather and leather goods, meat, pharmaceuticals, processed food and beverages, software development, implementing agencies, logistics, seafood, surgical instruments, textile and apparel, rice, germs and jewelry, cutlery, carpets, marble and minerals, footwear, chemicals, and engineering products (GoP, 2018; Ministry of Commerce, 2021).

The STPF envisions “Pakistan to become a globally competitive export-driven economy and a dynamic and efficient domestic market.” It seeks to overcome the persistent policy fragmentation that has impeded the effective implementation of previous Trade Policy Frameworks. The primary objective of the STPF is to render policy execution unidirectional and enhance the capacity of Pakistani enterprises to manufacture, supply, and market goods and services that meet or exceed global standards, strengthening their competitiveness in international markets.

Economic Corridors

Pakistan is developing several economic corridors to enhance its global supply chain, and the CPEC is one of them. China has recently invested USD62 billion in CPEC projects, marking a significant regional connectivity milestone. This investment includes a network of highways and railway projects to link the Gwadar port in Pakistan with the province of Xinjiang in northwest China, thereby connecting to international supply chain networks (Awan & Ali, 2022).

In addition, Pakistan has joined the Central Asia Regional Economic Cooperation Program, a collaborative initiative among 11 regional countries to promote trade. As part of this effort, the Afghanistan-Pakistan Transit Trade Agreement was revised, and the Uzbekistan-Pakistan Transit Trade Agreement was finalized (Ministry of Commerce, 2021).

Gwadar Free Zone

The Gwadar Free Zone (GFZ) is integral to improving regional connectivity and strengthening Pakistan’s position in the global supply chain. It is the international trade logistics hub under the CPEC and is positioned as a driver of Pakistan’s economic growth. Located adjacent to Gwadar Port, the GFZ facilitates industrial collaboration between China and Pakistan. It is situated on the western section of the existing port.

The GFZ is being developed in four phases from 2015 to 2030, covering 923 hectares, including an initial 25 hectares and an additional 898 hectares in the northern section. These GFZ aims to provide a business-friendly environment for manufacturing, trading, and service industries. The GFZ offers services to a broad spectrum of industries, including container yards, bonded warehousing, temperature-controlled, ambient, and refrigerated storage facilities, international purchasing, transit and distribution, packaging and labeling, transshipment, light assembly and re-assembly, imports and exports, and value-added exports.

In addition to industrial services, the GFZ provides various supporting services, such as business offices, banking institutions, customs facilities, retail stores, restaurants, entertainment venues, and medical facilities. It strengthens Pakistan’s trade and offers a platform for military and diplomatic cooperation with its neighbors. It plays a significant role in shaping Pakistan-China relations and supports Pakistan’s ongoing economic transition. GFZ will further enhance Pakistan’s global supply chain capabilities as it develops.

Dynamic Performance over Time with Multiple Indicators

Table 1 presents Pakistan's dynamic performance over time, measured across multiple indicators. The data spans the period from 2005 to 2022, highlighting trends in GDP (constant 2015 USD million), GDP growth (annual %), GDP per capita (current USD), GDP per capita, PPP (constant 2017 international USD), total labor force (million), GDP per capita growth (annual %), and R&D expenditure (% of GDP). Detailed insights into these indicators are illustrated in the graphs provided in the following sections.

TABLE 1

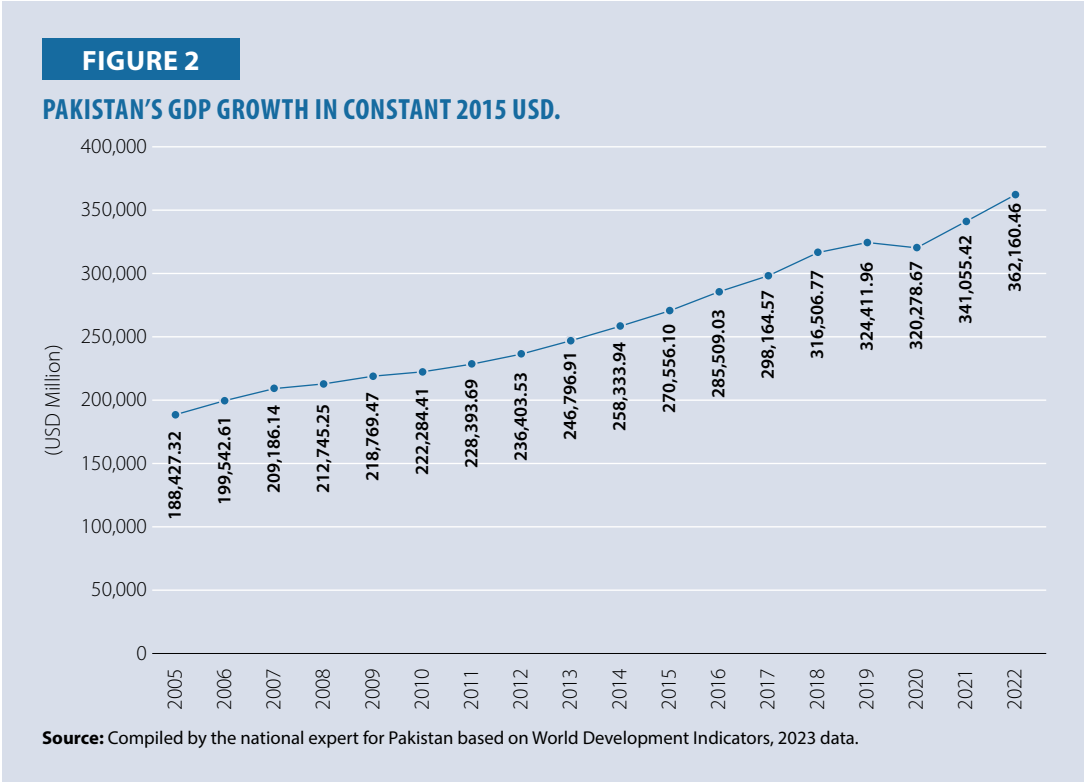
DYNAMIC PERFORMANCE OVER TIME WITH MULTIPLE INDICATORS.

Year	GDP (constant 2015 USD Million)	GDP Growth (annual %)	GDP Per Capita (current USD)	GDP Per Capita, PPP (constant 2017 international USD)	Total Labor Force (in Million)	Annual GDP Per Capita Growth (in %)	R&D Expenditure (% of GDP)
2005	188,427.32	6.52	688.50	3,836.09	51.75	4.24	0.40
2006	199,542.61	5.90	770.84	3,978.02	52.83	3.70	–
2007	209,186.14	4.83	837.63	4,081.91	54.35	2.61	0.63
2008	212,745.25	1.70	914.73	4,061.89	55.92	–0.49	–
2009	218,769.47	2.83	884.44	4,084.83	58.05	0.56	0.45
2010	222,284.41	1.61	911.09	4,058.01	60.26	–0.66	–
2011	228,393.69	2.75	1,075.45	4,082.45	61.55	0.60	0.33
2012	236,403.53	3.51	1,109.68	4,150.33	63.27	1.66	–
2013	246,796.91	4.40	1,126.04	4,266.71	64.80	2.80	0.29
2014	258,333.94	4.67	1,173.39	4,403.67	65.27	3.21	–
2015	270,556.10	4.73	1,282.44	4,552.61	67.59	3.38	0.25
2016	285,509.03	5.53	1,468.82	4,746.72	68.08	4.26	–
2017	298,164.57	4.43	1,567.64	4,891.72	68.74	3.05	0.21
2018	316,506.77	6.15	1,620.74	5,113.43	69.63	4.53	–
2019	324,411.96	2.50	1,437.17	5,157.55	71.92	0.86	0.17
2020	320,278.67	–1.27	1,322.31	5,004.35	72.84	–2.97	–
2021	341,055.42	6.49	1,505.01	5,232.14	76.94	4.55	0.16
2022	362,160.46	6.19	1,596.66	5,451.72	78.91	4.20	–

Source: Compiled by the national expert for Pakistan based on World Development Indicators, 2023 data.

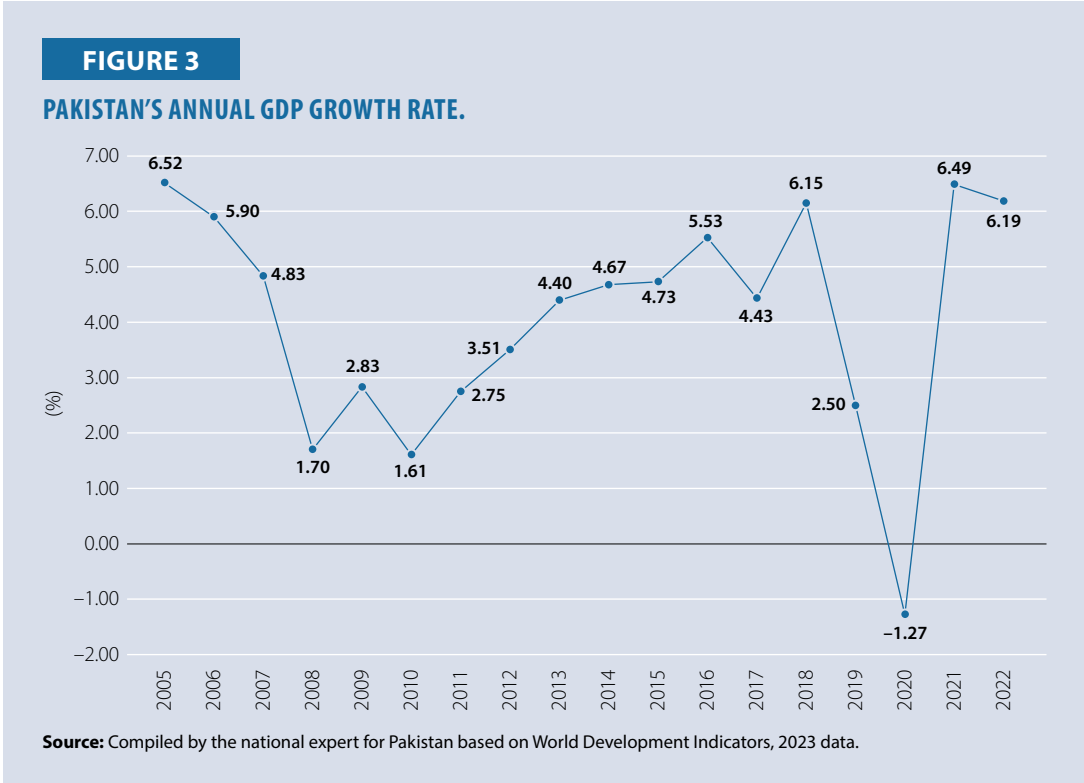
Pakistan's GDP Trends (2005–22)

Figure 2 illustrates Pakistan's GDP from 2005 to 2022, expressed in constant 2015 US dollars. The data indicates a consistent upward trend in the country's economic performance during this period. Notably, the GDP grew from USD188,427.32 million in 2005 to USD362,160.46 million in 2022, reflecting a significant increase in Pakistan's total economic output during the period. This trend demonstrates substantial economic growth and development during the period.



GDP Growth in Pakistan

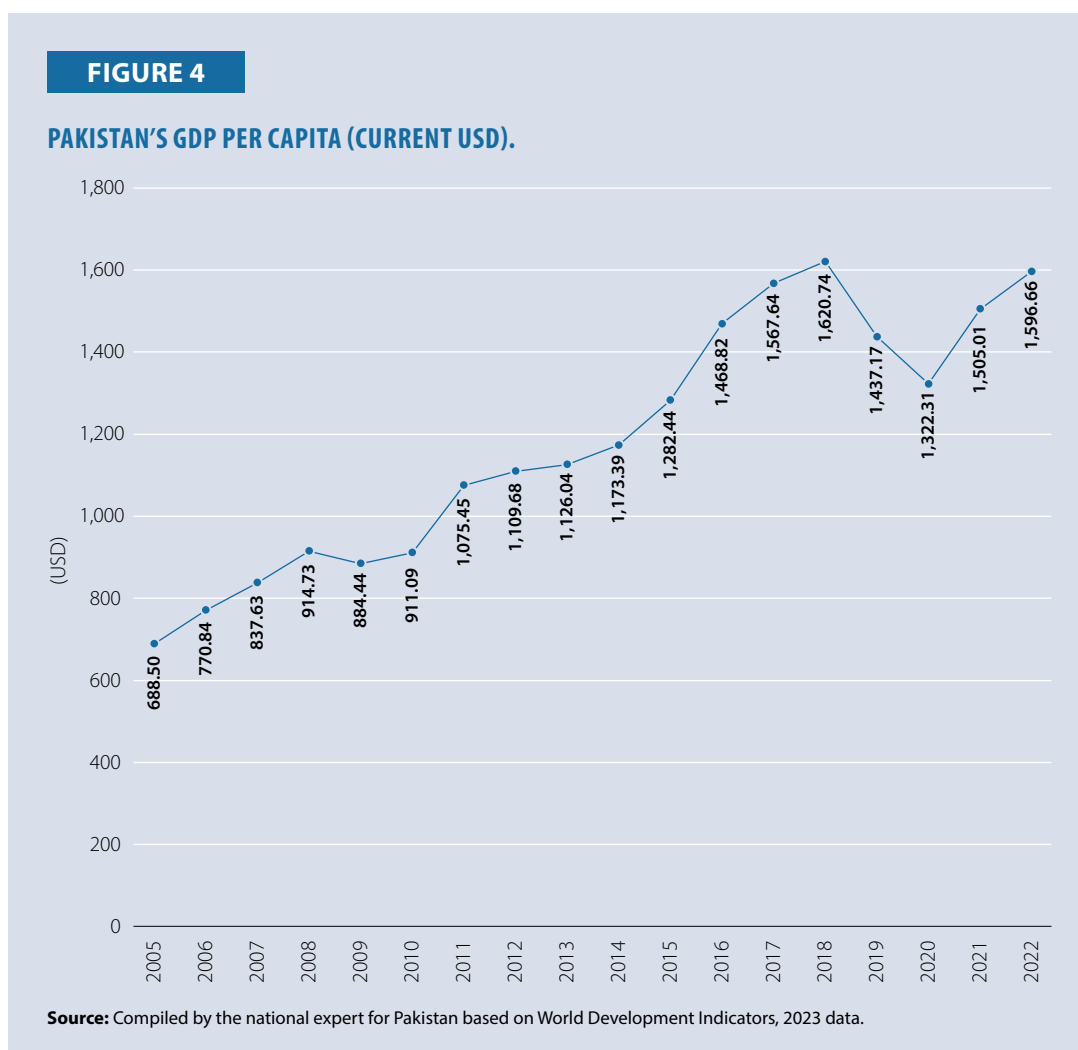
Figure 3 illustrates the dynamic trend of Pakistan’s GDP growth rate (annual %) from 2005 to 2022. The data indicates that the nation’s GDP grew robustly at 6.52% in 2005, marking a significant increase in its economic goods and services output. However, by 2022, the GDP growth rate had dropped to 6.19%, indicating slow economic growth.



This decline necessitates a deeper investigation into the factors contributing to the noted slowdown in GDP growth. Potential causes include the impact of COVID-19, shifts in economic policies, changes in the global economic landscape, domestic challenges, and structural adjustments in the business environment. To achieve success, a thorough examination of these contributing factors is necessary.

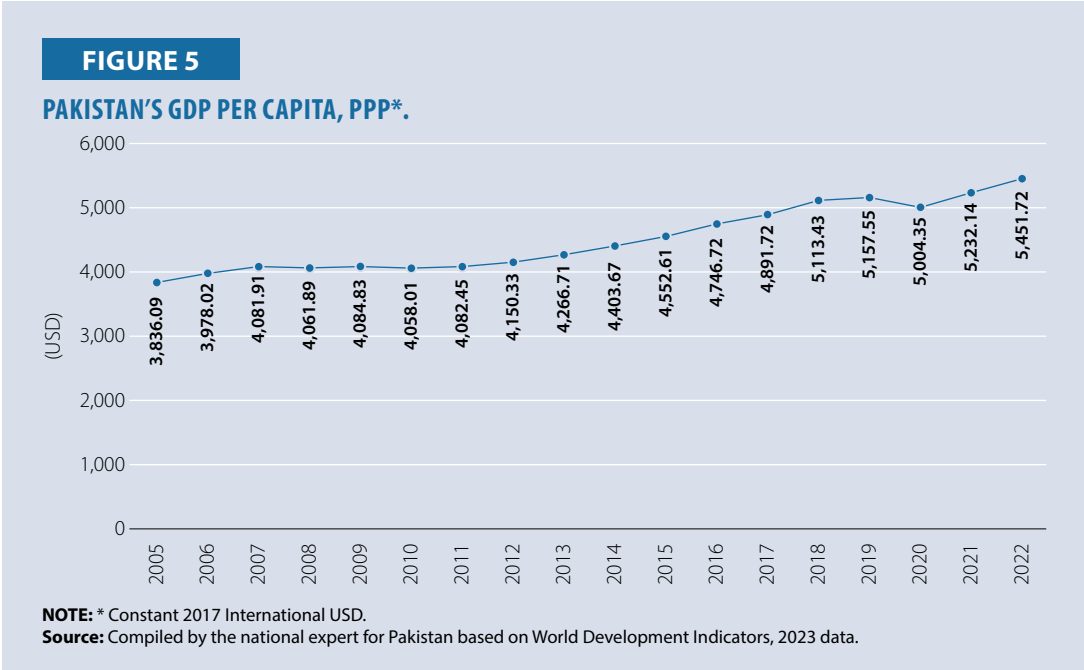
Pakistan's GDP Per Capita (Current USD)

Figure 4 illustrates the dynamic evolution of Pakistan's GDP per capita (current USD) from 2005 to 22. The data indicates that the country's GDP grew at a robust rate of 6.52% in 2005, signaling a significant increase in the production of goods and services. The GDP per capita peaked at USD1,620.74 in 2018. However, following the COVID-19 pandemic, the per capita GDP declined to USD1,596.66 in 2022. This suggests a discernible deceleration in the GDP per capita.



Pakistan's GDP Per Capita (PPP)

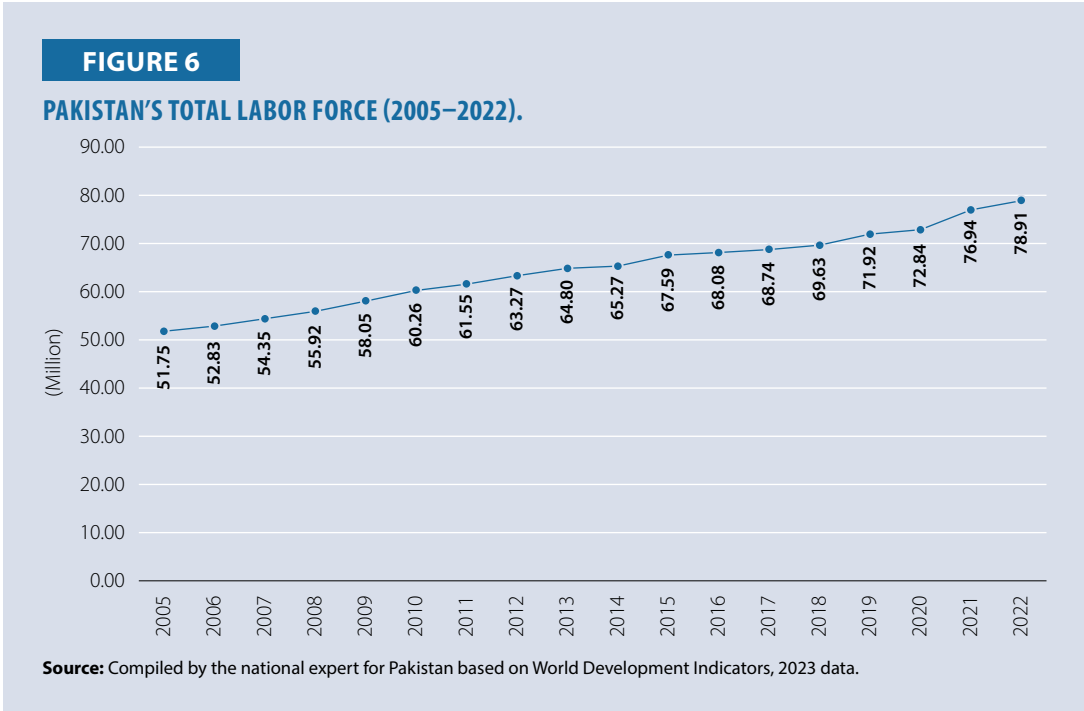
Figure 5 presents Pakistan's GDP per capita in terms of Purchasing Power Parity (PPP), expressed in constant 2017 international dollars, and illustrates the nation's GDP per capita growth during 2005–22. The data shows that in 2005, the GDP per capita (PPP) was USD3,836.09. This economic indicator exhibited significant fluctuations over the years, peaking at USD 5,451.72 in 2022, reflecting a notable increase in purchasing power during this period.



Labor Force Dynamics (Total in Million)

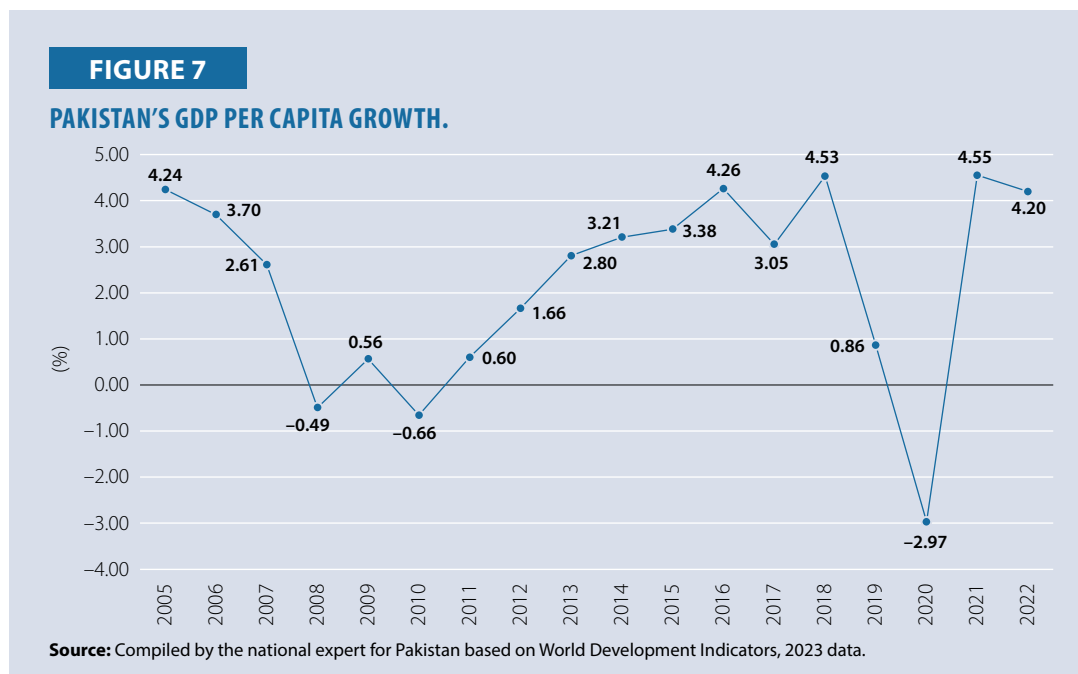
Figure 6 provides a detailed summary of the dynamics of Pakistan’s workforce, expressed in millions, over time. Closer data analysis reveals a clear upward trend, from 51.75 million workers in 2005 to 78.91 million strong labor force in 2022.

This increase in the labor force reflects the complex interplay of economic and demographic factors. The primary driver of this growth is the population increase during the observed period. Expanding the labor force profoundly impacts the economy, influencing employment, productivity, and overall economic output.



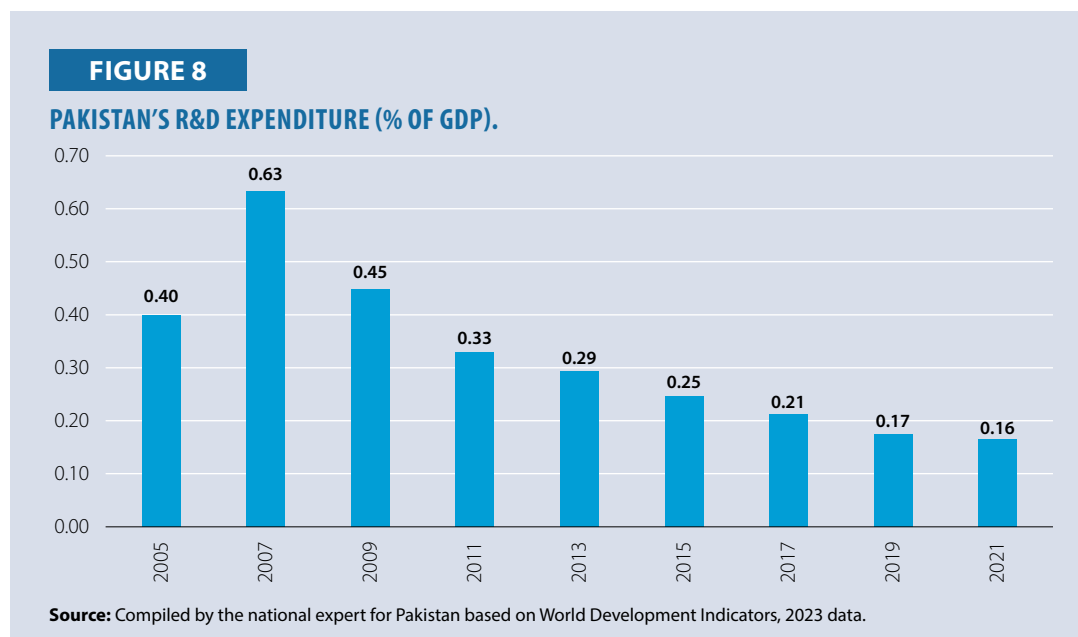
GDP Per Capita Growth

Pakistan’s GDP per capita growth is presented in Figure 7, showing fluctuations during 2005–22. In 2005, the growth was 4.24%, which declined to -0.49 % in 2008 and to -0.66% in 2010. Then after, the growth improved, reaching 4.53% in 2018. However, due to the COVID-19 pandemic, GDP per capita growth declined to -2.97% in 2020 before rebounding to 4.20% in 2022.



Research and Development Expenditure (% of GDP)

Figure 8 shows Pakistan’s R&D expenditure as a percentage of its GDP. In 2005, the country’s R&D expenditure was 0.40% of GDP, peaking at 0.63% in 2007. However, after that, the country’s expenditure on R&D steadily declined, reaching 0.16% of GDP in 2022. Overall, the trend indicates a significant reduction in the country’s R&D spending from 2005 to 2022.

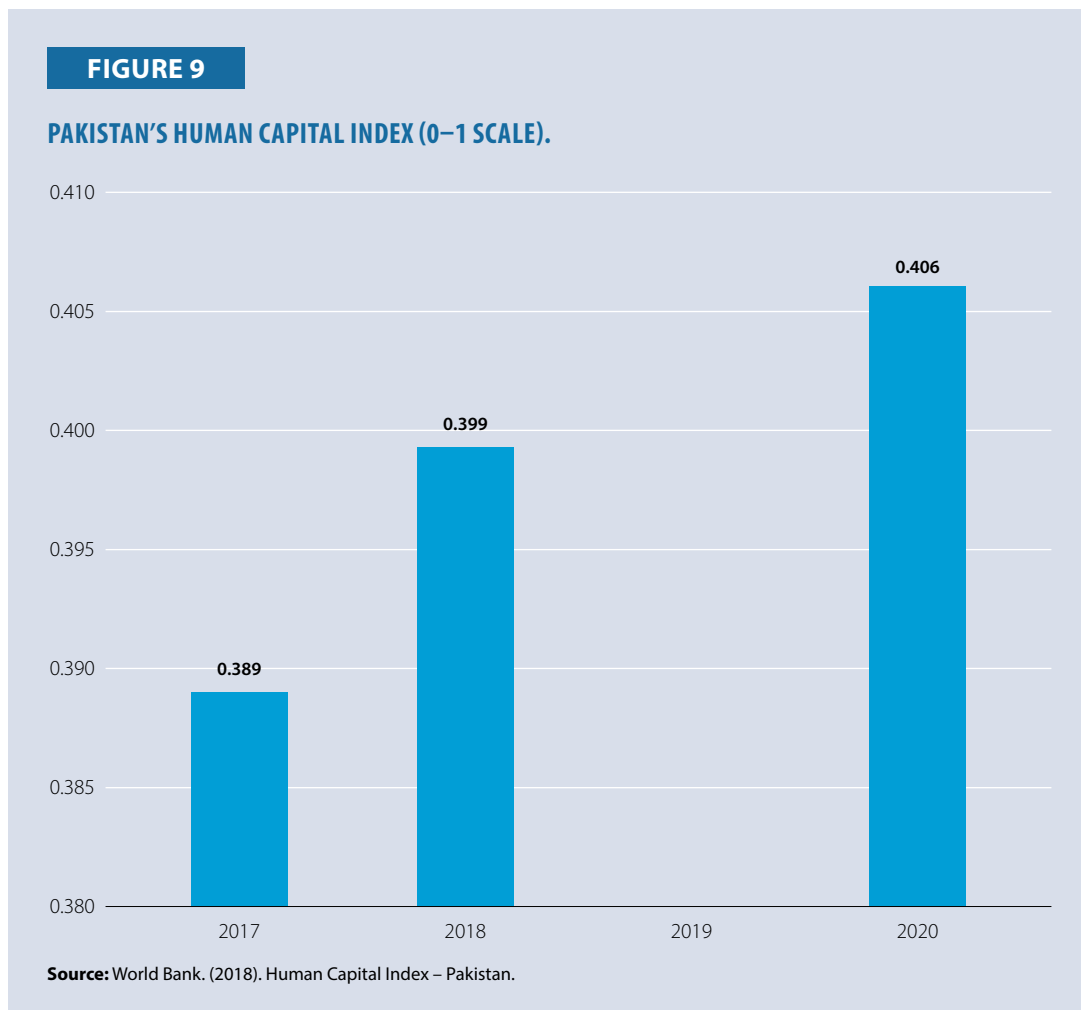


Human Capital Index in Pakistan

A worldwide initiative, the Human Capital Project, was started by the World Bank Group to promote the development of human capital as a critical factor in the growth and productivity of countries. The Human Capital Index (HCI), a cross-country measure that evaluates the anticipated amount of human capital that a child born today will attain by age eighteen, is integral to this endeavor. The evaluation considers the probability of facing health and education-related obstacles in their respective countries. Compared to ideal health and education, baseline the HCI quantitatively assesses a child’s expected productivity as a future worker (World Bank, 2021).

As illustrated in Figure 9, it can be observed that during 2017–22, there was a noticeable shift in Pakistan’s HCI. To be more precise, Pakistan’s HCI in 2017 was comparatively low at 0.369, reflecting difficulties and constraints with the nation’s human capital development. Nonetheless, there was a noticeable improvement by 2022, as seen by the HCI’s notable rise to 0.4061. This significant increase implies improvements in health and education-related parameters, which strengthens the prediction of the productivity of people born in that era in the future.

A greater HCI in 2022 than a lower score in 2017 suggests efforts and initiatives that have aided in Pakistan’s human capital development. These gains can be credited to policies addressing health and education issues, social infrastructure investments, and other planned actions to strengthen the country’s human capital.



Trends in Pakistan's Exports and Imports

Key measures for assessing a country's economic condition and productivity include exports and imports. Pakistan exports and imports from 2005–06 to 2022–23 are presented in Table 2. In 2005–06, the country's total exports were valued at USD16,451 million, while imports amounted to USD28,581, reflecting a significant trade deficit. Similarly, in 2022–23, exports were USD27,724 million, while imports reached USD55,198 million, indicating a persistent trade imbalance with imports continuing to outpace exports.

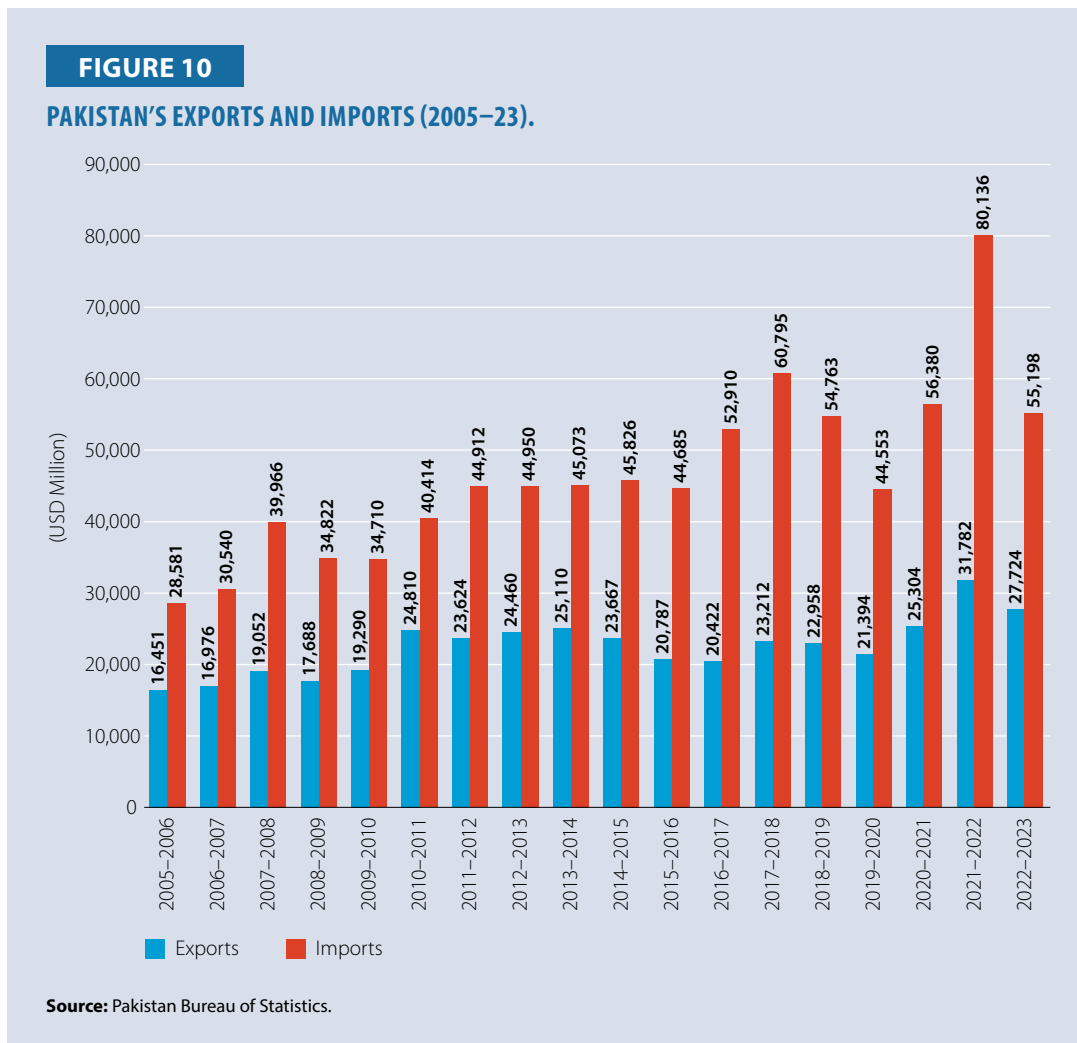
TABLE 2

PAKISTAN'S EXPORTS AND IMPORTS (2005–23).

Year	Exports (in USD Million)	Imports (in USD Million)
2005–06	16,451	28,581
2006–07	16,976	30,540
2007–08	19,052	39,966
2008–09	17,688	34,822
2009–10	19,290	34,710
2010–11	24,810	40,414
2011–12	23,624	44,912
2012–13	24,460	44,950
2013–14	25,110	45,073
2014–15	23,667	45,826
2015–16	20,787	44,685
2016–17	20,422	52,910
2017–18	23,212	60,795
2018–19	22,958	54,763
2019–20	21,394	44,553
2020–21	25,304	56,380
2021–22	31,782	80,136
2022–23	27,724	55,198

Source: Pakistan Bureau of Statistics.

Figure 10 presents a similar graphical comparison of Pakistan's export and import data, which indicates that the country's imports are much higher than exports. This highlights Pakistan's dependence on imports and the lack of locally produced goods.



Logistics Performance Index

The Logistics Performance Index (LPI) assesses the country’s logistics performance based on several criteria, including LPI score, customs, infrastructure, international shipments, logistics competence, tracking and tracing, timeliness, and LPI rank. Table 3 provides data on these criteria. In 2018, Pakistan’s LPI score stood at 2.42 on a scale from 1 (Low) to 5 (High), reflecting a below-average logistics performance within the region. This score highlights the need for significant improvement in the country’s logistics infrastructure and operations (World Bank, n.d.).

The table shows the LPIs of South Asian countries, revealing that Bangladesh, India, Maldives, Nepal, Sri Lanka, and Pakistan rank among the lowest in the region. Notably, Bhutan is the only South Asian country with an LPI score lower than Pakistan.

TABLE 3
LOGISTICS PERFORMANCE INDEX OF SOUTH ASIAN COUNTRIES.

Country	India	Maldives	Sir Lanka	Bangladesh	Nepal	Pakistan	Bhutan
LPI score	3.18	2.67	2.6	2.58	2.51	2.42	2.17
Customs	2.96	2.4	2.58	2.3	2.29	2.12	2.14

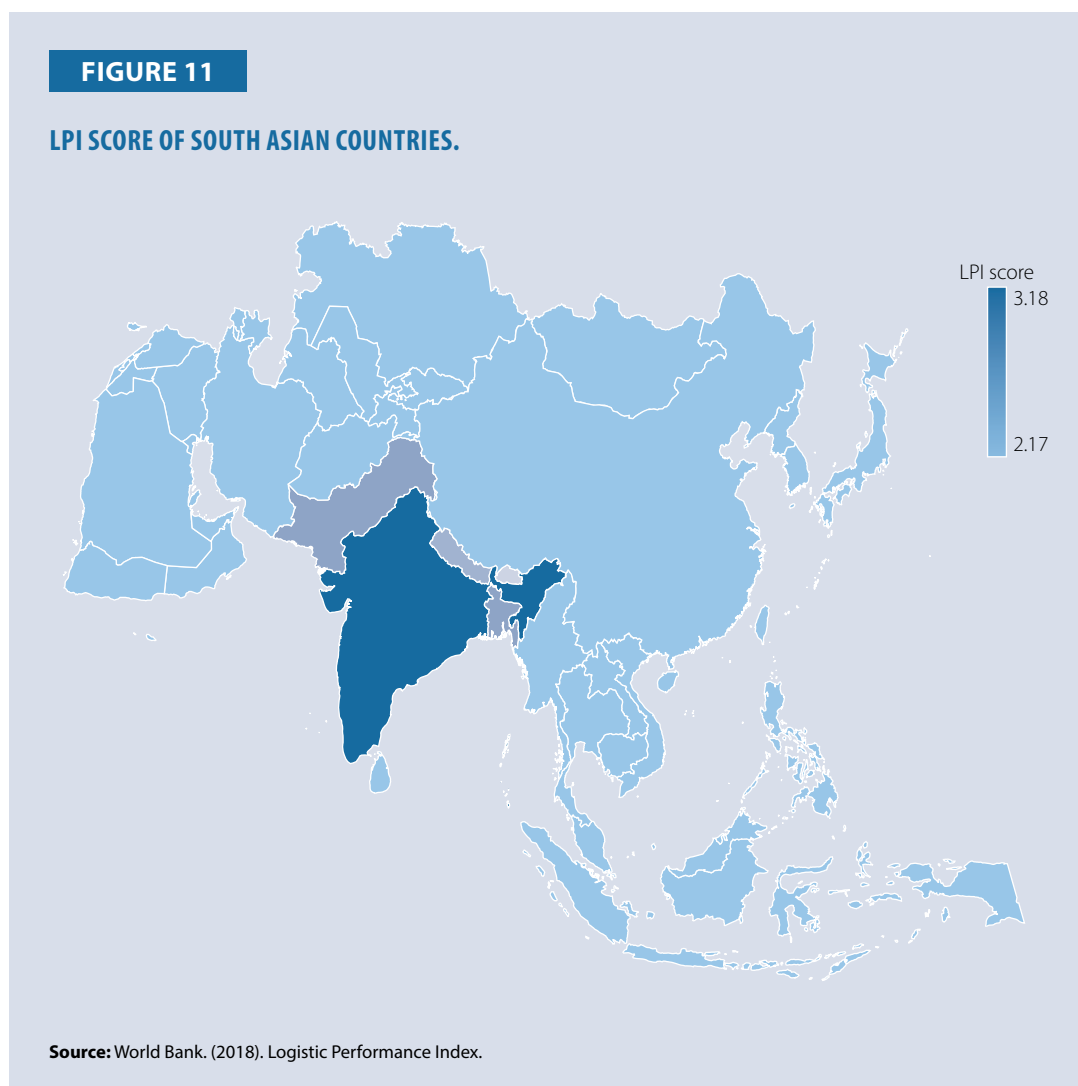
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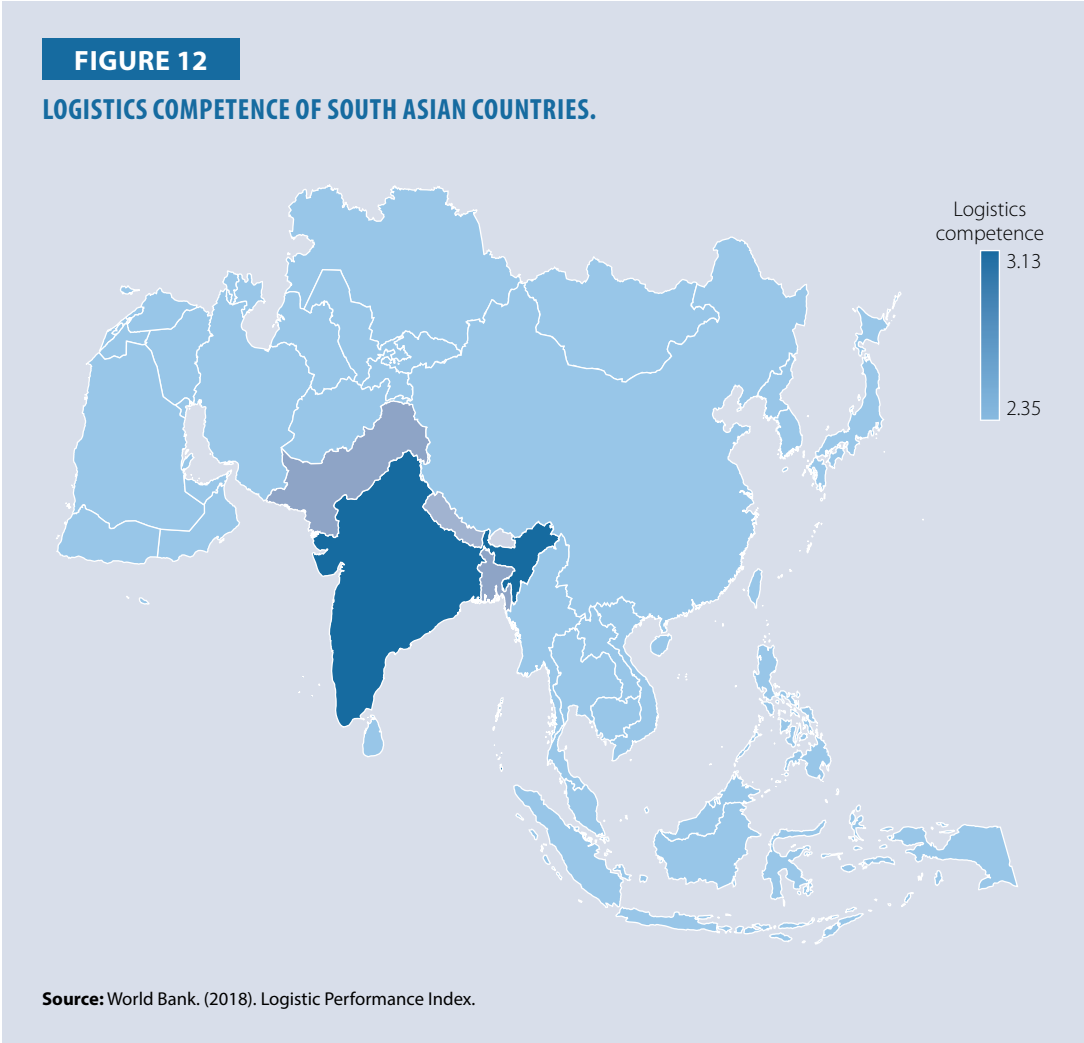
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Country	India	Maldives	Sir Lanka	Bangladesh	Nepal	Pakistan	Bhutan
Infrastructure	2.91	2.72	2.49	2.39	2.19	2.2	1.91
International shipments	3.21	2.44	2.51	2.56	2.36	2.63	1.8
Logistics competence	3.13	2.55	2.42	2.48	2.46	2.59	2.35
Tracking and tracing	3.32	2.77	2.79	2.79	2.65	2.27	2.35
Timeliness	3.5	3.18	2.79	2.92	3.1	2.66	2.49
LPI rank	44	86	94	100	114	122	149

Source: World Bank. (2018). Logistic Performance Index.

Figure 11 presents the LPI scores of South Asian countries, highlighting Pakistan’s relatively low performance compared to others in the region. While most countries have higher LPI scores, Pakistan’s score remains among the lowest.





On the logistic competence scale, as presented in Figure 12 and Table 3, Pakistan performs better than other South Asian countries, except India. This suggests that while Pakistan has competencies in logistics, government support is needed to improve them.

Case Study

Engro Fertilizers Limited

Company Introduction and GSC Plans

Engro Fertilizers Limited (EFERT) is a well-known company in Pakistan that manufactures and markets fertilizers. Its product portfolio includes urea, Nitrogen, Phosphorus, Potassium (NPK), Potash, Zarkhez, and Di-Ammonium Phosphate (DAP), marketed under seven Engro trademarks. EFERT serves a vast customer base, accounting for around two million farmers in Pakistan.

Dawood Hercules Corporation Limited (the parent company) manages investments in subsidiaries, associated companies, and joint ventures involved in various sectors, including fertilizers, power generation, telecommunication infrastructure, petrochemicals, mining, food, Liquefied Natural Gas (LNG), and chemical storage. One of its key subsidiaries, Engro Corporation Limited, holds a substantial share in EFERT. Engro Corporation is a publicly listed company that launched its Initial Public Offering in 2013 in Pakistan.

EFERT boasts extensive internal project execution capacity, drawing on over 50 years of operational experience across Pakistan. The company has established strong partnerships with global finance, construction, and technology companies, enhancing its ability to deliver large-scale projects effectively.

The company specializes in producing urea and NPK (potash) fertilizers and is a leading importer and distributor of DAP products widely sold across Pakistan. The company was the first to establish a urea production facility in the country, marking a significant milestone in developing Pakistan's agricultural industry. It is the second-largest producer of urea in Pakistan and holds the distinction of being the largest DAP importer in the nation.

TABLE 4**PRODUCTION CAPACITY OF ENGRO FERTILIZERS PER ANNUM (IN MT).**

Engro Fertilizers Ltd Production Capacity (MT p.a.)			
Company	Location	Urea	NPK
Base Plant	Ghotki, Sindh	975,000	
Enven Plant	Ghotki, Sindh	1,300,000	
NPK plant	Karachi, Sindh		150,000
Engro Fertilizers Ltd – Total		2,275,000	150,000

Note: MT, metric tons.

Source: Annual Report 2022, Engro Fertilizer Limited.

As indicated in Table 4, EFERT operates three distinct plants—the Base Plant, the Enven Plant, and the NPK Plant—with a combined production capacity of 2,275,000 tons per annum for urea and 150,000 tons for NPK.

The Suppliers

EFERT sources raw materials from both domestic and international suppliers. In 2021, the company had 238 international suppliers and 653 domestic vendors, excluding gas providers. EFERT's suppliers include a range of contractors, small enterprises, privately held firms, and large companies. The company's supply chain relies on both labor-intensive and technology-intensive processes.

Its imports primarily consist of phosphatic products, machinery, plant capital parts, and raw materials for its specialized fertilizer business division. While a substantial portion of raw materials is procured locally, since urea remains the company's main product, specific inputs for specialized fertilizers are imported. Additionally, a significant portion of the company's trading portfolio, particularly in the Crop Sciences Division and phosphate-based goods, is sourced from international suppliers.

The company guarantees adherence to established protocols for identifying and assessing domestic and international suppliers. EFERT is not significantly reliant on any of the local or global suppliers.

EFERT is a vertically integrated fertilizer firm primarily producing fertilizer products and raw materials in Pakistan. Thus, it has no other sources for its essential fertilizer components. However, to be termed a partner in some domains, it works with other businesses on several facets of its operations. The following are some of EFERT's critical suppliers.

Engro Energy Limited: Engro Energy, a division of Engro Corporation, provides natural gas to EFERT's production facilities.

Engro Vopak Terminal (EVT): Imported LNG is an essential raw ingredient for urea manufacturing. Through their joint venture, Engro Corporation and Royal Vopak EVT store and handle it.

Sui Northern Gas Pipelines Limited (SNGPL): EFERT's production facilities supply natural gas from SNGPL when Engro Energy cannot meet demand.

Fauji Fertilizer Company (FFC): Fauji Fertilizer Bin Qasim Limited, a joint venture between EFERT and FFC, has a granulation unit that generates granulated urea for both businesses.

Engro Polymer & Chemicals Limited (EPCL): A subsidiary of Engro Corporation, EPCL supplies EFERT with polypropylene bags for packaging its fertilizer products at all plants.

Engro Eximp Limited: A trading arm of Engro Corporation, Engro Eximp imports fertilizer products like DAP and Muriate of Potash for EFERT to distribute in Pakistan.

The Logistics Division

In response to COVID-19, EFERT established the Engro Logistics Division (Elogistics) to enhance its supply chain network. The division offers comprehensive supply chain solutions, focusing on efficiency and innovation. Elogistics operates one of the largest fleets in the country, consisting of 194 trucks, including flatbed, containerized, and refrigerated vehicles. The fleet covers over 20 million kilometers, moves 511,000 tons of cargo, and generates PKR2.7 billion in revenue annually.

Elogistics has also demonstrated a strong commitment to safety, achieving Total Recordable Incident Rates well below industry averages. The division received the Transport Safety and RoSPA 2021 awards at the 7th International Health, Safety, and Environment Awards. Furthermore, during the year, Elogistics obtained the ISO 9001:2015 certification, the world's most recognized quality management standard.

ESG Transformation

EFERT operates in a complex environment with opportunities and threats. The demand for fertilizers remains stable due to Pakistan's phosphorous—and nitrogen-deficient soil, leading to higher fertilizer use in the country. On the other hand, Pakistan has limited water resources, which makes farming difficult, reduces fertilizer consumption, and affects sales. These environmental factors require careful consideration.

Social and political challenges also impact EFERT's operations and supply chain. For example, social unrest near operating plants could arise from imbalances in the political or social environment. Moreover, Pakistan's low agricultural yields highlight the need for locally organized agri-value chains to enhance productivity and operational capability.

Sustainable Supply Chain Strategies

EFERT is adopting new technologies to develop a sustainable supply chain. The company has implemented ERP and One-SAP procurement systems, providing paperless solutions that strengthen the sourcing and procurement departments. EFERT has also recognized its supply

chain division into functional-based units, such as mechanical, electrical, chemicals, and packaging, replacing the previous structure that separated foreign and local procurement.

Besides, EFERT's supply chain is integrated with the centralized Engro Group network, fostering strategic procurement, synergy, and alignment with the UN-SDGs across its supply chain network (EFERT, 2021).

Furthermore, EFERT has implemented sustainable supply chain measures that prioritize eco-friendly operations, reduce waste, and maximize resource use. Engro Fertilizer works with suppliers with the same environmental objectives to create a sustainable and ethical supply chain. The company's sustainability efforts focus on economic, environmental, and social pillars.

Economic Sustainability: In 2021, EFERT generated PKR132 billion in revenue, added PKR17 billion in economic value, and added PKR15 billion in operating cashflows. The company generated PKR48 billion in wealth, paid PKR5.8 billion in salaries and PKR20.6 billion in dividends, and contributed PKR16 billion to the national exchequer. EFERT also played a vital role in national food security, supplying 36% of Pakistan's fertilizer needs in the year (EFERT, 2022).

Environmental Sustainability: EFERT is committed to energy and material consumption and conservation innovations. It is also concerned about responsible energy consumption with an increased focus on renewable energy. In 2021, the company introduced an innovative cooling water system that enables the reuse of 615 million tons of water annually (EFERT, 2022).

Social Sustainability: EFERT focuses on customer satisfaction and promotes gender inclusion at all levels, including its board. In 2021, EFERT spent PKR432 million on corporate social responsibility and community-related activities. It received third place in the Institute of Chartered Accountants of Pakistan reporting award for ethical and formal reporting in the fertilizer industry. Furthermore, EFERT employee engagement stands at 91%, the highest in the industry. The company also works on smallholder farmer development and market linkages to strengthen the local agricultural ecosystem (EFERT, 2022).

Supply Chain Collaboration

EFERT engages in both vertical and horizontal collaborations within its supply chain. Horizontal collaboration involves working with multiple suppliers, distributors, and other stakeholders to share risks, improve efficiency, and reduce supply chain variances. Vertical partnerships focus on building close relationships with specific suppliers across different procurement levels, ensuring a stable and reliable supply chain.

Challenges in COVID-19

The COVID-19 pandemic significantly affected EFERT's business operations, impacting employees' and stakeholders' physical and mental well-being. The disruption also halted supplier and customer activities, affecting overall business performance. The company proactively implemented health care and support mechanisms, including online and social media platforms, on-site quarantine facilities, specialized medical help desks, and counseling services. EFERT quickly introduced COVID-19 SOPs and protocols to maintain seamless supplier and customer interactions. Additionally, the company took steps to prevent the virus from spreading to nearby towns.

The lack of technical breakthroughs to enable remote operations posed challenges during the pandemic. However, EFERT equipped stakeholders with tools to enable remote connectivity and transitioned to paperless processes to facilitate speedy and transparent transactions while contributing positively to the environment.

The company anticipates challenges from political dynamics, inflationary pressures, and currency fluctuations. EFERT remains actively engaged with the industry and the Government of Pakistan to address these issues collaboratively, aiming to maintain uninterrupted urea production and ensure the nation’s long-term food security (EFERT, 2022).

EFERT’s Business performance

The business performance of the EFERT is assessed through key metrics, including the production of urea and NPK fertilizers, sales, gross profit, distribution and marketing expenses, and the value of property, plant, and equipment (in million PKR). The data in Table 5 indicates that the production of both urea and NPK increased over time. EFERT’s sales grew significantly from PKR69,537 million in 2016 to PKR132,363 million in 2021. A corresponding rise in gross profit was also observed, increasing from PKR6,705 million in 2016 to PKR44,074 million in 2021.

TABLE 5
EFERT BUSINESS PERFORMANCE (2016–21).

Year	Production (Units in MT)		Sale (PKR Million)	Gross Profit (PKR Million)	Distribution and Marketing Expenses (PKR Million)	Property, Plant, and Equipment (PKR Million)
	Urea	NPK				
2016	1881016	94610	69537	17,439	6,705	70,168
2017	1806977	109059	77129	23,219	7,245	68,923
2018	1928080	132790	109197	35,316	8,008	68,203
2019	2003035	134784	121355	39,540	8,736	65,940
2020	2263806	127082	105846	34,255	8,457	65,734
2021	2104722	144564	132363	44,074	8,530	73,031

Source: Annual Report 2022, Engro Fertilizer Limited.

Figure 13 illustrates the production of urea and NPK during 2016–22. The blue line represents urea production in Million Tons (MT), demonstrating significant growth over the years. In 2016, urea production was around 1,881,016 MT, decreasing slightly to 1,806,977 MT in 2017. It rebounded to 1,928,080 MT in 2018 and surpassed 200,000 MT in 2019. The company’s urea production peaked at 2,263,806 MT in 2020, slightly declining to 2,104,722 MT in 2021.

The orange line in the figure represents NPK production in MT. It shows that the NPK production was 94,610 MT in 2016, increasing steadily to 144,564 MT in 2021. Figure 13 also reflects consistent growth in EFERT’s fertilizer output over time.

Figure 14 presents EFERT’s sales and gross profit over time. It shows that sales and gross profit declined in 2020 due to the COVID-19 pandemic but recovered in 2021, reflecting improved business performance.

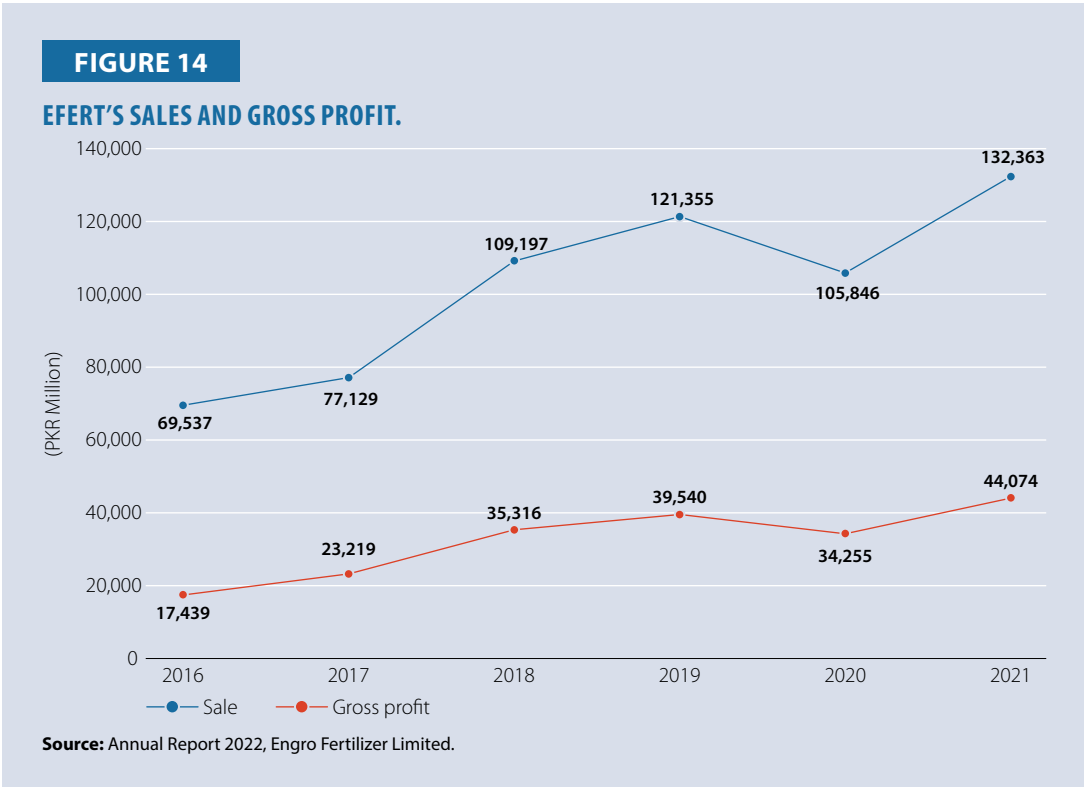
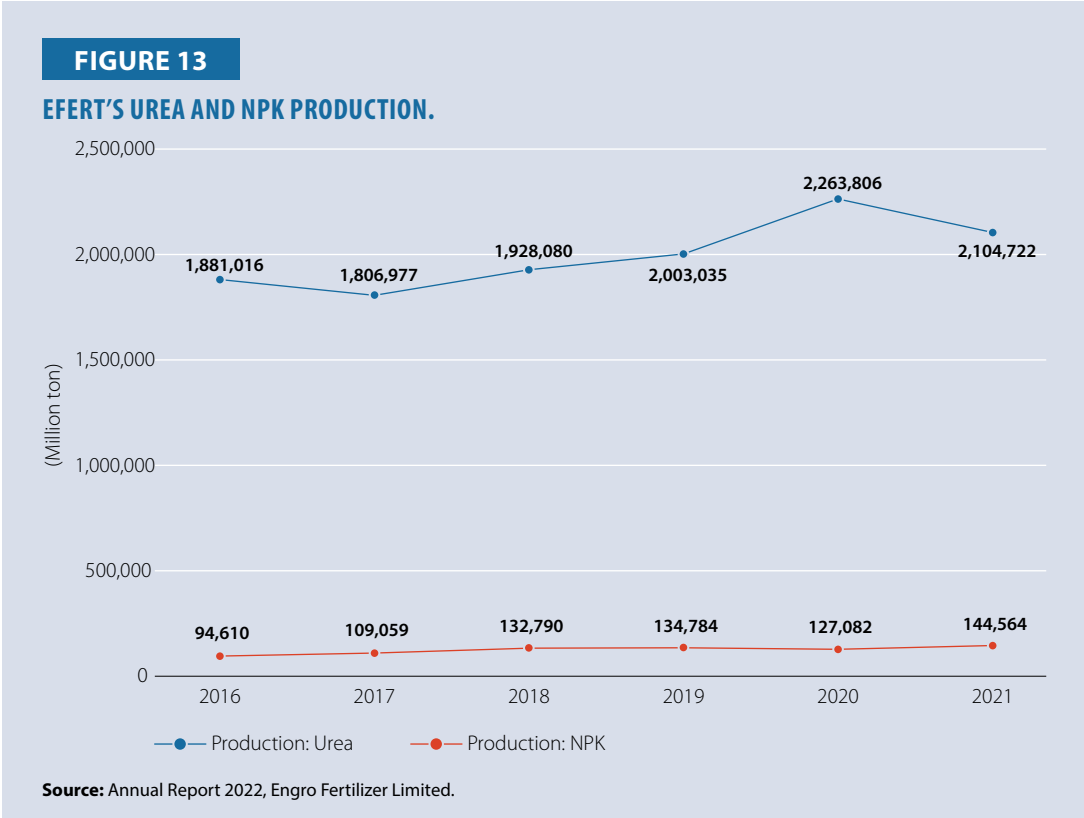


Figure 15 depicts the EFERT's distribution and marketing expenses during 2016–21. The curved line shows that expenses declined during the COVID-19 pandemic, with an increase in 2021 as operations resumed.

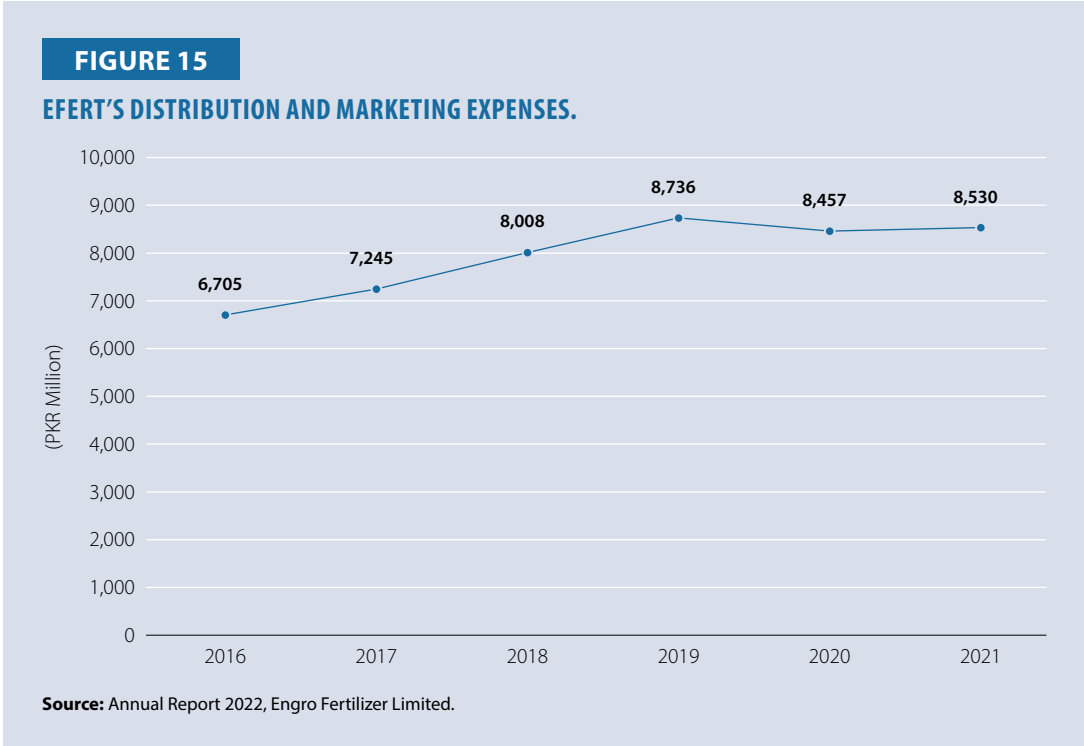
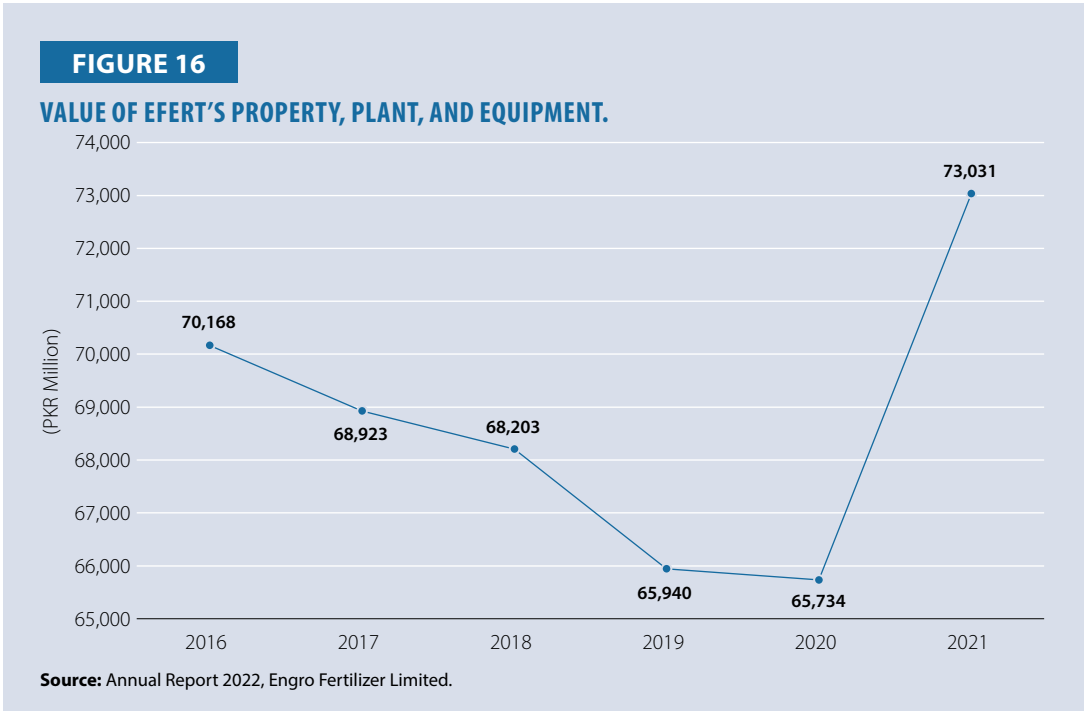


Figure 16 shows the value of EFERT’s property, plant, and equipment during 2015–22. It indicates a decline in assets during 2019 and 2020, followed by a rebound in 2021, reflecting improved investments and asset management.



EFERT's Financial Performance

The financial performance of the EFERT is evaluated using various financial ratios, as presented in Table 6. These include Return on Equity (ROE) based on profit after and before tax, Return on

Capital Employed (ROCE), Gross Profit Ratio (including subsidy), Net Profit to Sales Ratio (including subsidy), and Return on Assets (ROA). The table indicates that all these ratios exhibit a growth trend over time, reflecting an improvement in EFERT's financial performance.

TABLE 6
EFERT'S FINANCIAL RATIOS.

Year	ROE (PAT, in %)	ROE (PBT, in %)	ROCE (in %)	Gross Profit Ratio (including subsidy, in %)	Gross Profit Ratio (including subsidy, in %)	Net Profit to Sales (including subsidy, in %)	Net Profit to Sales Ratio (including subsidy)	ROA (in %)
2016	22.1	32.5	12	25.1	32.7	13.4	12	8.9
2017	26.5	39.6	14.9	30.1	34.3	14.5	13.6	10.4
2018	39.6	55.2	23.3	32.3	33.1	15.9	15.8	15.2
2019	38	61.7	22.4	32.6	32.6	13.9	13.9	13.8
2020	40.29	47.3	25.1	32.4	32.4	17.1	17.1	14
2021	44.97	63.7	31.3	33.3	33.3	15.9	15.9	15.9

Source: Annual Report 2022, Engro Fertilizer Limited.

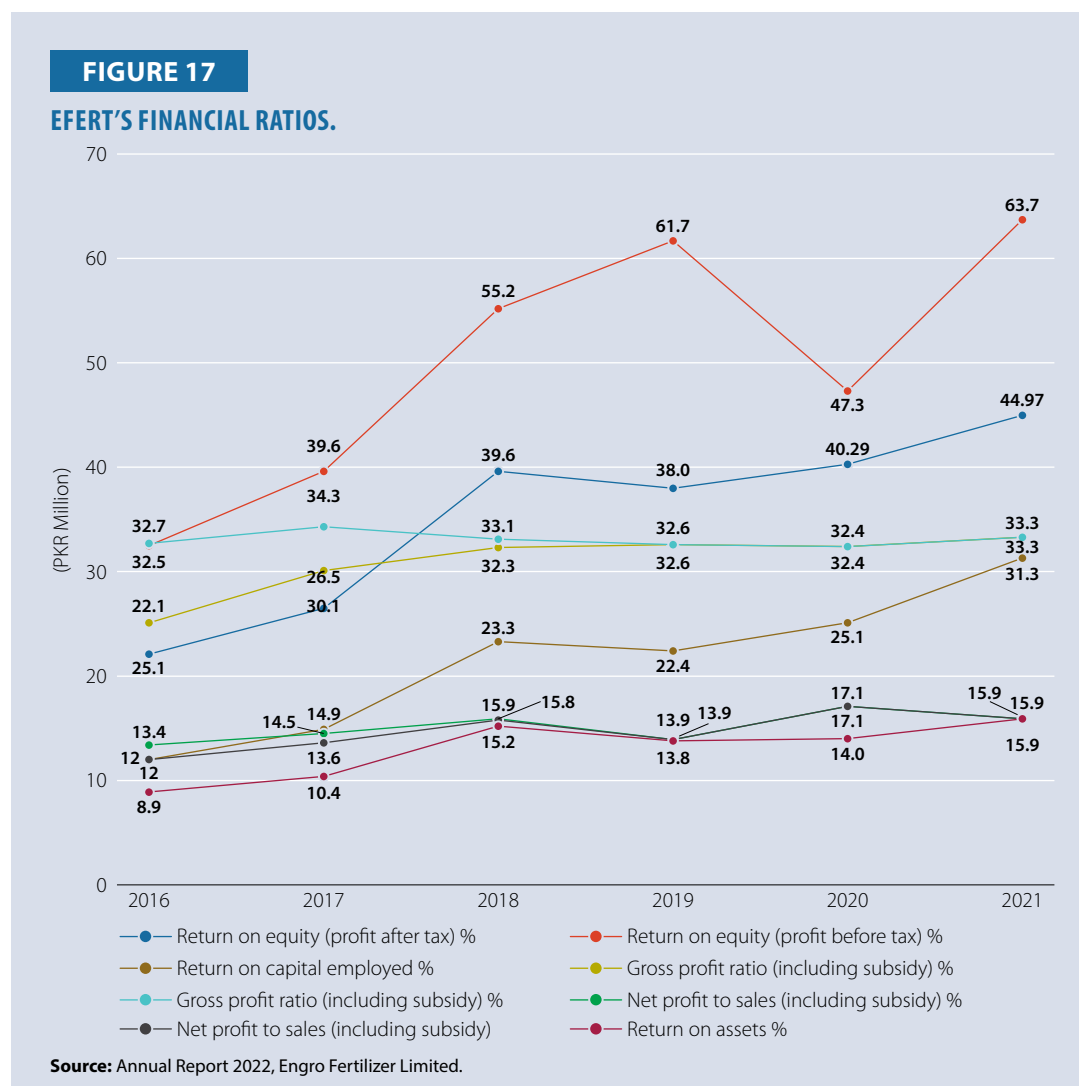
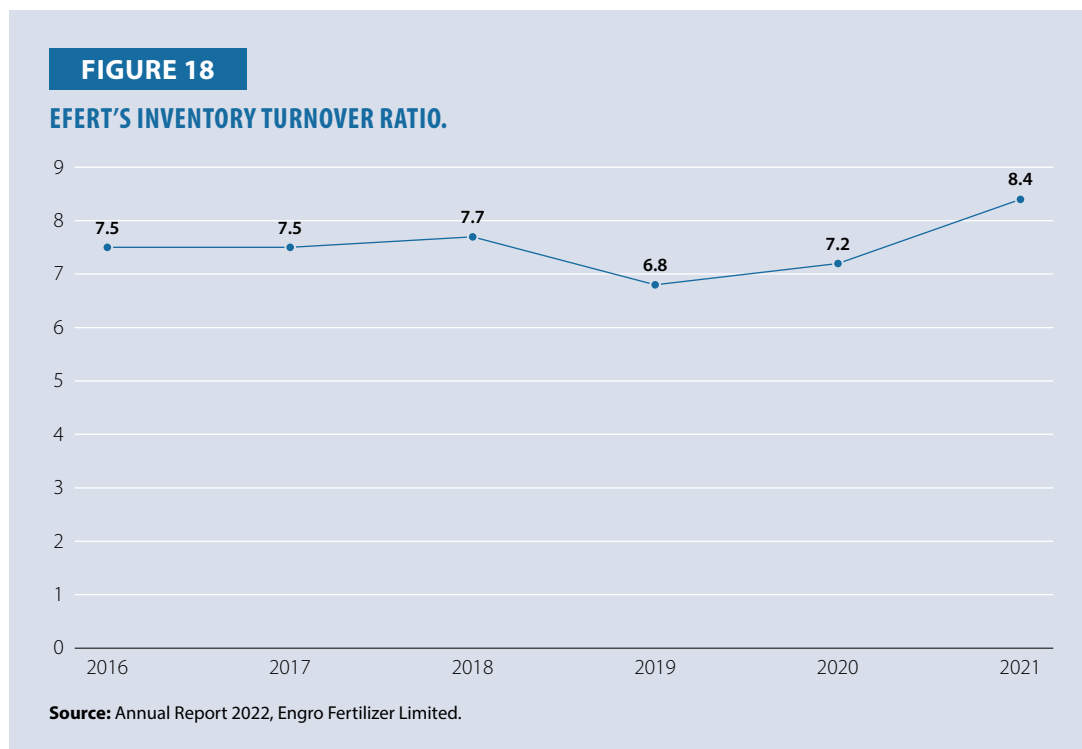


Figure 17 shows different financial ratios for EFERT during 2016–21. The data shows that the company’s ROE-PBT declined during the COVID-19 pandemic in 2020 but improved in 2021, reflecting a recovery in financial performance.

EFERT’s Inventory Turnover

Inventory turnover is a financial ratio used to evaluate how effectively a business manages its inventory. It indicates how frequently a company sells and replaces its inventory based on the cost of goods sold over a specific time frame. Figure 18 presents the inventory turnover data of EFERT, showing that during the COVID-19 pandemic, the company’s inventory turnover decreased. This decline is likely due to reduced production during the pandemic. However, the inventory turnover improved in 2021.



EFERT Employee Productivity

Figure 19 illustrates employee productivity at EFERT during 2016–21. The data shows that its employee productivity in 2016 was 1,669 kilotons (KT), which declined to 1,595 KT in 2017. However, it steadily increased, reaching 1,755 KT in 2020. In 2021, productivity dropped to 1,638 KT.

The data suggests that employee productivity at EFERT peaked in 2020, which coincided with the COVID-19 pandemic. This increase in productivity can be attributed to the reduced number of employees working at the plant during the pandemic.

Employee productivity can also be evaluated by analyzing net revenue and net income per employee. Figure 20 illustrates both productivity statistics. The data shows that EFERT’s revenue per employee increased during 2016–19, reaching PKR96,313 in 2019. However, in 2020, during the COVID-19 pandemic, the revenue per employee decreased to PKR77,714. It rebounded in 2021, rising to PKR95,777.

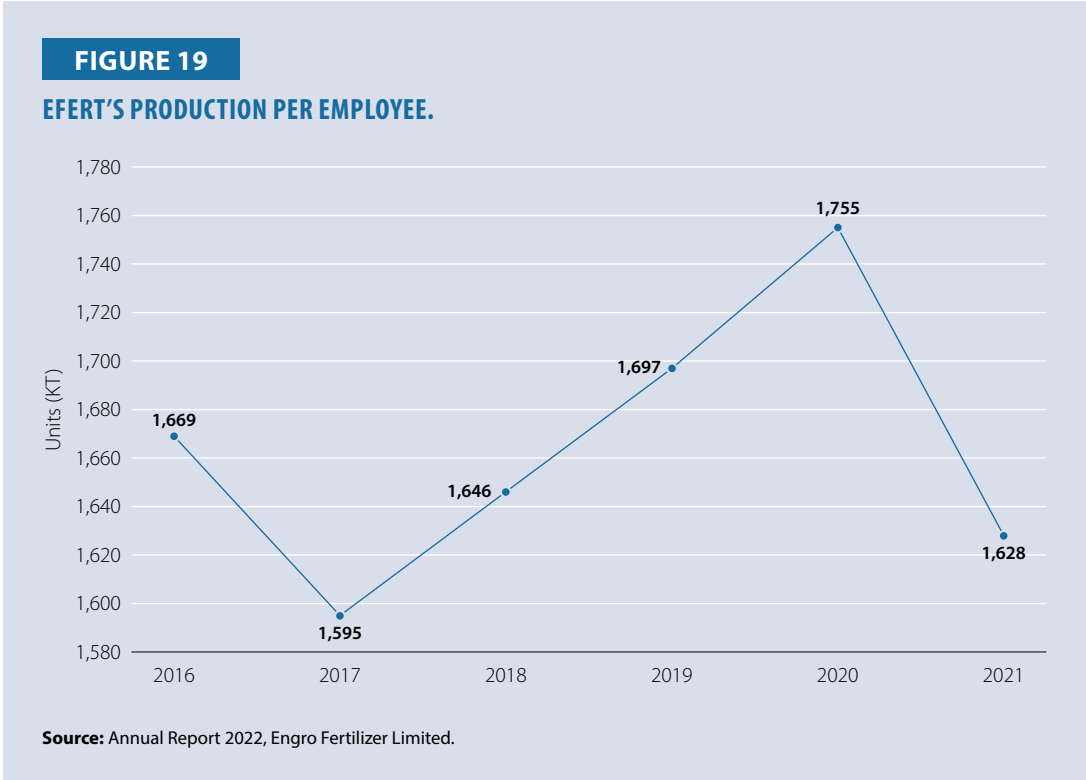
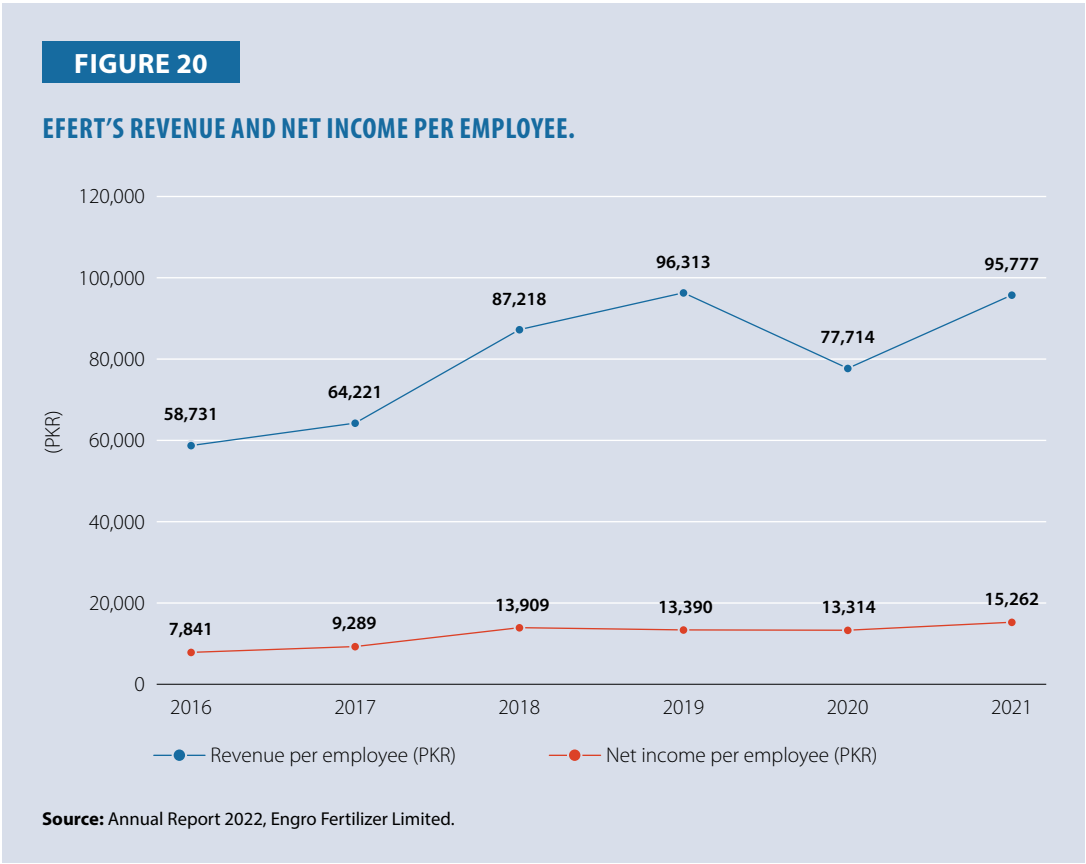


Figure 20 also illustrates net income per employee, which increased steadily during 2016–19, reaching PKR13,390. In 2021, it further improved, achieving the highest value of PKR15,265.



Global Supply Chain System Structure and EFERT

Engro Fertilizers prioritizes operational excellence throughout its supply chain. To expand further, the firm needs a sustainable structure that provides a steady and constant flow of inputs. Strategic partnerships with suppliers facilitate easy access to raw materials or capital inputs.

A critical aspect of EFERT's back-end operations is procuring industrial machinery and raw materials, which the company's manufacturing and commercial department manages according to authorized planning and budgeting criteria. Two key suppliers, SNGPL and Mari Petroleum Company Limited, provide the company with an uninterrupted gas supply, which is essential for production.

EFERT's supplier structure operates on a credit-based model, with Pakistan Credit Rating Agency ratings affirming the company's excellent creditworthiness. In 2021, the company maintained a long-term credit rating of AA and a short-term credit rating of A1+, reflecting its financial stability.

To evaluate the global supply chain in EFERT, the company should consider a model proposed by Professor Min-Ren Yan, a popular system frequently cited in the literature. The model assesses the supply chain horizontally and vertically, evaluating risk, cost, and shipping time across different supply lines. According to this model, the company should evaluate its suppliers at both levels.

EFERT currently relies on two primary gas suppliers at the horizontal level and is working to integrate its supply chain operations at the vertical level. However, the company should explore additional gas suppliers and evaluate its existing suppliers based on multiple factors, including cost-effectiveness and risk assessments at different procurement stages.

Findings

EFERT has established itself as a leader in Pakistan's fertilizer industry through its proactive approach to global supply chain challenges, digital transformation, and sustainability. Organizations nowadays operate in an uncertain and dynamic environment and need to create robust GSC networks. To achieve this, they should opt for facility dispersion, facility reinforcement, semi-manufactured product manufacturing, multiple sourcing, inventory management, primary and alternative bill of material (Hasani et al., 2016), and varied supply chains (Lin et al., 2021). EFERT should adopt these strategies to enhance its global supply chain for better resilience and long-term operational efficiency.

Conclusion

The most essential characteristic of market instability is pandemics. Although COVID-19 has emphasized the importance of supply chain management, supply chain maintenance strategies have continued to evolve. Supply chains must adjust their strategic direction in response to changes in the social environment, technology, and corporate structures, including many networks, to maximize long-term economic and social advantages. Key factors enabling companies to thrive before and after a crisis like COVID-19 include sustainability, resilience, JIT order fulfillment, stability, data analytics, collaboration, convergence, demand forecasting, and real-time intelligence (Hayat et al., 2021).

Research conducted by the ILO examined the supply chain strategies of global buyers, focusing on sourcing, purchasing procedures, and labor conditions. The ILO found that these strategies have exposed the fundamental causes of labor violations at supplier facilities and highlighted the disparity in working conditions between regular and temporary workers. Since the crisis, the

likelihood of fragmented social upgrading and the use of informal labor in GSCs has increased. However, whether South-South trade will offer a viable alternative path for social upgrading remains to be determined.

Global buyers have adopted private voluntary rules and regulations to address gaps in labor governance within the fragmented cross-national manufacturing sector. While these norms represent progress, recent research emphasizes global purchasers' private governance constraints and the conflict between buyers' governance efforts and purchasing practices (Lee, 2016). Therefore, Businesses in Pakistan must comply with international labor laws to establish themselves as reliable partners in the global supply chain.

Moreover, any country can enhance its GSC performance by employing effective supply chain planning tools, developing a global supply chain strategy, leveraging e-business applications and IT capabilities, achieving both intra- and inter-organizational integration and applying TQM principles across the supply chain (Balan et al., 2006). Forecasting uncertainty, including catastrophic events and economic downturns, is essential for mitigating risks (Alvarado-Vargas et al., 2019). These strategies can help international managers achieve competitive advantages, including reduced operating costs for GSCs and differentiation through processes and supplier-purchaser relationships.

Compared to global supply networks, regional supply chains offer greater stability, reliability, and lower risk of disruption, even under varying levels of uncertainty. In GSCs, upstream suppliers are particularly vulnerable during unpredictable periods. As more businesses enter emerging markets, they must determine strategic actions to safeguard their supply chains and assess the probability of future disruptions (Alvarado-Vargas et al., 2019).

Companies should focus on local and regional supply chains, as these networks offer more advantages than global suppliers. Therefore, companies should actively pursue the localization of their supply chain networks.

Policy Implications

This report provides insights for organizations as well as for country-level policymakers.

At the organizational level, policymakers must recognize that sustainability is among the most critical GSC challenges. Pakistani organizations should adopt sustainable GSC practices. Decision-makers should consider factors such as supply chain risk management, supplier evaluation, supply chain reallocation, and the social, economic, and environmental impacts on supply chains and buyer-supplier relationships (Hayat et al., 2021). Furthermore, organizations should prioritize local and regional supply chain networks, as these can be more fruitful than GSCs.

At the country level, the Government of Pakistan should develop policies to enhance economic cooperation with neighboring countries, including Afghanistan, Iran, India, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, and Uzbekistan. Strengthening regional cooperation will contribute to building robust GSC for Pakistani organizations.

Additionally, governments should address the risks associated with GSCs by enacting policies promoting supply chain diversification and relocation strategies. This includes developing laws to support and facilitate these efforts.

Recommendations

To enhance its global supply chain, Pakistan should implement the following measures.

Develop Economic Corridors: Pakistan's strategic location provides an opportunity to develop economic ties with neighboring countries. While Pakistan is actively working on the CPEC project, it should also establish economic cooperation with other countries in the region. Potential corridors include the Pakistan-Iran-Turkey Economic Corridor, China-Pakistan-Iran Economic Corridor (W-CPEC+ or CPEC's westward expansion), Pak-Afghanistan Economic Corridor, Uzbekistan-Pakistan Economic Corridor, Pakistan-India Economic Corridor, and Russia-Pakistan Economic Corridor. Developing these trade routes will help strengthen Pakistan's global supply chain and foster economic growth across industries.

Improve Logistic Performance: Pakistan must improve its logistics performance, as its LPI score is among the lowest in the region. Enhancing the country's logistics capabilities requires improvements in logistics competencies, infrastructure, international shipments, tracking and tracing, and timeliness of shipments.

Strengthen Institutional Mechanism: Although Pakistan has numerous institutions to support trade, many institutions create barriers to international trade. To facilitate international trade, the number of channels should be streamlined to reduce complexities and enhance efficiency. Simplifying institutional structures will enable smoother international trade and contribute to the development of robust GSCs.

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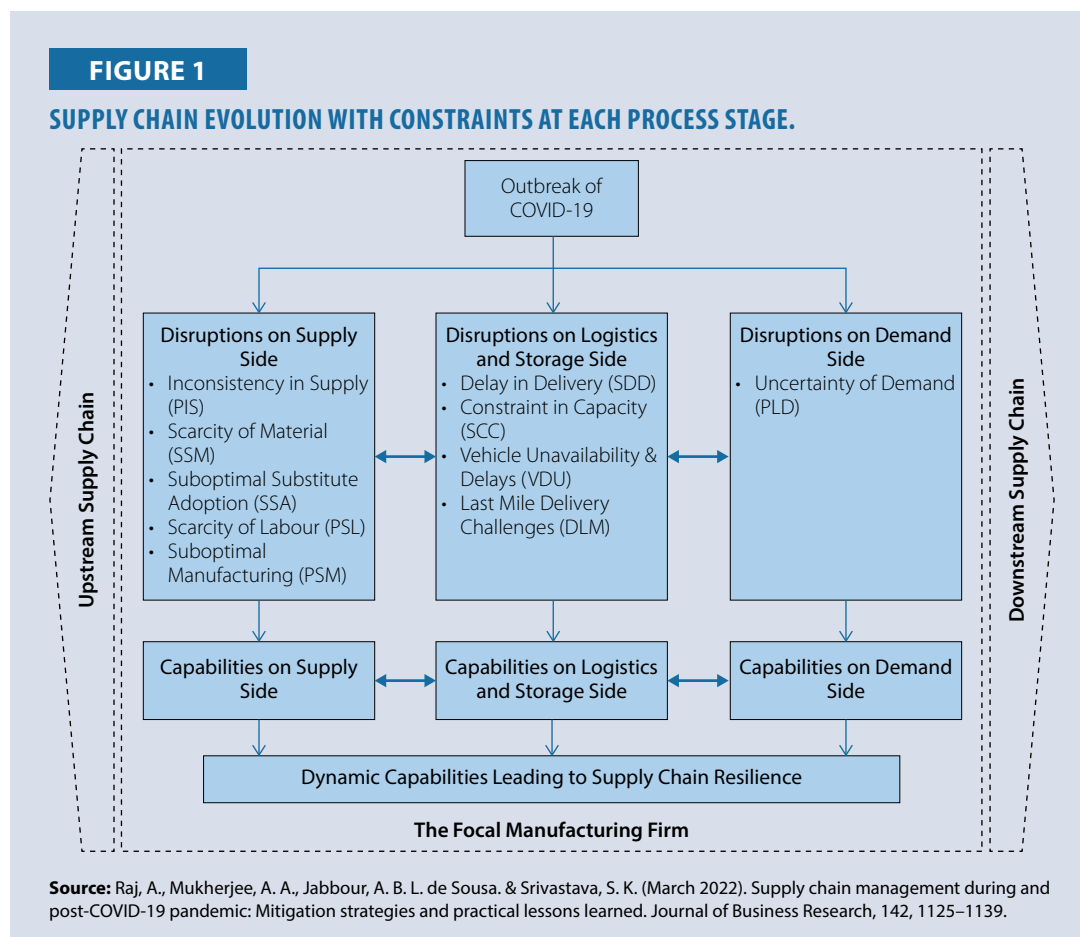
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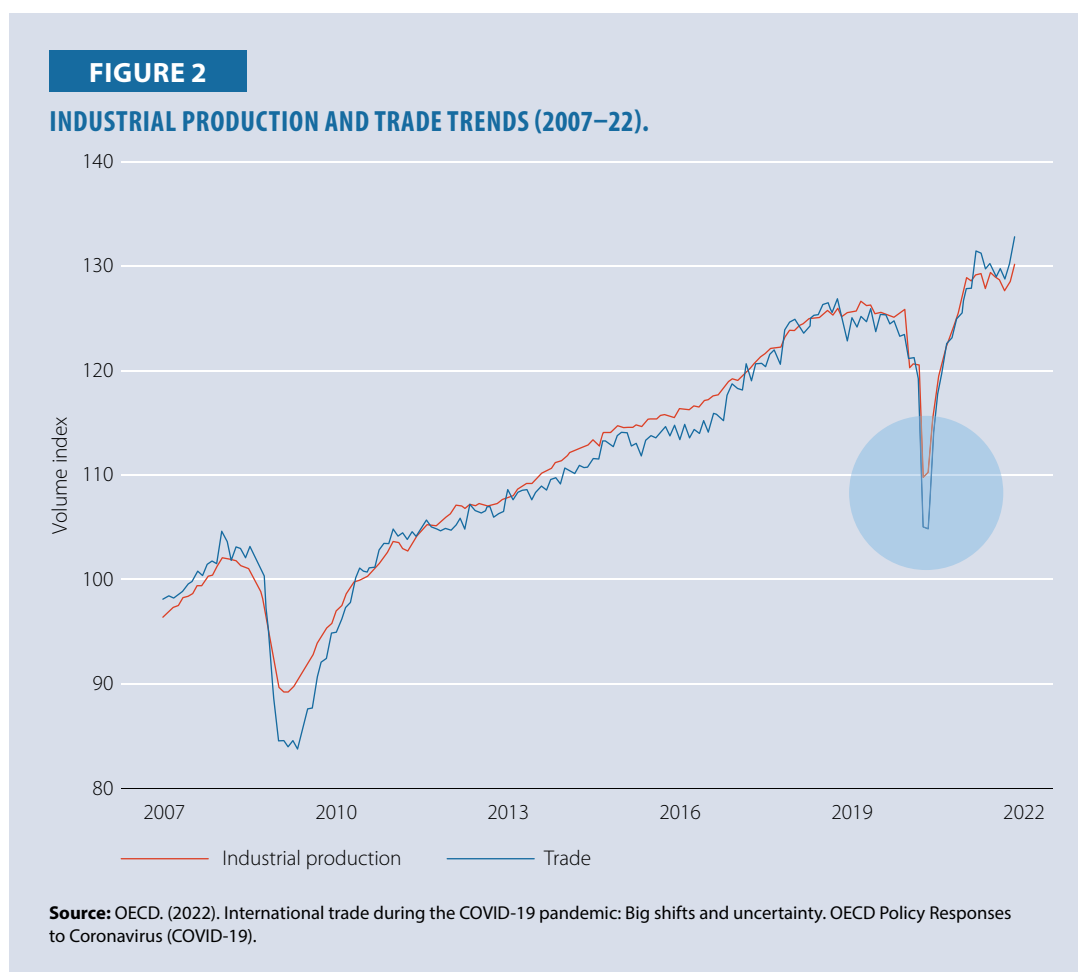
Introduction

GSC Diversification and Relocation Strategies

The supply chain industry is a testament to adaptability, constantly evolving to meet new challenges. New trends and technologies emerge to improve efficiency, effectiveness, and resilience. For organizations to remain competitive, staying updated on these developments is crucial. GSCs vary in size, shape, and configuration, evolving in how they are coordinated, controlled, and managed. While some supply chains remain mature and relatively stable, others undergo significant changes. The advent of the COVID-19 pandemic accelerated the need for all supply chains to adapt, ensuring their operational viability amid disruptions in supply, logistics, and storage and fluctuations in demand. These challenges forced supply chains to evolve their capabilities, leading to dynamic solutions focused on supply chain resilience, as illustrated in Figure 1 (Raj et al., 2022).



As seen in Figure 2, industrial production and trade volumes followed a similar trajectory, with a sharp decline during the COVID-19 pandemic. However, industrial production posted a quicker recovery due to the coping mechanisms implemented by GSCs. The scenario highlights the importance of diversification and relocation strategies, which have become crucial for companies



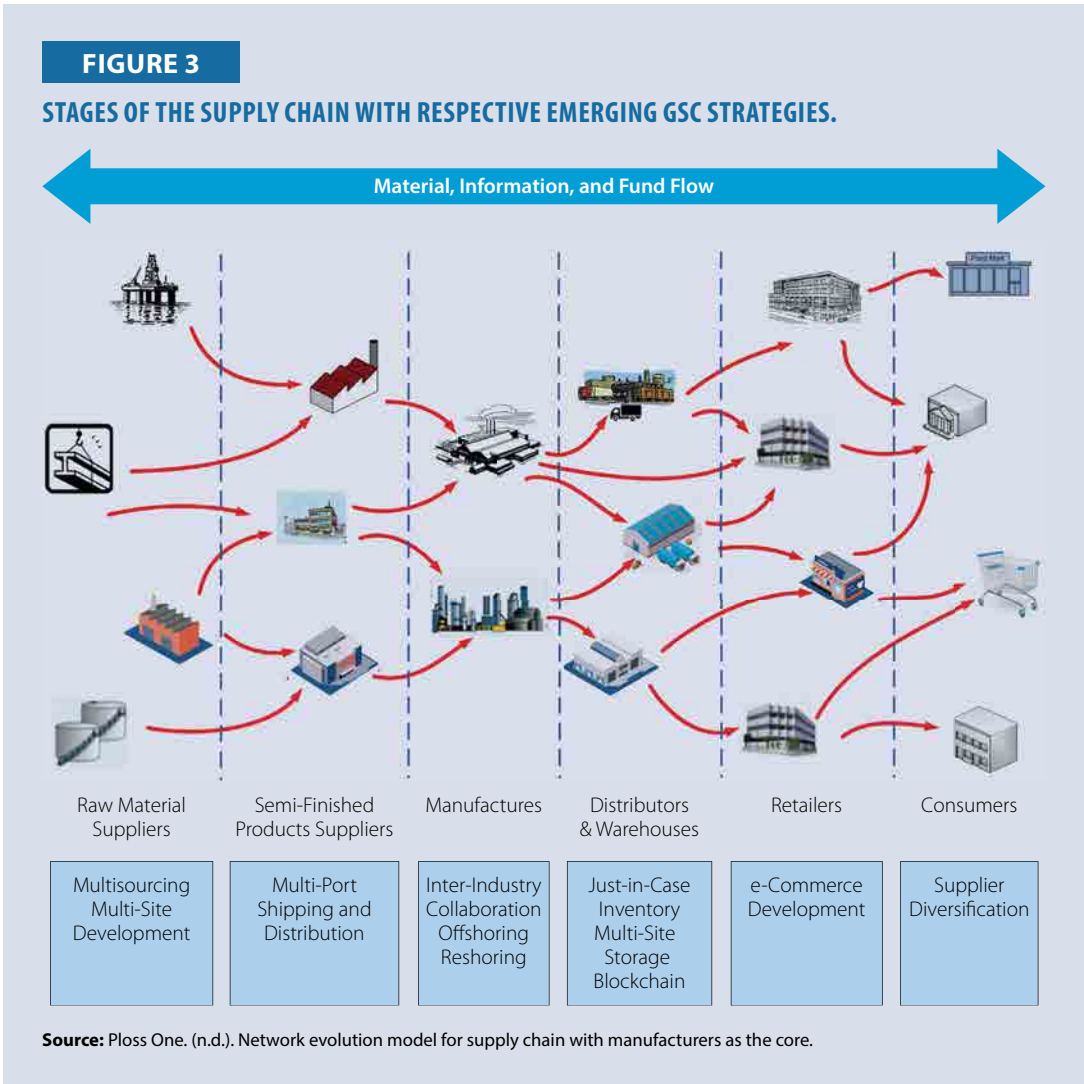
looking to optimize their supply chain operations, reduce risks, and ensure fiscal stability after the stagnation caused by the pandemic and the ensuing re-opening.

These strategies, designed to enhance operational resilience, reduce costs, and improve overall supply chain efficiency, are a beacon of hope for the industry. They focus on distributing supply chain activities across different geographic locations and suppliers, creating partnerships never perceived as possible. By doing so, companies can enhance operational resilience, reduce costs, and improve overall supply chain efficiency. These emerging strategies are grouped by whether they expand sourcing to new markets, find the best and most resilient supply chain infrastructure, or reassess current practices to best cope with the emerging challenges.

Build Redundancy and Diversity into the Supply Chain

Multi-Sourcing: As illustrated in Figure 3, this strategy involves sourcing components, services, or products from multiple suppliers across different regions or countries. It reduces the risk associated with a single point of failure and acts as a business continuity program to ensure operational resilience. It establishes ‘preferred’ supplier relationships but also opens up both competition and supply contingencies, like the practice of Supplier A + 1, where the buyer maintains a minimum of two suppliers for the same product or service.

Multi-Site Development: This involves setting up multiple manufacturing facilities in different regions inside and outside the country. As explained in Figure 3, this strategy effectively reduces



production disruptions due to natural disasters, labor strikes, and geopolitical issues while ensuring price competitiveness per region.

Multi-Point Distribution: This practice involves establishing distribution centers in various locations to serve diverse markets better, reduce shipping costs, and minimize lead times (see Figure 3). It also explores the concept of synergistic or shared operations, where industry players establish common storage spaces to store items from both companies. This arrangement allows one distribution center to serve both companies, especially when one company does not have a local presence. In the commodities industry, this practice is known as swaps, where one player swaps their position with another player with a local presence instead of physically bringing items into the area. This saves a lot of logistics costs, supports sustainable practices, and reduces human intervention.

Relocation Strategies

Nearshoring (Figure 3): This strategy involves relocating manufacturing and sourcing activities closer to the target market. By doing so, companies can reduce lead times and supply chain costs and eliminate the need for compliance localization, which may arise when dealing with foreign entities. Nearshoring fosters strong local relationships, leading to smoother operations and fewer regulatory pushbacks.

Reshoring (Figure 3): It refers to bringing back supply chain processes to the home country after outsourcing them. This move is often driven by rising labor costs in offshore locations, quality control issues, or the need for better oversight of production processes and intellectual property (IP). Reshoring has proven beneficial for companies facing challenges like long supply chain routes or port congestion but may require significant capital expenditure in ‘right matching’ the requirements of the local facilities.

During the pandemic, reshoring became necessary for the industry since supply chains in major manufacturing and production hubs in Asia were disrupted, leaving American and European markets short of essential commodities. In some cases, governments also compelled companies to produce essential goods domestically to meet the shortfall of traded goods from other countries. This includes the US invocation of the Defense Production Act to ensure a steady supply of essential goods in the country during the pandemic (Lawson & Rhee, 2020).

Offshoring (Figure 3): Companies often establish manufacturing or sourcing operations in other countries to lower costs. While offshoring strategy can lead to cost savings, it may also introduce risks such as supply chain disruptions due to long distances and potential issues like IP infringement and operational stoppages due to subpar labor and working conditions. A variation of this strategy involves expanding supply chain operations while maintaining a sizeable operation in the home country.

Application of Risk Mitigation Measures

Supply and Supplier Diversification (Figure 3): Companies establish multiple suppliers and service providers across different geographic regions to mitigate supply chain risks. This approach requires standardizing requirements and service levels to ensure consistent quality assurance (QA). Additionally, companies may task their R&D teams with identifying alternative raw materials for production, reducing the dependency on a single source and mitigating risks from disruptions such as natural disasters, economic crises, or political instability.

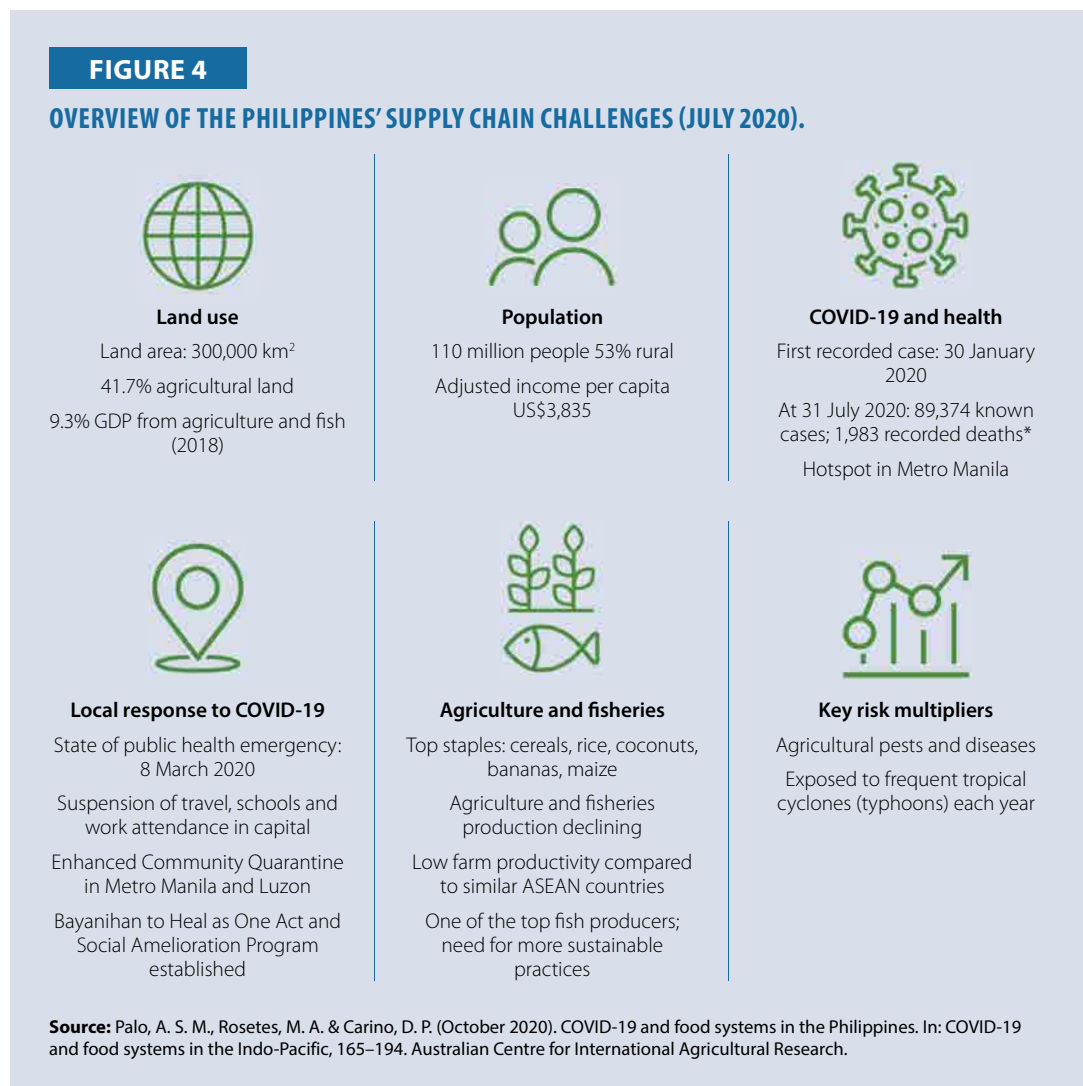
Improved Inventory Management (Figure 3): Inventory management became a significant challenge during the pandemic due to supply chain disruptions. Companies with lean inventories struggled to meet demand as supply chain lead times increased and port congestion worsened. However, the disruption was not limited to companies with lean supply chains. The pandemic affected all product movement, exacerbated by a lack of adequate workforce to run inbound and outbound operations. Besides, companies were forced to increase stock levels and incur additional holding costs to address these concerns and cope with the rising demand.

The pandemic also accelerated the adoption of supply chain technologies to enhance supply transparency and movement. Technologies such as AI and ML significantly improved supply planning and forecasting by analyzing comprehensive data from across the supply chain. Additionally, Blockchain technology has contributed significantly to making supply chain information more transparent to all stakeholders, identifying pain points, and enabling necessary adjustments or activation of BCPs.

By leveraging these tools, companies can create large-scale simulations of GSCs, allowing them to anticipate and respond to various shocks. They can then use machine learning techniques to detect problem areas across the supply chain. This knowledge can then be used in market designs that strengthen the system, helping prevent future disruptions from pandemics or other disasters (Minca, 2022).

Overview of the Government Approach

As in many other countries, supply chains are crucial for the Philippines’ economy. The Philippines, an archipelago with over 7,000 islands, faces unique challenges in supply chain management due to geographical, political, infrastructural, and human resources constraints. The country is a net importer, relying heavily on external sources for raw materials to sustain its industrial production sector. As a primary consumer of imported raw materials, the pandemic caused a significant slowdown in this sector, with supply chains grinding to a halt in both source and destination countries.



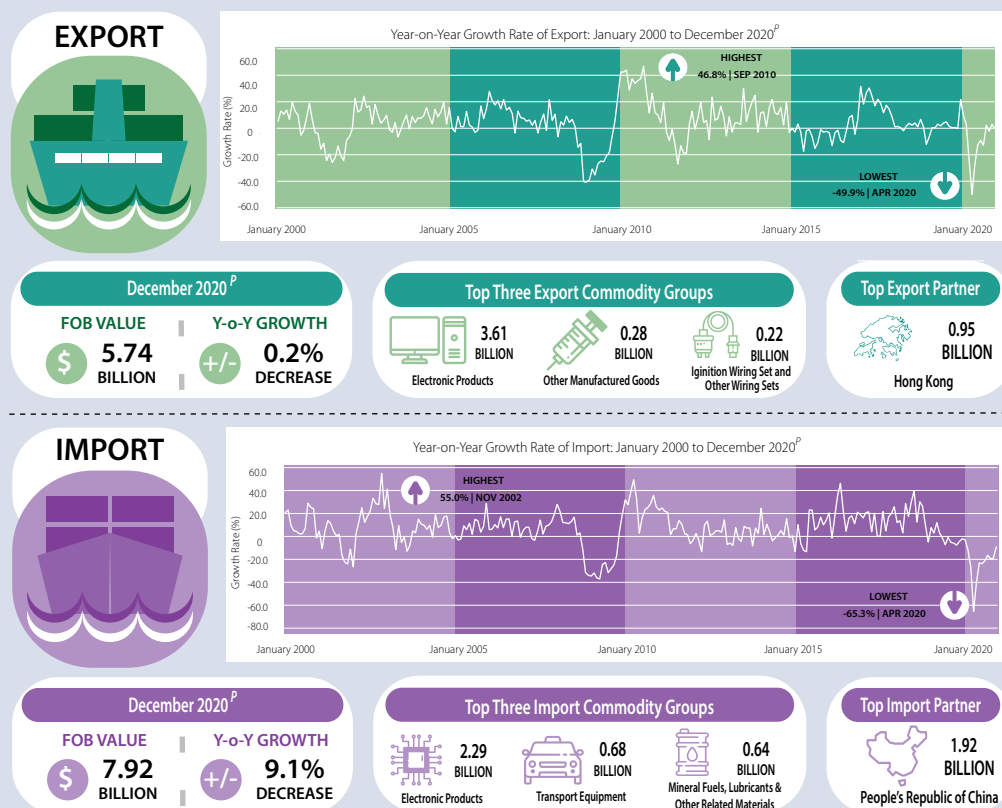
In reviewing the evolution and implementation of GSC strategies, it is essential to reflect on how the pandemic affected the country’s supply chains, the government’s immediate and long-term responses, and the lessons learned that served as the basis for implementing the emerging GSC strategies to revive and enable the economy to move forward.

The Philippine Government’s COVID-19 Response: Strengthening Supply Chains

The Philippine government’s response to the COVID-19 pandemic was centralized through the Bayanihan to Heal as One Act (RA No. 11469), signed by former President Rodrigo Duterte. The Act empowered the President, along with the Inter Agency Task Force (IATF), to quickly address

FIGURE 5

PHILIPPINE TRADE STATISTICS (2020–22).



Source: Philippine Statistics Authority, Government of the Philippines.

the rapidly growing cases of COVID-19 and the challenges of enforcing community quarantine. The key measures under the Act include the following:

- Implementation and enforcement of community quarantine rules.
- Distribution of subsidies to low-income households via the Social Amelioration Program.
- Permission for Local Government Units (LGUs) to utilize more than 5% of their existing Calamity Funds.
- Ensuring the availability of essential goods.
- Strict regulation of business and consumer practices to prevent hoarding, profiteering, etc.
- Ensuring access to credit.

The immediate consequences of the pandemic were starkly evident. The imposition of community lockdowns and rigid mobility restrictions disrupted the supply chain, revealing transport and Internet connectivity limitations across regions. Problems in the seamless transportation of goods

across regions also became evident during the period. The movements of raw materials and manufactured goods slowed down significantly, experiencing delays in transit, with some shipments getting stuck in ports, airports, and warehouses. Additionally, the imposition of documentary permits across various LGUs further strained the supply chain, exacerbating the challenges faced during the pandemic (Balberian & de Leon, 2020).

New GSC Dynamics and Their Impact on Aggregate and Firm-Level Productivity

While the government's steps helped address the general populace's safety concerns during the pandemic, COVID-19 and its response also created significant bottlenecks in the supply of goods. To illustrate this, let us evaluate the supply and price of the country's staple food, rice, during the onset of the pandemic. Let us also examine the strategies adopted at the national level to alleviate the price and supply shock caused by COVID-19.

Expanding the inquiry to the government's response during the 'market re-opening' stage, when the pandemic was relatively under control, there was a race to re-open the economy and ensure adequate trade volume to sustain the national economy. The Philippine government implemented supply chain-specific strategies focused on the continuity of goods movement and supporting local commercial players. These initiatives were focused on two key areas.

Removing Supply Movement Bottlenecks

The government's initial response to the pandemic was to regulate the citizen's movement while ensuring the continuity of basic working conditions, sidelining the economy. Lockdowns and pre-existing road restrictions and regulations led to the stagnation of trade using traditional supply chains. The following actions helped decongest supply chains, improving the flow of goods and bringing attention to existing national and local regulations that hampered the movement of goods long before the pandemic.

Memorandum Circular No. 20-06: Ensuring Unhampered Movement of Cargo and Transit of Personnel of Business Establishments Allowed to Operate During the Enhanced Community Quarantine of Luzon. Initially enacted to ensure that goods could move and personnel managing the supply chains could operate, this policy's lasting effect led to a comprehensive review of all road policies regulating the transport industry post-pandemic (PCW, n.d.).

National Transport Policy (2017 to present): This policy outlines strategies for achieving a transport system that is safe, reliable, efficient, intermodal, cost-effective, environmentally sustainable, and people-oriented. While primarily focused on passenger movement, it also impacts how supply chains operate nationwide. It includes the following:

- Massive infrastructure development focused on priority industries.
- Promoting intermodal transport by developing truck terminals, inter-island ports, and ports outside Metro Manila.
- Harmonizing road regulations across the country.
- Codification and implementation of national standards for loading units to reduce transport costs.
- Accelerating government transactions.

- Overhauling regulations to separate operations and regulatory arms of transportation-related government offices, focusing on policies that aid transport operations nationwide (Battalones, 2020).

Executive Order (EO) No. 41 (25 September 2023): The order prohibits LGUs from collecting toll fees from vehicles transporting goods or merchandise while passing through national roads and other thoroughfares not constructed or funded by them. President Ferdinand Marcos Jr. emphasized that reducing transport and logistics costs is one of the pillars of the 8-Point Socioeconomic Agenda.

Developing Local Supply and Supporting Local Businesses

During the COVID-19 pandemic, many businesses were forced to close due to the lack of human resources, goods, raw materials, and means of transportation. The MSMEs were hit hard and struggled to restart businesses due to depleted capital, dwindling sales, and their financial support for employees during the crisis. The government sought to stimulate economic recovery by assisting these businesses in restarting operations through financial aid and delaying corporate obligations to banks.

- **Enterprise Rehabilitation Financing Facility (COVID-19 P3-ERF):** Under Pondo sa Pagbabago at Pag-asenso (Fund for Change and Progress), this facility provided capital to assist MSMEs.
- **Small Business Corporation Moratorium on MSME Loans:** This initiative postponed MSME loan payments, easing financial burdens during recovery.
- **Memorandum Circular No. 20-04:** Prescribing the Implementation Guidelines for IATF Resolution No. 12 issued by the Inter-agency Task Force for the Management of Emerging Infectious Diseases on Social Distancing and Business Operation.

The government's 2020 Investment Priorities Plan focused on fostering domestically-driven growth, encouraging domestic innovation, and easing regulations for local firms rather than pursuing supply chain relocation outside its borders. Nevertheless, reforms to improve the ease of doing business in the Philippines were introduced, including the Ease of Doing Business and Efficient Government Service Delivery Act (2019), which enabled a one-stop-shop application process for new businesses. Additional economic reforms, such as amendments to the Foreign Investments Act, the Retail Trade Liberalization Act, and the Public Service Act, aimed to attract foreign investors (Battalones, 2020).

Impact of GSCs on the Philippines

Impacts of Supply Diversification and Relocation

As more companies embrace nearshoring and increase capacity in other countries, the impact on international trade and the geopolitical landscape becomes evident, as explained.

Shorter Distances, Lower TEU/Miles, and Freight Rates

Nearshoring involves moving production closer to home and reducing the transit distance of cargo. This leads to a corresponding decrease in TEU per mile. The shorter distance could also lower freight rates, though this depends on several factors, such as the size and energy efficiency of the vessel, competitive pressures, and vessel utilization levels.

Shift from Deep-Sea to Short-Sea and Intra-Regional Trades

The current manufacturing hubs in Asia are far from major consumption markets in North America and Europe, requiring traversing oceans and seas. Therefore, these trades are dubbed deep-sea trades. Trade between countries closer to each other is generally through smaller water bodies and involves shorter distances; hence, these routes are referred to as short-sea trade. In cases where the origin and destination countries are located in the same geographical region, the routes are called intra-regional trades, such as Intra-Asia or Intra-Europe.

By shifting production (origin) to the same region as primary markets (destination), nearshoring aims to shift trade volumes from deep-sea to short-sea and feeder routes. This increases the importance and demand for short-sea and feeder trades.

Increased Investments Emerging Procurement Hubs

As nearshoring boosts export-oriented production in new locations, stakeholders in the transport process will need to increase their capacity in these emerging manufacturing hubs. This includes new services by shipping companies to cover these locations, investments in vessels of adequate capacity, and equipment suitable for the cargo profile of the trade.

Port operators will also need to invest in augmenting capacity and infrastructure, including dredging (to deepen draught to accommodate bigger vessels carrying heavier cargoes), procuring container handling equipment (cranes and ITVs), and acquiring additional storage space. It will also drive investments in trade-enabling infrastructures, such as CFSs, ICDs, railway lines, and road connectivity. As new sourcing origins witness an upsurge in capital expenditure meant for infrastructure, investments in existing manufacturing hubs will slow down.

Changes in Vessel Fleet Composition

The trend of upsizing vessels was driven by the concentration of production in a few locations, resulting in high cargo volumes from a limited number of ports and countries. With production now dispersed across locations, cargo volumes will spread more evenly across regions. This reduces the need to deploy mega vessels and increases the demand for a higher number of smaller vessels to serve new sourcing origins.

Changes in Cargo and Investment Flows

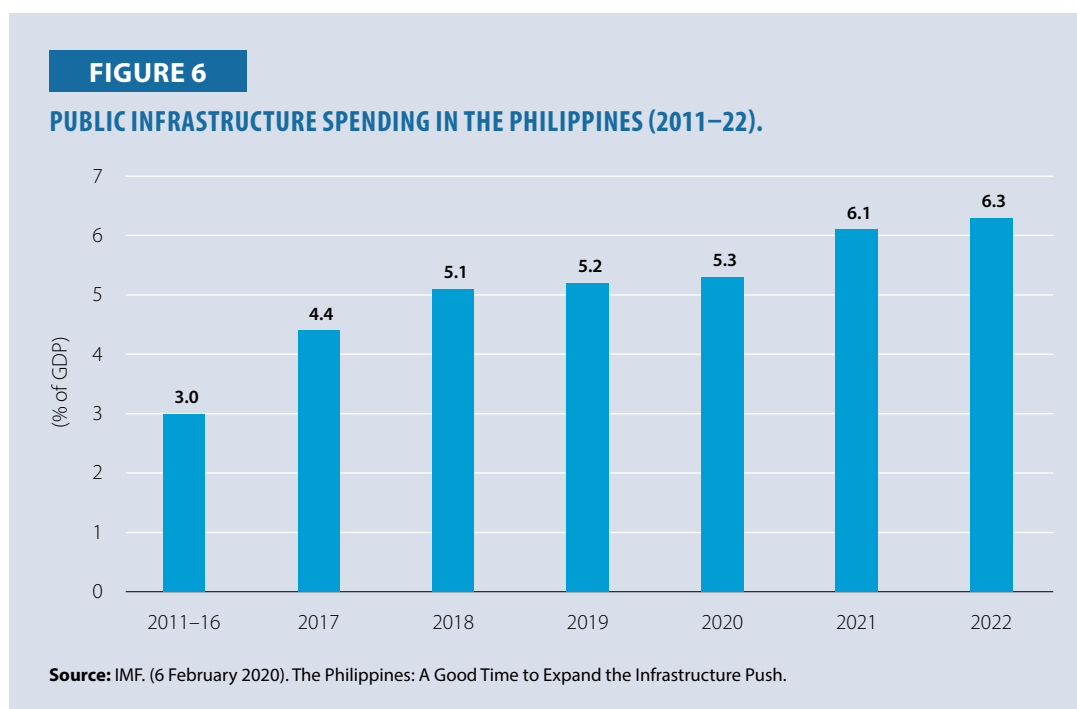
Over the past two decades, Asia has dominated cargo outflows due to offshoring and outsourcing trends. This has often been referred to as the shifting of power Eastwards. With nearshoring, the balance of power will steadily shift towards other developing countries in the Western Hemisphere, leading to changes in cargo flows. Since investment follows cargo flows, there will also be changes in investment flows corresponding to the alteration in cargo flows.

Geo-Political Realignments and Emerging Trade Blocs

Nearshoring will reduce reliance on limited sourcing origins and strengthen trade and political ties with new countries, leading to new trade alliances. Geo-political realignments will occur as economic relations become deep-rooted and countries prioritize investments in geographically closer and politically aligned trade partners (Bhonsle, 2023).

Transport, Storage, and Distribution

The Philippine economy has been among the top performers in Asia in recent years. Yet, the economy faces constraints due to its outdated and insufficient infrastructure. For instance, according to estimates, driving just one kilometer in Metro Manila can take about five minutes.



To address these challenges, the Philippines has significantly increased spending on roads, bridges, airports, seaports, and other large-scale infrastructure projects. As shown in Figure 6, public infrastructure investment rose from an average of 3% of GDP during 2011–16 to over 5% in 2018, with the target to exceed 6% by 2022. The government’s Build Build Build program includes large projects aimed at tackling bottlenecks, with a focus on transportation, water resources, and energy sectors (IMF, 2020).

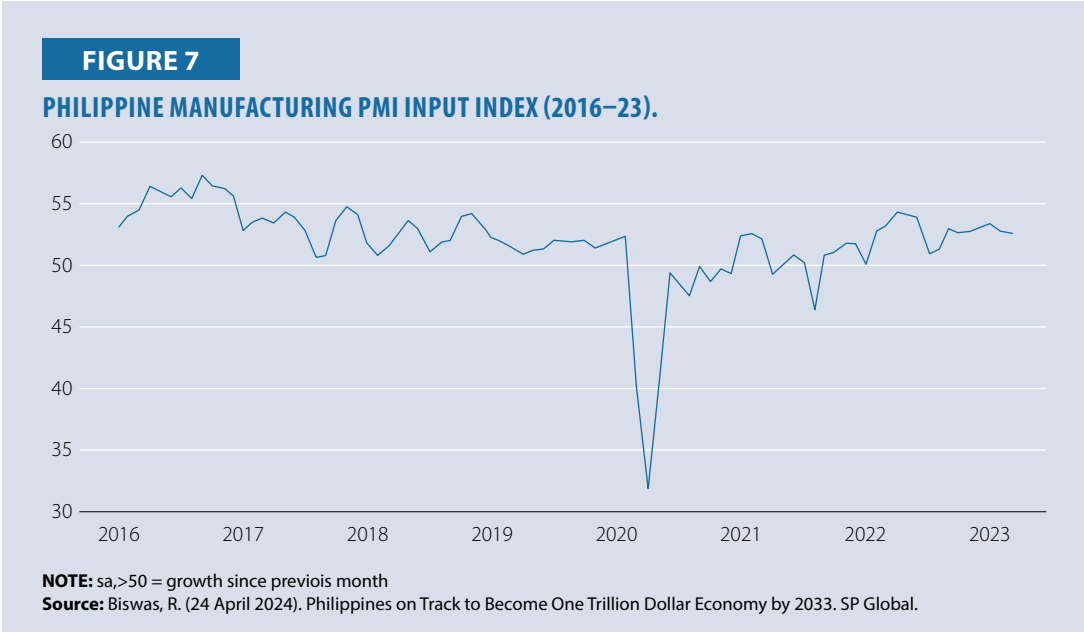
Manufacturing and Inventory Management

The 2021 Annual Survey of Philippine Business and Industry final results showed that 25,279 establishments in the formal sector of the economy were engaged in manufacturing activities. This represents an increase of 14.5%, up from the 22,083 establishments engaged in this section in 2020.

Among industry groups, the sector manufacturing other food products led with 7,656 establishments or nearly one-third (30.3%) of the total for the section in 2021. Other significant industries include the manufacture of beverages with 4,091 establishments (16.2%), printing and service activities related to printing with 2,311 establishments (9.1%), and manufacturers of grain mill products, starches, and starch products with 1,395 establishments (5.5%).

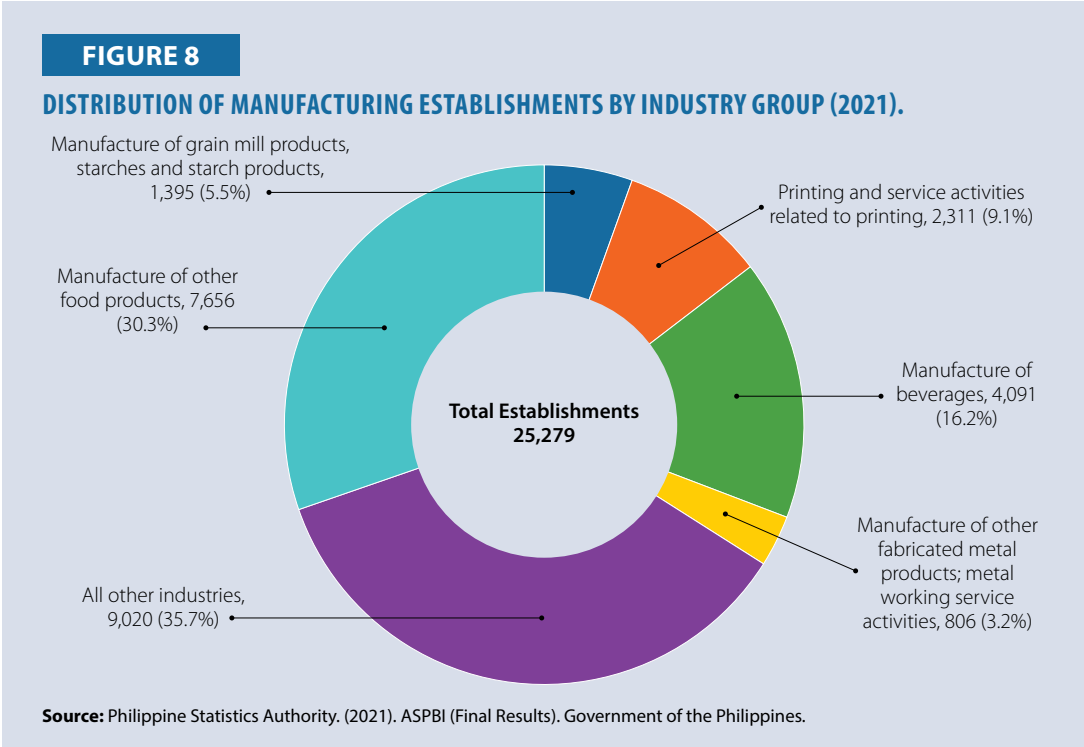
Among regions, the National Capital Region (NCR) recorded the highest number of 4,422 manufacturing establishments (17.5%). CALABARZON followed this with 4,129 establishments (16.3%), while Central Luzon had 3,011 establishments (11.9%). The electronic components manufacturing industry group employed the highest number of workers.

As shown in Figure 7, the manufacturing section employed a total of 1.17 million workers in 2021, a slight 1.9% decrease from the 1.19 million workers in 2020. Of the total workforce, 1.16 million workers, or 99.1%, were paid employees, while the remaining were working owners or unpaid workers.



By industry group, electronic components manufacturing companies employed the highest number of workers, 189,300 (16.1%), in 2021, followed by other food products and the manufacturer of parts and accessories for motor vehicles, with 121,275 workers (10.3%) and 75,200 workers (6.4%), respectively.

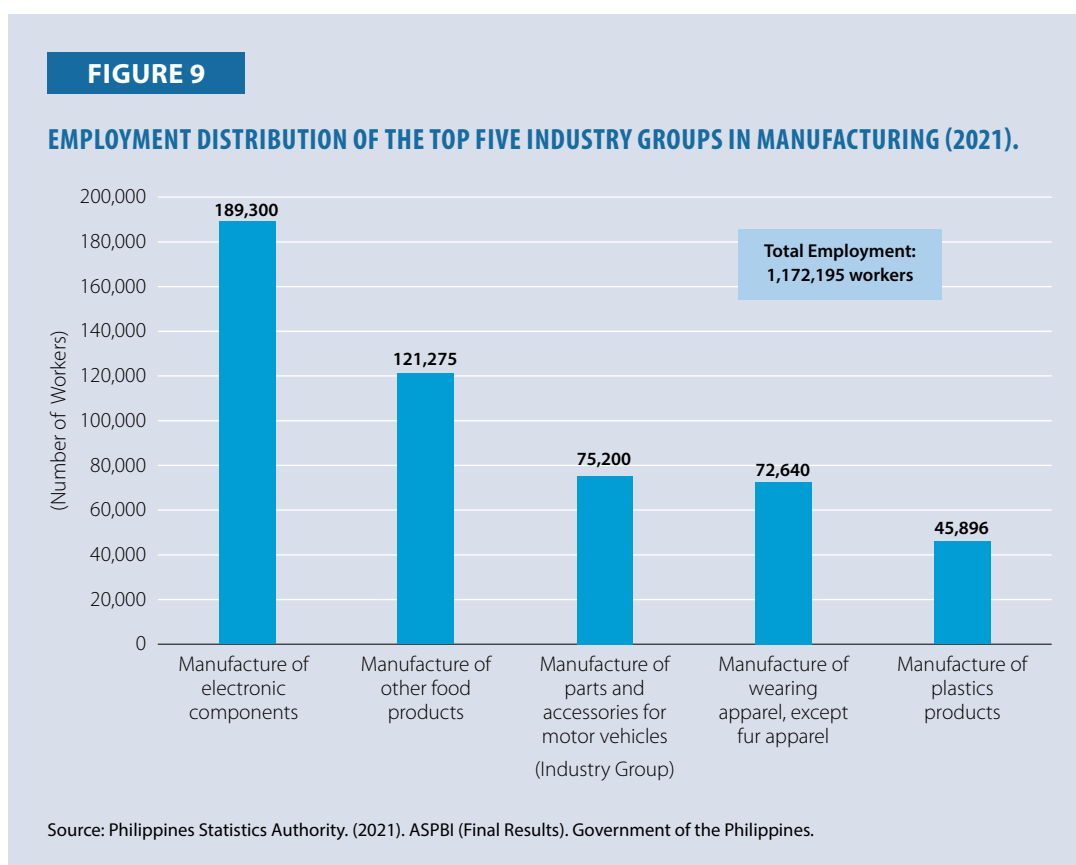
Overall, four regions employed more than 100,000 workers. CALABARZON led with 518,645 workers (44.2%), followed by Central Luzon with 172,945 workers (14.8%), NCR with 164,322 workers (14.0%), and Central Visayas with 146,389 workers (12.5%). Figure 8 illustrates the distribution of establishments across the manufacturing industry, with essential goods dominating the sector.



On average, the manufacturing sector employed 46 workers per establishment in 2021, a 14.8% decrease from the 54 workers per establishment in 2020. The manufacture of electronic components had the highest average employment of 1,413 workers per establishment in 2021, followed by the manufacture of computers and peripheral equipment and accessories, with 1,262 workers per establishment. On the other hand, the manufacture of musical instruments had the lowest average, with only five workers per establishment. These manufacturing numbers are summarized in Figure 9, which presents the total employment per industry group in 2021.

E-commerce transaction is the sale or purchase of goods or services between businesses, households, individuals, governments, and other public or private organizations conducted over the Internet. The goods and services are ordered over the Internet, but the payment and the ultimate delivery of the goods or services may be conducted online or offline.

The total sales from e-commerce transactions for the manufacturing section amounted to PHP17.21 billion in 2021, indicating a 19.5% decrease from PHP21.38 billion in 2020.



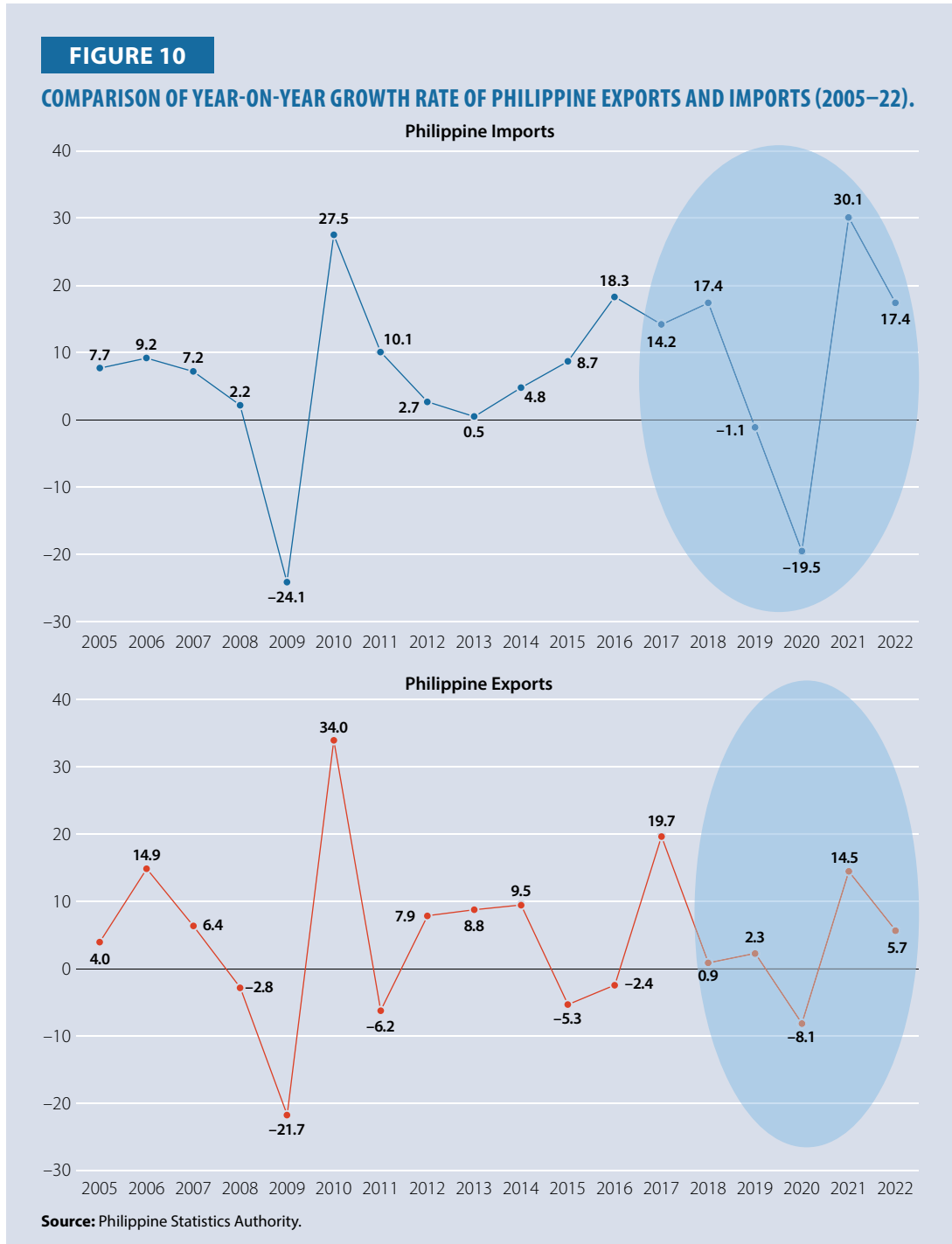
Manufacturing other fabricated metal products and metalworking services generated PHP9.89 billion, or 57.5%, of the total e-commerce sales in 2021. This was followed by manufacturing of other chemical products not elsewhere classified (PHP2.08 billion or 12.1%) and medical and dental instruments and supplies (PHP1.76 billion or 10.2%).

Among the 17 regions in the Philippines, 11 recorded e-commerce sales in 2021, led by CALABARZON at PHP11.02 billion (64.0%). It was followed by Central Luzon at PHP2.28 billion (13.2%) and NCR at PHP2.02 billion (11.7%).

Impact of New GSC Trends on the Aggregate Productivity and Economic Development

While the country’s industrial production slowed down due to the lack of raw materials and the inability to deliver finished goods to customers, the value of exports did not drop as sharply as imports. This was mainly due to the rapid localization or regionalization of raw material sourcing, which allowed manufacturing operations to continue, enabling the country to meet its export obligations (Thorbecke & Pai, 2015).

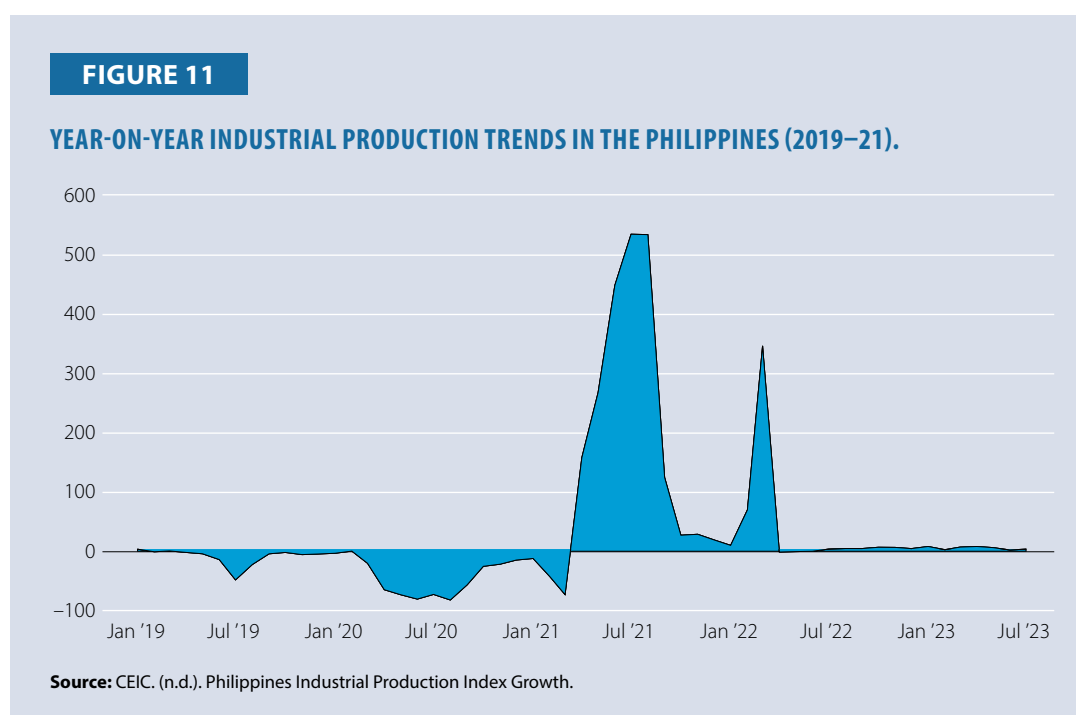
As illustrated in Figure 10, trade began to recover once pandemic restrictions eased and supply chains were realigned to facilitate product movement, both locally and internationally. This is



evident when comparing trade, import, and export values between 2020 and 2021. The Philippines has been experiencing accelerated growth in recent years, from 5.6% in 2021 to 7.6% in 2022. As recovery and reform efforts continue, the country is progressing from a lower middle-income status country with a Gross National Income (GNI) per capita of USD3,640 in 2021 towards achieving upper middle-income status (GNI per capita range of USD4,256–13,205) in the short term.

As illustrated in Figures 11 and 12, worker productivity has been a key driver of economic growth in the past decade. According to IBON, labor productivity, measured at constant 2018 prices, grew by 28.9% from PHP330,035 per worker in 2012 to PHP425,511 in 2022, based on data from the Philippine Statistics Authority. Analysis of the impact of new GSC trends on aggregate productivity and economic development reveals that robust domestic demand fueled 6.4% growth in Q1 2023, countering weaker global demand. After peaking in early 2023, inflation fell to 6.1% in May after the country's central bank, Bangko Sentral ng Pilipinas, tightened monetary policy. However, it remained well above peer countries in the ASEAN region.

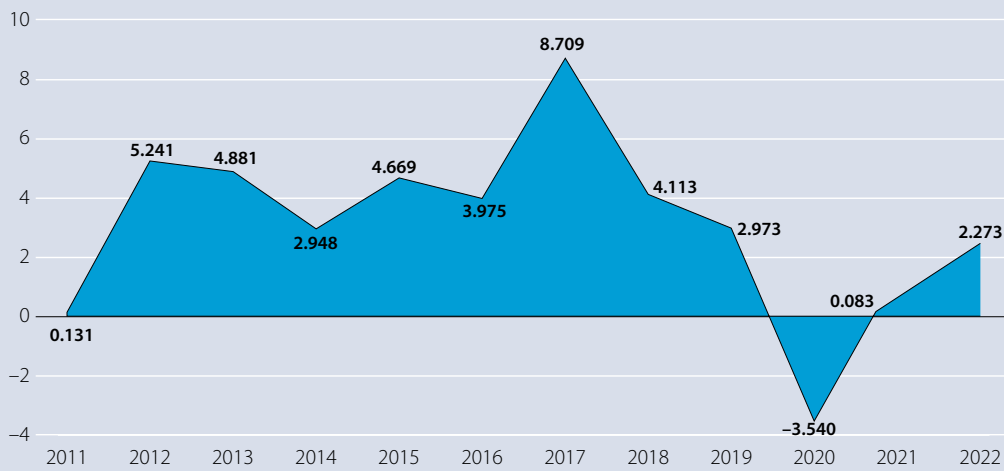
Besides, the medium-term fiscal consolidation plan remains on track, with the fiscal deficit narrowing to 7.3% of GDP in 2022 and the national government debt stabilizing around 61% of GDP. Domestic demand is expected to drive continued economic growth, projected at 6.0% in 2023, and gradually moving to its potential over the medium term (IBON, 2023).



Meanwhile, in real terms, the economy grew by 60.2%, with GDP increasing from PHP12.4 trillion in 2012 to PHP19.9 trillion in 2022. Labor productivity is calculated by dividing GDP by the total number of employed workers (WorldData.info, n.d.).

The economy of the Philippines is recovering well, with the country's growth increasing from 5.7% in 2021 to 7.6% in 2022. Over the medium term, the growth outlook remains positive, supported by strong domestic demand, a robust labor market, continued public investment, and

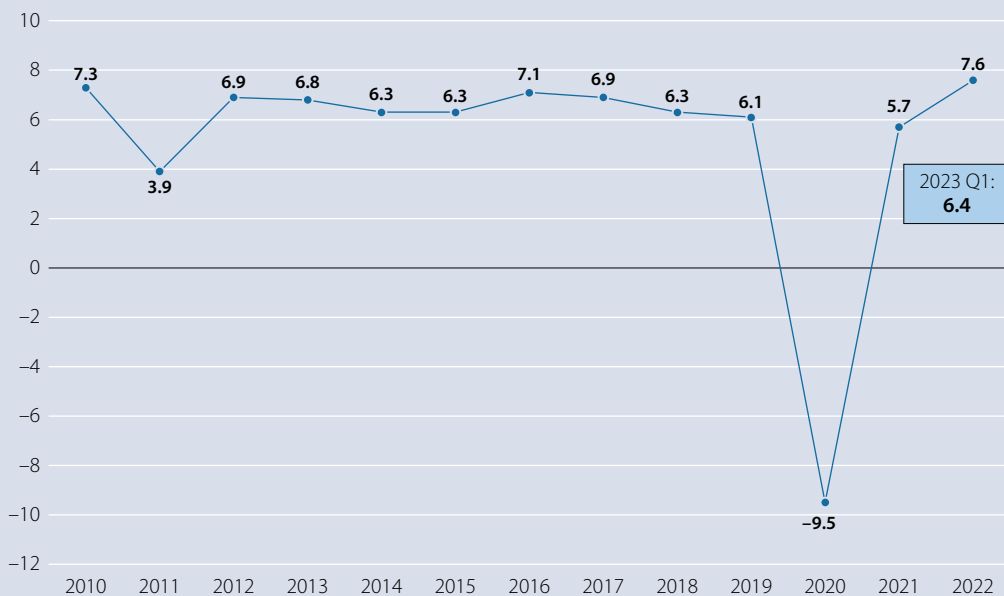
FIGURE 12
LABOR PRODUCTIVITY IN THE PHILIPPINES (2011–22).



Source: CEIC. (n.d.). Philippines Labour Productivity Growth.

recent investment policy reforms to boost private investment. With continued recovery and reform efforts, the country is on track to transition from lower middle-income status (GNI per capita of USD3,950 in 2023) to upper middle-income status (per capita income range of USD4,466–13,845) (WorldData.info, n.d.).

FIGURE 13
ANNUAL REAL GDP GROWTH RATE OF THE PHILIPPINES (2010–22).



Source: Balisacan, A. M. (13 July 2023). Infrastructure Development and Investment Climate in the Philippine Socioeconomic Agenda. [Presentation]. Philippine Economic Briefing, Toronto, Canada. National Economic Development Authority.

Case Study

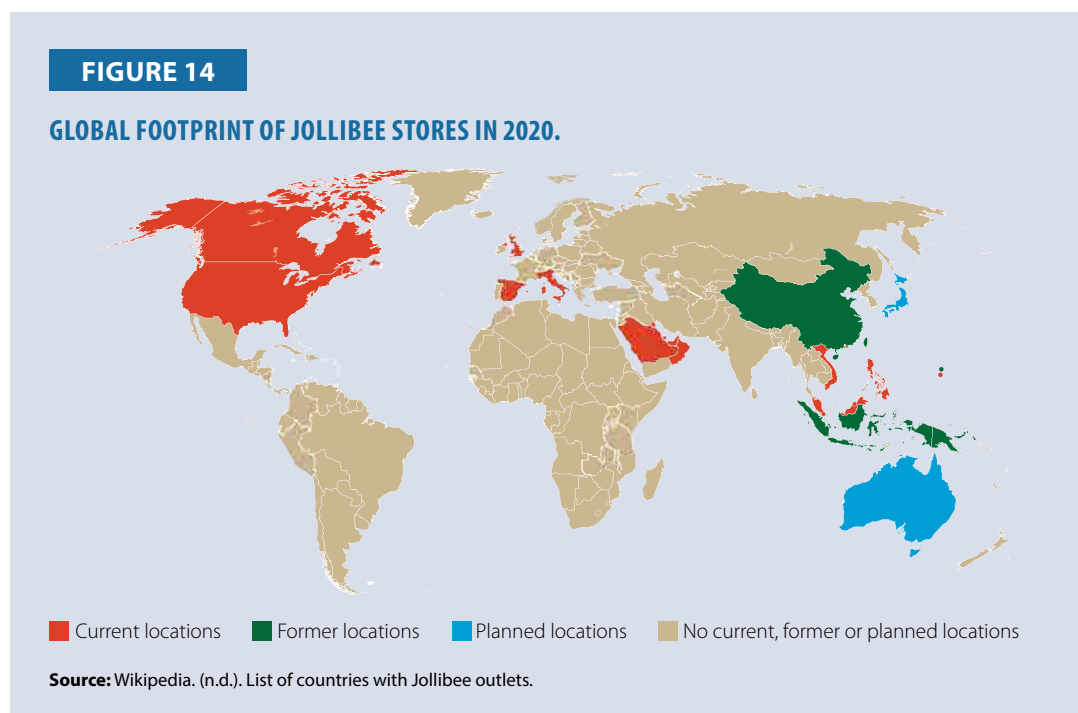
Jollibee Foods Corporation (JFC)

Company Introduction and GSC Plans

Jollibee Foods Corporation (JFC) was incorporated on 11 January 1978, with its core business centered around developing, operating, and franchising of Quick Service Restaurants (QSRs) under several well-known trade names. These include Jollibee, Chowking, Greenwich, Red Ribbon, Yong He King, Mang Inasal, Burger King, Highlands Coffee, PHO24, Smashburger, Tim Ho Wan, Tortazo, The Coffee Bean & Tea Leaf, Panda Express, Yoshinoya, and Milksha. JFC's activities also extend to manufacturing and property leasing to support the QSR systems and other business endeavors.

Alongside its subsidiaries that manage and operate the company's QSR trade names, JFC wholly owns Freemont Foods Corporation, which owns and operates Jollibee stores in Visayas and Mindanao. It also owns Grandworth Resources Corporation, a real estate company that owns or leases some of the properties used as store sites.

As of the end of 2022, JFC operated 1,204 Jollibee stores in the Philippines. Of these, 768 were franchised, while 436 were company-owned. JFC also has a notable international presence, operating 378 Jollibee stores globally. These include 61 stores in the US, 25 in Canada, one in Guam, two in Italy, 12 in the United Kingdom, 155 in Vietnam, 19 in Brunei, 21 in Hong Kong, 18 in Singapore, four in Macau, six in Malaysia, one in Spain, and 53 in the Middle East (Jollibee Food Corporation. (n.d.).



Founded by Tony Tan Caktiong, JFC is headquartered in Pasig City, Philippines. Its core business operation is divided into three main segments.

1. **Food Service:** This segment operates quick service restaurants and produces food products for Jollibee Group-owned and franchised QSR outlets.

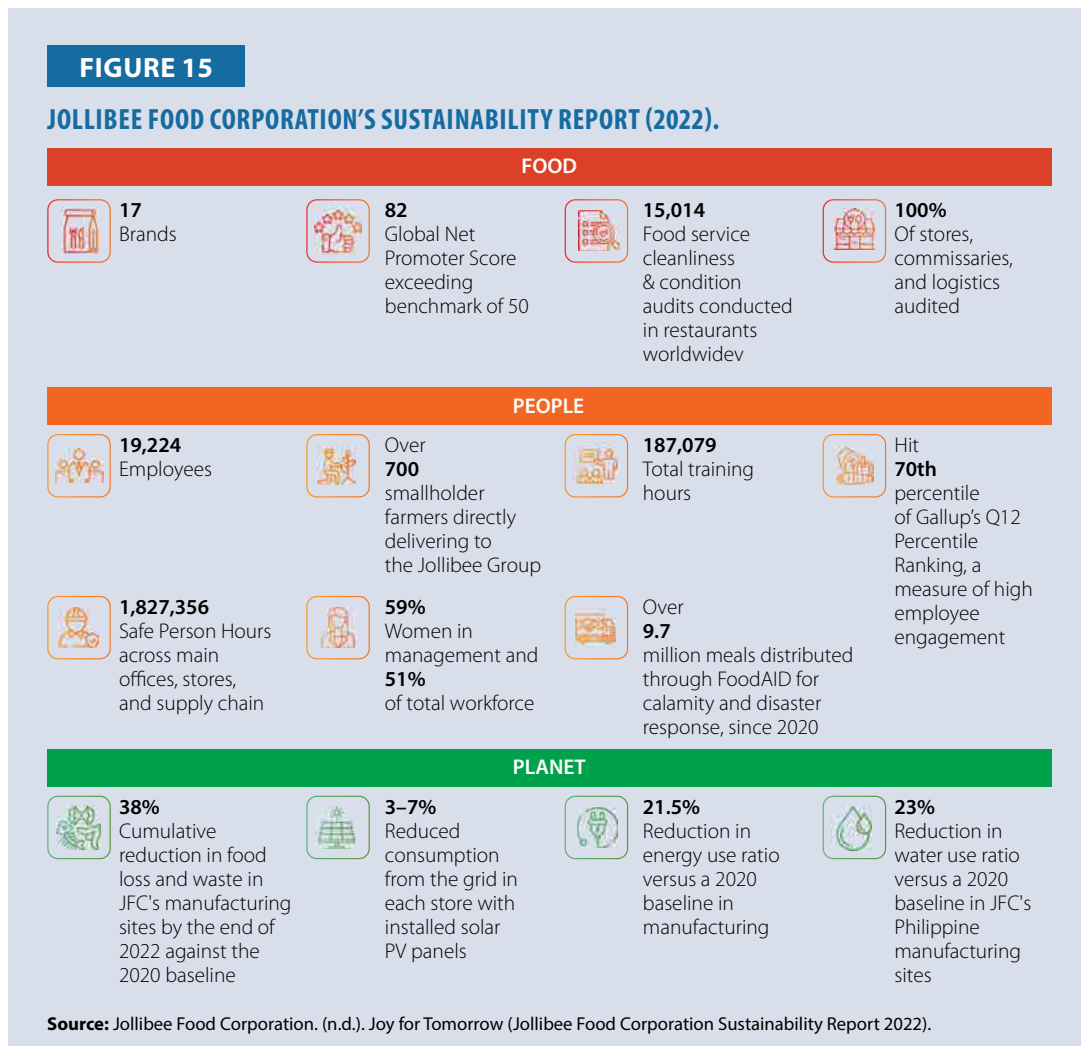
2. **Franchising:** As part of this segment, the company handles franchises of Jollibee Group’s QSR store concepts.

3. **Leasing:** The segment leases store sites to Jollibee Group’s independent franchisees.

Impact of Global Supply Chain on the Company

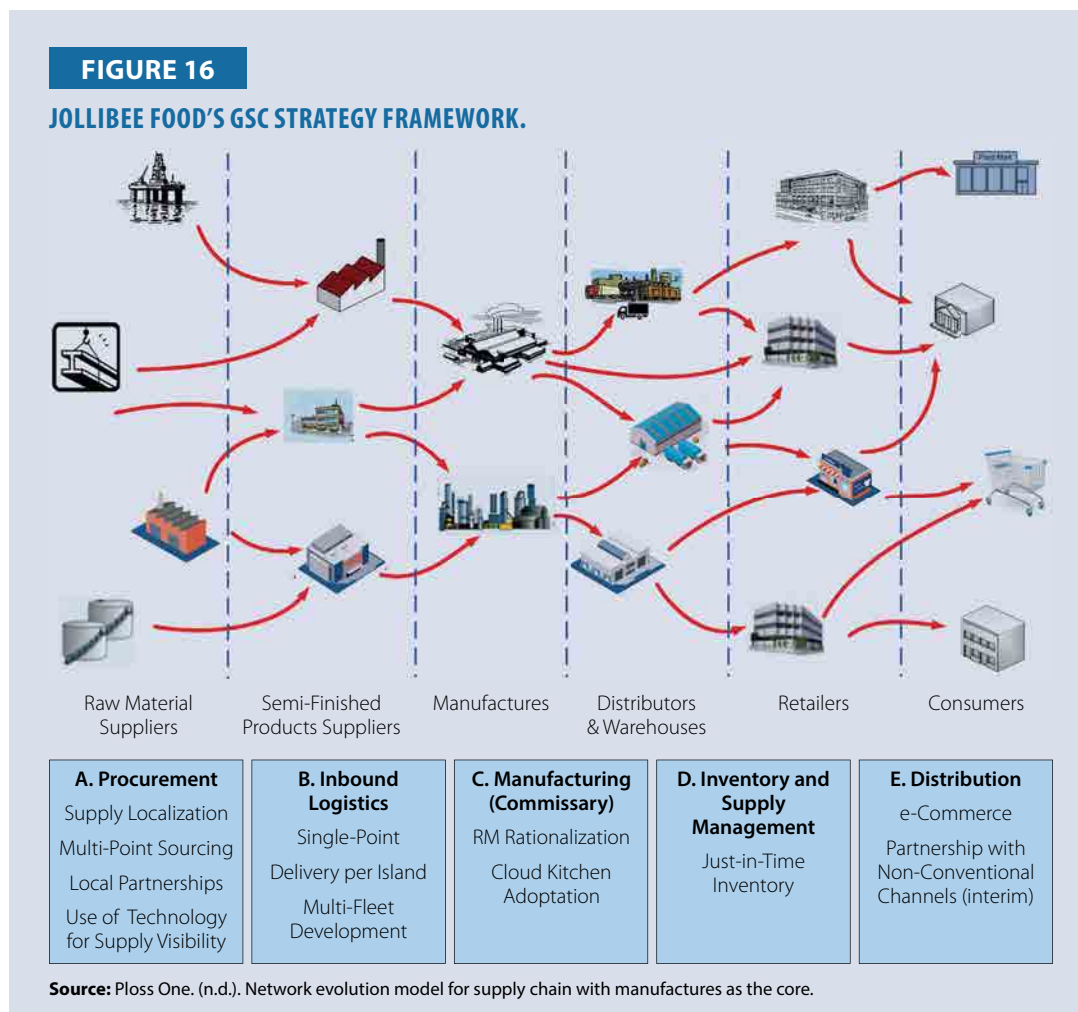
Jollibee has successfully developed a robust value chain for its local operations while integrating best practices from its international operations. These practices are filtered, tested, and implemented based on the unique dynamics of the local environment. Before the COVID-19 pandemic, the company’s revenue from sales and operations showed steady double-digit growth year-on-year. However, with the onset of COVID-19, the company saw a steep decline in revenue due to store closures, staff shortages for managing restaurants and commissaries, and restrictions on people’s movement.

Jollibee’s CEO, Ernesto Tanmantiong, acknowledged the significant challenge posed by the pandemic but remained optimistic about the company’s future. “While the COVID-19 pandemic has brought unprecedented disruption to our operations in the Philippines and other parts of the world, we are already planning for the full restoration of our operations,” Tanmantiong stated. “We expect growth to resume even if gradually, driven by our delivery, take-out, and drive-through business channels.” (Nikkei Asia, 2020).



Supply Diversification: Multi-Sourcing

Jollibee has long adopted a multi-sourcing procurement strategy, where they source from multiple suppliers, each rigorously vetted before awarding a purchase order. The company implements a multi-stage accreditation process to ensure that suppliers are financially stable, operationally sound, and capable of meeting the required quality and quantity standards set by Jollibee’s internal stakeholders. The strategy has been a key part of the company’s supply chain approach, yielding positive results even before the disruptions caused by the COVID-19 pandemic or government-imposed lockdowns.



JFC’s Purchasing team handles all supply sourcing for food, non-food products, and services. They source from a mix of major producers to localized suppliers based on strategies designed to optimize cost and ensure supply resiliency for JFC. Contingency and issue management plans are continually improved and updated to address logistics concerns such as port congestion and sea freight disruptions. JFC identifies opportunities for packaging suppliers to improve efficiency by assessing raw material sources, such as resin, pulp, and paperboard, while documenting third-party certifications (Jollibee Food Corporation, n.d.).

Local Supply Partnerships

For over 45 years, JFC has partnered with reputable suppliers who share its commitment to food quality, safety, and sustainability. Figure 17 shows JFC’s local supplier spending.

FIGURE 17

JFC'S PROPORTION OF SPENDING ON LOCAL SUPPLIERS.

Disclosure	2019	2020	2021
Percentage of procurement budget used for significant locations of operations that is spent on local suppliers	83.93%	55.06%	91.07%

Source: Jollibee Food Corporation. (n.d.). 2021 Sustainability Report.

San Miguel Foods Incorporated (SMFI) is a long-standing partner, supplying JFC with fresh, quality poultry products for Jollibee’s Chickenjoy and other products like pizza toppings, hams, bacon, butter, cheese, and flour for the different restaurant brands of JFC. Both companies, rooted in the Filipino value of malasakit or concern for others, work hard to provide fresh, delicious, safe, high-quality food, offering value for money. JFC and SMFI are proud of their Filipino roots and ability to compete globally as professionally managed, customer-centered, strategic, and flexible companies. Beyond common values, their partnership is driven by strategically aligned goals, mutual respect, transparency of business directions and challenges, and commitment to finding solutions to address ever-changing consumer demands (Inquirer, 2023).

Developing Local Supply through Partnerships with Grassroots Producers

In 2008, Jollibee Group Chairman and Founder Tony Tan Caktiong launched a bold initiative to purchase directly from local farmers, providing them a stable market. The decision recognized that despite agriculture being one of the key sectors in the country, the farmers remain among the country’s most vulnerable, and a lack of opportunities and resources prevents them from earning a higher income.

FIGURE 18

OVERVIEW OF JFC'S FARMER ENTREPRENEURSHIP PROGRAM.



Source: Jollibee Group Foundation. (n.d.). Farmer Entrepreneurship Program.

Jollibee Group Foundation, the company’s social development arm, took on the challenge and translated the idea into the Farmer Entrepreneurship Program (FEP). The FEP eventually integrated small-scale farmers into JFC’s supply chain. Today, vegetables like white onions, green bell

peppers, tomatoes, and other vegetables used in Jollibee, Chowking, Greenwich, and Mang Inasal come directly from small-scale farmers across the Philippines.

Since 2009, FEP farmers have delivered over 10,000 metric tons or 700 truckloads of vegetables to the Jollibee Group, earning more than PHP411 million in total sales (see Figure 18). Furthermore, 94% of FEP farmer groups are already GAP-certified, while the remaining continue to work towards this milestone. Since its launch in 2008, the FEP has enabled 14 farmer groups comprising more than 500 farmers (Jollibee, n.d.).

Technology for Better Supply Planning and Visibility

Jollibee has digitized procurement processes through partnerships with spend management cloud provider Ivalua and supply chain solutions provider Consus. JFC has deployed Ivalua's platform to empower its procurement digital transformation, with Consus leading the implementation.

The implementation covers supplier information, risk and performance management, eSourcing, contract management, catalog management, spend analysis, savings tracking, category management, and widespread change management. As the company continued to grow and expand internationally, it required an integrated global procurement platform. It selected Ivalua's platform due to its ability to support every stage of the company's planned transformation, including quick deployment and the flexibility to meet changing requirements.

Integrated with JFC's SAP ERP systems, the platform ensures seamless information flow and maximum automation. Key benefits (Birch, 2021) of the platform include:

- Improved governance and auditability
- Efficient procurement processes
- Better analysis and informed decision-making
- Proactive risk management
- Improved supplier qualification and collaboration
- Better compliance with contracts and policies
- Milestone in procurement transformation

Supply Chain Sustainability

Jollibee Group has made significant strides during its 45-year journey, driving various community and energy-saving projects. However, it is now consolidating its sustainability efforts under the 'Joy for Tomorrow' global sustainability agenda, centered around three pillars: food, people, and the planet. This more cohesive framework unites the Jollibee Group community, including employees, business partners, suppliers, vendors, and other stakeholders, toward shared sustainability goals. Similarly, SMFT's sustainability goals focus on four overarching goals: establishing a circular economy approach by 2040, achieving net zero by 2050, uplifting the lives of at least 15 million people by 2030, and ensuring a fully sustainable and ethical supply chain by 2040 (Jollibee, 2023).

Potential Impacts

FIGURE 19**JFC'S SYSTEM-WIDE INCOME STATEMENT (2019–22).****JOLLIBEE FOODS CORPORATION**

Doing business under the name and style of Jollibee

AND SUBSIDIARIES**CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME***(Amounts in Thousand Pesos, Except Per Share Data)*

Years Ended December 31

	2022	2021	2020
REVENUES			
Gross sales	P=201,375,231	P=146,496,331	P=124,577,293
Sales discount	-4,717,946	-3,909,895	-3,332,250
Net sales	196,657,285	142,586,436	121,245,043
Royalty, set-up fees and others (Note 20)	11,845,358	8,710,309	6,467,134
	208,502,643	151,296,745	127,712,177
PFRS 15 impact on system-wide advertising fees	3,399,573	2,278,845	1,600,825
	211,902,216	153,575,590	129,313,002
DIRECT COSTS (Note 21)	174,945,874	127,496,679	115,726,337
GROSS PROFIT	36,956,342	26,078,911	13,586,665
EXPENSES			
General and administrative expenses - net (Note 22)	22,905,918	16,473,091	23,754,221
Advertising and promotions	4,109,053	3,331,207	2,643,907
	27,014,971	19,804,298	26,398,128
INTEREST INCOME (EXPENSE) (Note 23)			
Interest income	341,189	164,967	226,616
Interest expense	-4,768,732	-4,145,749	-3,787,652
	-4,427,543	-3,980,782	-3,561,036
EQUITY IN NET EARNINGS (LOSSES) OF JOINT VENTURES AND ASSOCIATES - Net (Note 11)	4,062	-43,423	-1,081,308
OTHER INCOME - Net (Note 23)	5,669,710	3,893,018	4,161,177
INCOME (LOSS) BEFORE INCOME TAX	11,187,600	6,143,426	-13,292,630
PROVISION FOR (BENEFIT FROM) INCOME TAX (Note 24)			
Current	3,514,740	2,029,364	1,546,619
Deferred	334,367	-1,387,929	-2,205,626
	3,849,107	641,435	-659,007
NET INCOME (LOSS)	7,338,493	5,501,991	-12,633,623

Source: SGV. (14 March 2023). Jollibee Food Corporation: Doing business under the name and style of Jollibee and Subsidiaries.

Business Performance

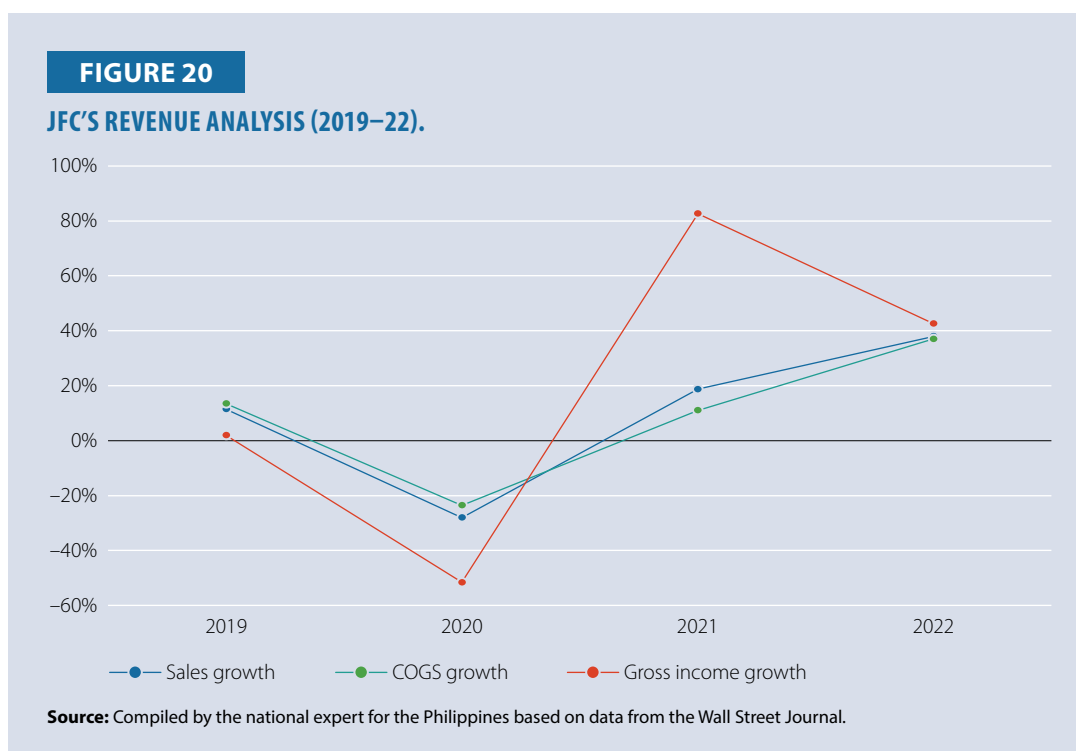
JFC's system-wide sales improved significantly, growing by 40.2% in 2022 due to the easing of pandemic restrictions in critical markets, network expansion, and strong same-store sales growth (see Figure 19). Its revenue for the year stood at 38.0%r. Notably, despite high inflation and global supply chain challenges, JFC generated an operating profit of PHP9.9 billion, a 58.4% increase from 2021 and 6.5% better than the 2018 pre-pandemic operating income level of PHP9.3 billion.

The company's sales growth for 2022 was driven by a 27% increase in same-store sales growth, 6.1% from new stores, 2% from the Milksha acquisition, and a 5.2% foreign currency translation gain. The company saw an increase of 58.4% in its operating income and 26.4% in net income attributable to equity holders of the parent company, amounting to PHP9.9 billion and PHP7.6 billion, respectively.

With its strong profit performance, the company generated PHP27.0 billion in cash from operations, an increase of 23.7% compared to 2021. JFC spent PHP9.7 billion in capital expenditures, primarily for new stores and renovation of existing ones. It has a solid balance sheet, with total assets of PHP233.4 billion, which has increased by 10.7% year-on-year. Its cash level reached PHP28.9 billion, representing 12.4% of the company's total assets.

JFC reversed its losses from the pandemic, with net income reaching PHP5.9 billion in 2021, a significant recovery from its massive PHP11.5 billion losses in 2020. The conglomerate was among the Philippines' publicly listed companies with the sharpest losses in 2020. Earnings in the fourth quarter gave the biggest boost to the full-year figure, growing 59.6% to PHP2.03 billion. System-wide sales, a measure of all sales to consumers, jumped 20% to PHP211.7 billion, while revenues jumped 18.7% to PHP153.5 billion, as summarized in the revenue analysis in Figure 20.

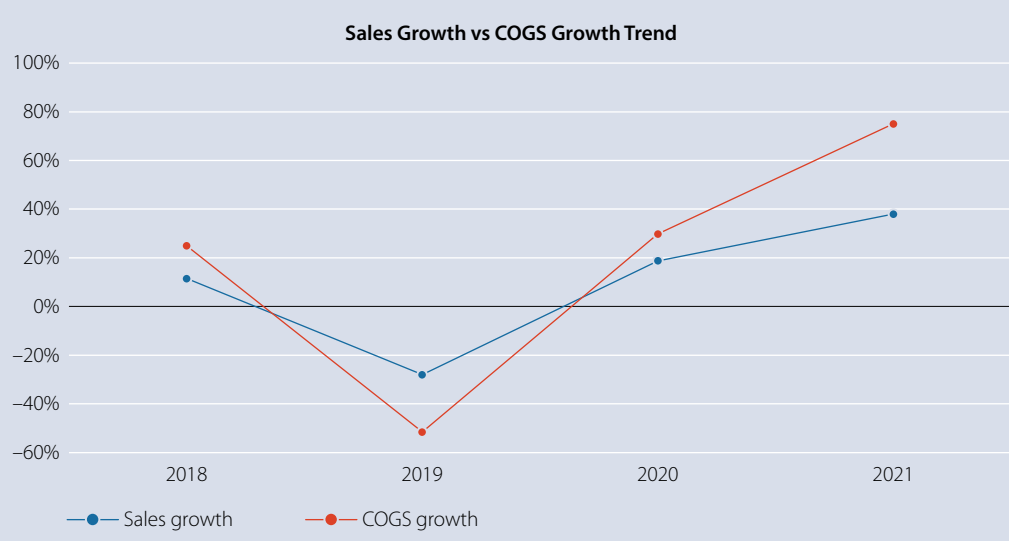
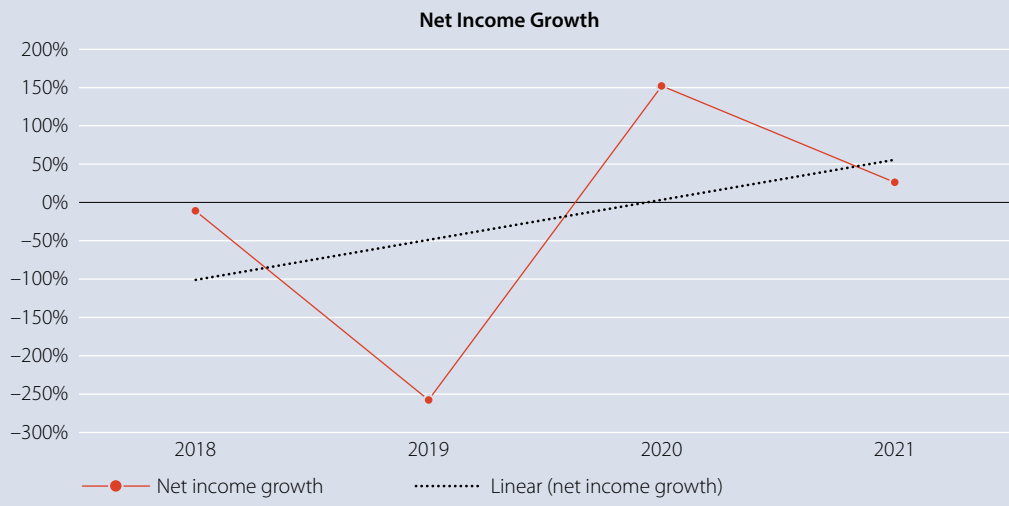
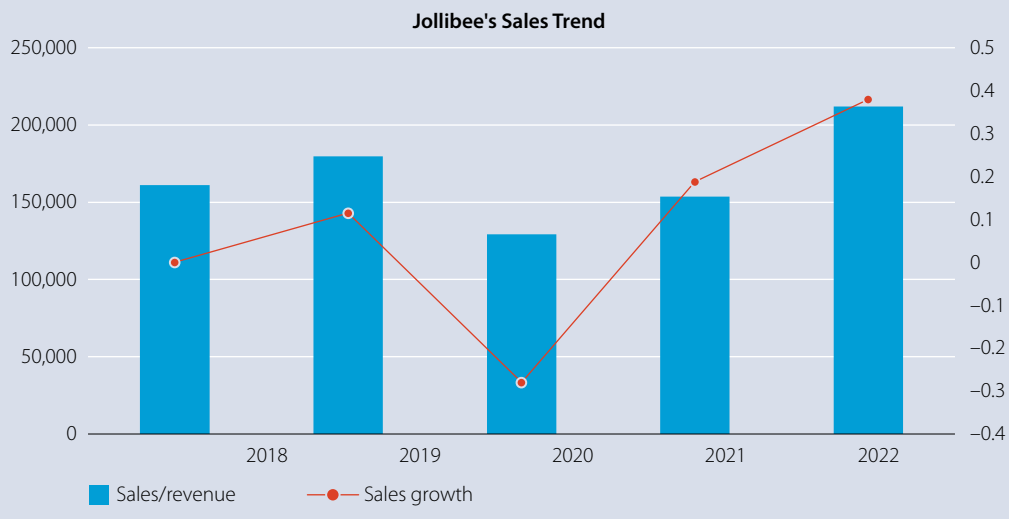
Its growth was driven by sales in the Philippines and North America and sales from subsidiaries like Coffee Bean and Smashburger. JFC chief executive officer Ernesto Tanmantiong said that the company's international sales in the fourth quarter had equaled the sales in the same period before the COVID-19 outbreak (Rivas, 2022).



During the pandemic, JFC's marketing strategy shifted to a digital-first approach to align its marketing communication with its customers' media consumption habits. One of its major marketing pivots was improving the takeout and delivery channels of its stores and brands. This initiative effectively drove sales at the height of the pandemic in 2020, particularly in a market where off-premise channels like delivery contributed significantly to total sales.

The company also introduced off-premise outlets, such as delivery and take-out-only stores in the country, like Greenwich and Panda Express. To make delivery even more efficient, it launched the Jollibee Cloud Kitchens in key locations like Singapore and the US.

FIGURE 21
JFC'S FIVE-YEAR SALES, NET INCOME, SALES, AND COST OF GOODS SOLD TRENDS.



Source: Wall Street Journal. (n.d.). Jollibee Foods Corp.

Jollibee also introduced innovations in its menu, adding ready-to-cook products and group meals offered at good value, enabling customers to enjoy these in the safety of their homes.

“The global pandemic brought about several shifts in consumer habits, and we quickly responded to these changes so that we could continue delivering taste and value to our customers amid a crisis,” said Jollibee Group Chief Marketing Officer Daniel Gomez (Gonzales, 2022).

Conclusion

Government Intervention to Assist in GSC Implementation

The Philippine government did not let the unprecedented crisis go to waste. It did not sit idly by and wait for the coronavirus to subside. Instead, it continued to pursue game-changing reforms to make the Philippines a preferred investment destination. For instance, the Corporate Recovery and Tax Incentives for Enterprises law slashes corporate income tax and rationalizes the fiscal incentives system.

Moreover, the government continues implementing various plans and programs to improve the country’s competitiveness. The aggressive ‘Build Build Build’ program further accelerates the country’s economic growth, seeking to raise investment levels sufficiently to maintain existing infrastructure and meet the growing needs of the economy and the population. The government committed to increasing public infrastructure spending annually to 6.4% of GDP by 2021 (Balberian & de Leon, 2020).

In addition to the policies enacted to enable the economy’s recovery after the pandemic, the government introduced three landmark laws to open the Philippines further to foreign investors and stimulate trade. These include the amended Retail Trade Liberalization Act, the Foreign Investments Act, and the Public Services Act. From 2015 to 2021, the government invested heavily in public infrastructure to compensate for past neglect, which earned the Philippines the distinction of having one of the poorest public infrastructures in ASEAN. Between 2016 and 2020, infrastructure spending averaged 4.6% of GDP, with the actual infrastructure spending in 2021 reaching PHP1.12 trillion, or 5.8% of GDP (Diokno, 2022).

The government’s recent efforts to revive and invigorate the local agricultural value chains are also expected to support companies’ recovery by ensuring adequate local supply as a substitute for foreign-sourced production inputs. Increased government support for local production and farming, including land reform programs, machinery improvements, and the building of storage and post-processing facilities, aims to sustain these efforts.

Corporate Response and Adoption of GSC

Despite the advantages enjoyed by existing manufacturing centers and the obstacles to shifting production geographically closer, nearshoring has steadily gained popularity. The supply chain disruptions over the last three years provided further impetus to the process, as these disruptions exposed vulnerabilities in the existing GSCs and demonstrated the risks of over-reliance on a handful of manufacturing locations.

As companies grapple with the complexities of trade wars and geo-political tensions, it is becoming evident that supply chain reliability can be improved by redesigning supply chains to bring them closer home. Companies will likely consider having two parallel supply chains, one that is Asia-

centric for the Asian markets and another focused on serving core American and European markets (Bhonsle, 2023).

Businesses are also gradually investing in resources required to build scale and develop infrastructure at newer manufacturing locations. In the long run, this will help these new hubs develop efficiencies and competitiveness on par with existing centers. While the extent of the capacity shift will depend on costs and accruing benefits, political expediency, and growth rates, more capacity will inevitably move closer to developed economies.

This period prompted significant innovation and flexibility in the corporate sector, emphasizing the importance of adaptability, compassion, and solidarity in addressing a global concern. Corporations reap the benefits of these GSC strategies, pivoting on horizontal and vertical supply chain collaboration to bring businesses powerful benefits, many of which are further enhanced by utilizing an end-to-end shared digital platform to manage sourcing and supply chain efforts. These include:

Supply Chain Talent and Partner Retention

Businesses today understand the value of customer retention and the level of competition vying for brand loyalty. However, customers are only one of the things companies need to succeed. They must also attract and retain top employee talent and maintain long-term partnerships with the best players. According to The Global Supply Chain Institute, “supply chain talent management is arguably the most difficult and unique of all business requirements.” Retaining talented supply chain managers and partners is one of the farthest-reaching rewards of supply chain collaboration efforts. By using a professional digital platform to manage supply chain operations, companies can provide their supply chain managers with top-tier tools to do their jobs, hone their professional skills, develop their careers, and boost job satisfaction. All of these eventually contribute to a company’s success.

When companies offer their suppliers and partners a unified platform to collaborate on daily QC matters, complex market regulations, and transparent, ethical standards, they demonstrate their business’s professionalism and dedication to efficiency. They show their most valued SC partners that cooperation with your brand is an opportunity for them to raise their profile and generate more business. The best supply chain talent and partners will undoubtedly want to work long-term with a company that can deliver this level of competence.

Lower Your Long-Term Costs

One-off partnerships have their time and place in any operation; however, long-term collaborations impact the bottom line the most. The benefits of long-term supply chain collaboration are that they are practical, straightforward, and felt daily. Simply put, the longer a company collaborates with another, the better the understanding of each other’s strengths, weaknesses, and working methods. This helps both partners play to each other’s strengths.

With professional quality control and compliance software, ensuring real-time communication and mutual transparency with long-term suppliers is much easier, optimizing and automating routine procedures, saving all parties valuable time.

Improve Product Quality and Safety

Delivering safe, high-quality products is essential to customer satisfaction and is a goal that brands and retailers strive for. Collaborating with supply chain partners provides companies with an extra

perspective on the challenges affecting product quality and safety in the industry, whether related to raw material issues, new regulations on chemical management, or other factors. Working within a shared digital platform that captures, consolidates, and analyzes quality and compliance data from all stages of the manufacturing process offers both companies and their partners a 360-degree view of the sourcing operations. With actionable insights, companies can track quality and safety issues back to their source and address the underlying problems with high-precision interventions and corrective actions.

Drive Better Ethical Standards Through Multi-Stakeholder Collaboration

Ethical and sustainable sourcing has become a high priority for consumers and businesses. However, no matter how dedicated a company is to improving human rights and environmental sustainability within its industry, one can only achieve so much. It is widely acknowledged that multi-stakeholder collaboration is paramount for driving meaningful and lasting change in GSCs.

Working with supply chain partners allows companies to work collectively to promote greater supply-chain transparency, elevate ethical and environmental standards, and exert more effective pressure on parts of the supply chain resistant to positive change. Moreover, by collaborating through a unified digital platform, supply chain partners can share ethical compliance data quickly and efficiently, coordinate audit schedules, and, where compatible ethical compliance protocols exist, rely on each other's findings. This reduces the need for duplicate auditing and reduces auditing fatigue on suppliers (QIMAOne, n.d.).

Recommendations

Global Supply Chain strategies aim to evolve the process and system to serve stakeholders best. While supply chain processes have undergone a steady and gradual evolution, the outbreak of the COVID-19 pandemic forced governments and companies to expedite these changes. The urgency was necessary to ensure continuity of operations and the flow of goods, ultimately guaranteeing the survival of the people in general.

The study illustrates that, for effective change in the supply chain strategy, the government and private corporations need to work hand-in-hand. Both parties must align on addressing concerns that hinder the efficient and cost-effective flow of goods in the market. Successful government and private sector collaboration demonstrates that supply chain strategies can be pivotal for driving economic and fiscal recovery. Conversely, a lack of cooperation between these entities may invalidate or delay the implementation and realization of the benefits offered by GSC strategies.

This report presents its recommendations based on the premise that the government and the private corporations play equal roles in shaping supply chain strategies and ensuring their successful implementation.

Recommendations on Government Policy

As the Philippines experiences economic re-emergence or economic re-opening, the most suitable way for the government to support the implementation of GSC strategies is to treat the current economic conditions with the same urgency as during the pandemic.

Remove obstacles to the effective, continuous, and cost-effective flow of goods and services

- Support and fund infrastructure projects, especially farm-to-market roads, to help local suppliers bring their goods to market while reducing the need for middlemen acting as transport brokers.
- Remove barriers to conducting business by providing legislative support, reducing red tape, and promoting professionalization of government services.
- Create fair trade programs to ensure a level playing field for all stakeholders and strictly enforce them.
- Centralize transport and supply chain strategies and regulations to prevent issues such as multiple fee charges, long permitting queues, and bureaucratic delays.

Encourage and reward public and private partnerships

- Open collaborative opportunities on projects that cannot be fully funded by the government or fully implemented by private firms without government intervention.

Pursue an appropriate policy mix to balance inflationary pressures and economic growth

- A tightened monetary policy and contractionary fiscal stance appropriately address a positive output gap and persistent inflationary pressure. The “all-of-government approach” against inflation is welcomed as it addresses supply-side problems. Macroprudential tools can be used actively to address potential financial stability issues.

In the medium- to long-term, fiscal policy should aim to restore fiscal buffer while supporting sustainable growth and development. Fiscal consolidation is supported by strong commitment, well-defined targets, and measures anchored by fiscal rules and discipline. On the financial system side, close coordination between regulators is crucial in identifying, monitoring, and mitigating financial stability risks that might arise from non-financial corporates. Meanwhile, the authorities should continue to improve the liquidity management framework, develop the bond and repo markets, and expand financial inclusion to enhance the system’s resilience to shocks and promote market activities.

A comprehensive strategy is warranted to bolster the Philippines’ medium to long-term economic growth potential. Overcoming the scarring effects of the pandemic mandates a sustained focus on upgrading and upskilling the workforce to embrace a more technology-driven economy. Implementing policies and measures to attract investments, particularly foreign investments, and promoting exports of goods and services are the underpinnings of long-term economic development. Furthermore, the government can enhance the country’s competitiveness through infrastructure investment, digitalization, and developing a green economy. (AMRO, 2023).

Recommendations on Corporate GSC Strategy Implementation

Corporations are the driving force of the country’s economy. The manner and expediency with which they create and implement their supply chain strategies will dictate their position on both the local and global stages. In an ever-evolving economic environment where all aspects of the business are interconnected and on the verge of eroding the concept of differentiation, an efficient, cost-effective, fully integrated supply chain backed by redundant contingency strategies will define the next big thing in business. To build such a supply chain, local companies should implement the following measures:

- a. Hasten the development and implementation of technology to improve inventory planning and management through supply source redundancy and visibility. Companies have experienced the flexibility and benefits of fully integrated and visible inventory and supply management for supply chain practitioners. The drive for continuous improvement runs true to all facets of the supply chain but is more evident and faster in technological solutions supporting the processes.
- b. Creation and testing of BCP implementation must include a wider range of inclement market conditions, both local and international.
- c. Companies must conduct inter- and intra-industrial collaboration through knowledge sharing and frequent industry and process reviews.
- d. Businesses must continuously explore avenues for cooperation and synergy with the government to hasten infrastructure-building projects. The pandemic proved that players within different industries who do not usually work together can be ‘forced’ to work together for the common good of both parties.
- e. Companies must increase their R&D investments, focusing on the development of processes and materials that can be used across multiple production lines or products from the same group of companies instead of developing products and services in silos. For example, instead of developing products A, B, and C using different materials, a company can look for ingredients and processes that can be used throughout the whole or most of the product line, which will save up on supply chain and administrative costs of maintaining multiple ingredient lines.

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THAILAND

Introduction

In April 2020, Thailand implemented several social measures to combat the COVID-19 pandemic, including a nationwide lockdown, curfews, and mandatory 14-day quarantine for international travelers (Rajatanavin et al., 2021). These measures had a profound impact on several industries, particularly those closely tied to the local economy. Industries such as rubber, cassava, and automotive manufacturing faced significant challenges, with some companies experiencing factory closures that lasted 3–6 months.

The two-month suspension of economic activities created cash flow problems for approximately 90,000 firms. The most vulnerable included restaurant operators, owners of small air transport businesses, and those in the hotel industry. Small enterprises, in particular, faced more vulnerability than their larger counterparts. Large companies, especially those involved in restaurant operations, auto dealerships, and hotels, were at greater risk of exposure to the outbreak and, consequently, had a higher probability of facing financial difficulties than large companies in other sectors (Chaivichayachat & Leingchan, 2020).

The food manufacturing sector, which traditionally supplies restaurants, was significantly impacted by COVID-19. Major restaurants, hotels, and catering services (HORECA) could not operate during the crisis. In response, many HORECA businesses pivoted to food delivery services to sustain their operations.

During this crisis, businesses of all sizes focused on survival and continuity rather than profitability. Entrepreneurs adapted their operations to ensure business viability. For instance, restaurants shifted to delivery services or offered take-out options, allowing them to retain their workforce and continue serving customers. Also, with the closure of physical retail stores, businesses explored social commerce and e-commerce avenues.

In March 2020, exports in Thailand increased, particularly in the electrical appliance sector, which included products such as air conditioners. Demand for electronic tools and devices, including laptops and printers, also rose, driven by the shift to remote work. The shift necessitated technologies to enhance convenience and support the new work-from-home environment.

Consumers actively seek ways to obtain the products they need, and sellers must anticipate where buyers will purchase. This adaptability facilitates smoother and more effective sales strategies. However, certain products, like building materials, may not be readily purchased online. Smaller building material stores capitalized on this opportunity by selling their products through multiple channels, including live sales, offline outlets, and online platforms. These approaches have proven to be effective techniques for boosting sales and enhancing business resilience.

Businesses were forced to adapt to the 'new normal' by transforming their sales strategies and expanding distribution channels through technology integration, moving beyond conventional business practices. This adaptability yielded positive results, including a decline in COVID-19

infection cases. Consequently, measures related to the pandemic were gradually relaxed, benefitting sectors such as shopping malls, barber shops, and beauty salons. As restrictions ease, different sectors also stand to benefit from post-COVID-19 expansion opportunities. However, the pace of recovery depends on various factors, including the number of job losses, labor strikes, and business closures. These events have reduced purchasing power and shifted demand towards essential, high-quality, reasonably priced products.

Digital transformation is crucial for a resilient supply chain. Before the pandemic, the extent of digitalization in Thailand was relatively limited. However, the outbreak accelerated its adoption, driven by the widespread shift to work-from-home, online learning, and the rapid growth of e-commerce and food delivery platforms. To further promote digital inclusion, the government introduced digital wallets and mobile applications to support initiatives like the 50-50 co-payment scheme, vaccine distribution, and the check-in application (Lhakard, 2022). These measures contributed to the success of these programs and increased awareness of digital technology among the Thai population.

Utilizing technologies like AI, IoT, and automation within the manufacturing sector substantially improved supply chain visibility. This enhancement has led to greater reliability, responsiveness, and productivity. The pandemic also spurred investment in these technologies as businesses sought ways to mitigate supply chain disruptions. This growing digital acumen will likely benefit businesses seeking to expand their presence in global markets.

GSC Diversification and Relocation Strategies

Environmental factors have become increasingly influential in GSC strategies. In addition to maximizing efficiency, production planning must now account for sustainability and environmental impacts, balancing traditional business objectives with possible ecological costs. Considerations related to natural disasters and pandemics also play a greater role, notably after COVID-19 exposed the vulnerabilities of concentrating production facilities in a single location. These challenges have demonstrated how concentrating production facilities can disrupt the entire economic system.

To ensure long-term security, manufacturers must seriously explore ways to reduce these risks. For example, dispersing production facilities and increasing the focus on maintaining corporate flexibility in response to change rather than solely prioritizing maximum efficiency (Leingchan, 2020).

Manufacturers faced widespread supply chain disruptions during the pandemic, including lockdowns, labor shortages, and transportation challenges. To effectively mitigate these risks, businesses need to develop contingency plans. Companies relying on single sourcing encountered significant supply disruptions, prompting businesses to adopt strategies such as multiple sourcing or diversification to ensure survival and business continuity. By seeking alternative suppliers, companies can reduce the risks associated with supply shortages.

There is also a growing trend of nearshoring, where companies move the sourcing location closer to the production sites to reduce lead time and logistics costs. Furthermore, the relocation of production bases emerges as a viable option that addresses the immediate challenges and creates opportunities for Thai industries and suppliers to reshape the dynamics of the supply chain in the post-pandemic landscape. Thailand's advantageous position in Southeast Asia makes it a fascinating choice for companies seeking to relocate or set up regional manufacturing centers. These industries include medical, cosmetics, food and agro-industry, electric vehicles, and digital and smart electronics.

The effectiveness of Thailand's supply chain diversification and relocation strategies depends on industry, market dynamics, and specific business objectives. Table 1 further illustrates the concept of relocation within the country's food industry. It also summarizes the advantages, impacts, and adaptive measures in response to COVID-19. The summary focuses on raw materials, packaging, and production.

TABLE 1

ADVANTAGES, IMPACTS, AND ADAPTATION STRATEGIES OF MANUFACTURERS IN THAILAND'S FOOD INDUSTRY.

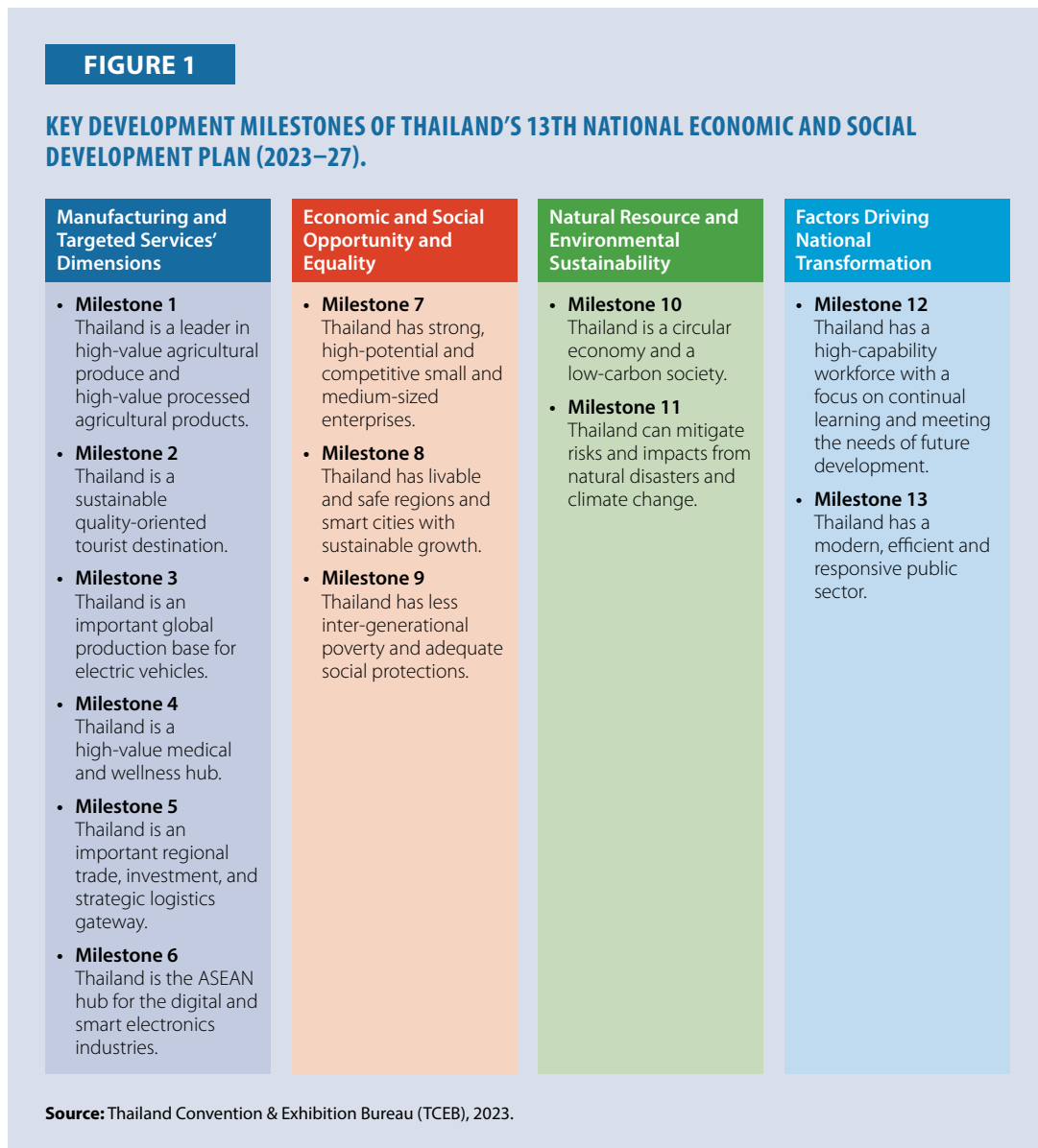
Topic	Advantage	COVID-19 Impact	Adaptation
Raw Material	Two-thirds of Thailand's food production comes from local raw materials like vegetables, fruits, meat, and seafood. The remaining is imported and includes seafood and products like wheat, wheat flour, and soybeans that cannot be produced locally.	Sales of ready-to-eat, instant, canned food, and sauce increased during the pandemic, while the HORECA sector experienced a significant decline.	The food industry coped with labor shortages by implementing bubble and seal policies. Meanwhile, HORECA adapted by selling directly to consumers, supermarkets, and food delivery platforms.
Packaging	Thailand's primary packaging source is China; however, the nation's diverse packaging imports from various countries buffer any significant impact. During this crisis, food packaging is considered more necessary and important than usual due to the increasing delivery of food. Packaging must be clean, safe, and strong to give consumers confidence when receiving food.	The cost of packaging from non-Chinese sources is higher, thereby increasing production expenses.	Diversify the sourcing of packaging materials from a variety of countries. Focus more on food safety and packaging.
Production Technology and Production Process	Historically, the United States was a major supplier of machinery imports due to its early advancements in processed food production and efficient machinery. Today, Thailand primarily imports machinery from three key countries: China, Japan, and Germany. China leads in machinery imports due to its technological innovation, cost-effective production, and high-volume manufacturing, which allows for competitive pricing. The increasing competition from Europe and the United States has prompted greater adaptability.	The COVID-19 crisis substantially impacted machine manufacturers in China, as lockdowns caused shortages of goods and machine parts. Production plants remained closed, and there were severe restrictions on imports and exports, leading to a direct effect on trading partners.	In the food industry, the production capacity was approximately 50–60% in 2019. However, in early 2020, there was a heightened demand for processed foods, allowing manufacturers to expand their production capacity by 70–80%. Consequently, manufacturers can further boost their production capacity in the event of increased food demand.

Source: Compiled by the national expert for Thailand.

Overview of the Government Approach

The Royal Thai Government introduced new regulations or trade policies in response to the pandemic. Thailand’s policies and rules may influence its attractiveness as a destination for businesses seeking stability and favorable trade conditions. Additionally, government policies and initiatives in Thailand aim to play a significant role in shaping the country’s position in the evolving global supply chain landscape.

Thailand’s 13 Development Milestones, outlined in the 13th National Economic and Social Development Plan, serve as the blueprint for the national development from 2023–27. This plan aims to transform Thailand into a ‘developed country with security, prosperity, and sustainability, guided by the sufficiency economy philosophy.’ It is structured around four fundamental principles, as illustrated in Figure 1. The government has also identified critical industries, such as agro-industry, electric vehicles, medical and wellness, automotive, trade, investment, strategic logistics, and digital and smart electronics, offering targeted support and incentives to promote excellence in these sectors.



Key Development Milestones

Promotion of Thailand 4.0: The Thai government has been actively promoting its Thailand 4.0 initiative, which focuses on transforming the economy through innovation and technology. This initiative aims to make Thailand a hub for advanced manufacturing and digital technologies, thus attracting businesses looking to diversify their supply chains (KPMG in Thailand, 2023b).

Promotion of Industry 4.0: The primary goal of Industry 4.0 is to leverage ICT to enhance productivity, boost automation levels, and improve overall efficiency. Participating in a global supply chain offers several advantages in strengthening a firm's technological capabilities for Industry 4.0, particularly in production planning, inventory management, and data analysis. However, there are notable disparities in technological proficiency among different groups in these areas.

The research findings reveal that foreign firms participating in local and global supply chains exhibit superior technological capabilities compared to local firms operating within local supply chains. Additionally, local firms engaged in GSCs outperform their regional counterparts, particularly in data analysis. This underscores the positive impact of interactions with international firms and engagement in GSCs on technological advancement (Chea et al., 2020).

Investment Promotion Privileges: In the first half of 2023, Thailand witnessed a surge in investment interest, with 891 projects seeking promotion, which amounted to THB364,420 million in value. Notably, 464 of these applications were concentrated in targeted industries, totaling THB286,930 million. This constitutes 79% of the total applications. The key sectors attracting these investments were electrical and electronics, agro-industry, and food processing, as well as the automobile and automotive parts industries (TCEB, 2023).

In particular, the electrical and electronics sector experienced a remarkable seven-fold increase, with 106 investment applications exceeding THB160 billion. This growth is attributed to companies relocating production bases to Thailand to mitigate global trade tensions and conflicts among major powers. Thailand's competitive production costs and investors' growing confidence have further fueled this trend.

Meanwhile, Thailand's largest industry, the agro-industry and food processing sector, welcomed 139 new projects contributing THB51,270 million in investment, alongside substantial expansion investments by local and foreign investors. Prominent international companies, such as Pringles and Lotus Biscoff, have expanded their production operations in Thailand over the past six months.

Furthermore, as of 11 July 2023, Thailand's Sovereign Credit Rating by Fitch Ratings stood at BBB+, with a stable credit outlook. Public debt also began to decrease, and foreign investment has surged by 70%, reflecting a positive economic outlook.

The Thailand Board of Investment (TBI) extends a range of incentives and investment promotion benefits to entice foreign investors, particularly those considering establishing or transferring manufacturing operations to Thailand. These inducements encompass potential tax exemptions, simplified work permit procedures, and import duty waivers.

Eastern Economic Corridor (EEC): Thailand's Eastern Seaboard has been a global business hub for over three decades, fostering trade and investment. It has consistently been acknowledged as

the preferred destination for major industrial manufacturers. Presently, Thailand is actively cultivating fresh business prospects for prospective investors in emerging industries, positioning itself as the industrial nucleus of the future and a strategic regional office location for leading global companies.

Through extensive expansion and development of transportation and logistics systems, the new facilities aim to evolve into a comprehensive business center, supporting trade, investment, logistics, and tourism in Asia (TBI, 2017). EEC is a key area for industrial development, infrastructure improvement, and innovation-driven industries. It aims to attract high-tech industries, including aerospace, automotive, electronics, and biofuels.

Trade Agreements: Thailand is part of various RTAs, including ASEAN and ASEAN Plus, which provide access to a large consumer market. The government continues to pursue trade agreements and partnerships to enhance Thailand’s attractiveness as a regional manufacturing and export hub.

Customs and Trade Facilitation: Thailand has been working to improve customs and trade procedures to facilitate the smooth flow of goods and reduce trade barriers. These efforts are primarily centered around improving efficiency at ports and border crossings. The five key initiatives (NESDC, 2022) are listed.

1. Promote paperless customs clearance processes by simplifying import and export procedures.
2. Establish information linkages for permits and certificates of main products.
3. Harmonize and standardize commodity codes to enable the development of a single application e-form for each restricted product and facilitate information exchange with the National Single Window (NSW) system.
4. Create a single e-form platform to streamline the processes.
5. Accelerate changes and improvements in laws and regulations, enabling paperless transactions and information exchange through the NSW system.

These measures aim to improve trade processes and reduce paperwork, ultimately fostering a more conducive environment for businesses and international trade.

Logistics and Infrastructure: Ongoing investments in logistics infrastructure, including ports, airports, and transportation networks, aim to establish efficient connectivity for businesses involved in supply chain operations. Notably, the first phase of a high-speed train project is expected to be completed by 2026. This project will link Bangkok with key strategic locations within Thailand and extend to the Malaysian border. The project will bolster domestic connectivity and also foster enhanced linkages with neighboring countries, promoting regional economic integration (KPMG in Thailand, 2023b).

Digital Transformation: The government is proactively championing the integration of digital transformation and Industry 4.0 practices within manufacturing and supply chain operations to

bolster competitiveness and efficiency. Under the Thailand 4.0 model, digital infrastructure development takes center stage, focusing on harnessing the potential of 5G networks and efficiently managing telecommunications infrastructure, ultimately propelling 5G technology.

Moreover, Thailand 4.0 advocates for collaborative efforts between the public and private sectors, exemplified by initiatives like the Thailand 5G Alliance. This partnership framework is instrumental in launching projects such as Smart Hospitals and other ventures that drive technological advancements and innovations (KPMG in Thailand, 2023b).

Sustainability Initiatives: Thailand is placing a significant emphasis on sustainability and environmental considerations across various industries (ITA, 2021; NESDC, 2022; EIU, 2021). Companies that adopt environment-friendly practices can access government support and incentives. These initiatives encourage businesses to become more environmentally responsible by adopting three key measures.

1. Promote energy efficiency to reduce resource consumption.
2. Implement measures to decrease greenhouse gas emissions.
3. Embrace policies that advocate using alternative energy sources within the supply chain, such as electricity, biofuels, and natural gas.

By integrating these sustainable practices, companies can contribute to environmental conservation and gain access to government support and incentives to drive their eco-friendly initiatives.

New GSC Dynamics and Their Impact on Aggregate and Firm-Level Productivity

The dynamics of GSCs significantly impact aggregate and firm-level productivity in Thailand. These dynamics influence productivity at two levels.

Aggregate Productivity

Several critical metrics emerge when evaluating Thailand's overall productivity in the post-pandemic global supply chain. These include:

GDP Growth and GDP Per Capita: Thailand's potential to position itself as an attractive destination for foreign investment and manufacturing is a pivotal driver of productivity. This positioning has the potential to significantly impact GSC dynamics by enhancing GDP growth and per capita income. Additionally, Thailand's appeal as a manufacturing hub can create substantial export opportunities, further boosting the GDP and per capita income.

Logistics Performance Index: Both the government and private sectors are heavily investing in infrastructure development, focusing on transforming Thailand into a regional and global industrial hub. Key investments target logistics infrastructure improvements, including improvements in e-customs clearance procedures, streamlined international transport facilitation, and integrated network of water, air transport, and standard railways. These enhancements aim to reduce logistics costs, minimize delays, and improve the country's LPI score.

Digital Skills Readiness: Significant financial commitments are being directed toward ICT, enabling the digitalization of various industries. The country is fostering digital skills readiness

across sectors and accelerating digital transformation by driving the adoption of technologies such as AI, IoT, automation, Augmented Reality (AR), and Virtual Reality (VR).

Human Capital Readiness: Alongside infrastructure and technology, workforce development is a critical focus for the government and private sectors. Investments in education and training are integral to this strategy and are designed to expand Thailand's pool of skilled labor. The ultimate goal is to elevate human capital readiness at the aggregate level.

Research and Development Expenditure as a Percentage of GDP: Collaboration with global partners is expected to facilitate valuable technological transfers, driving improvements in R&D expenditure as a percentage of GDP. This focus on R&D is likely to enhance productivity across multiple industries.

In summary, Thailand's potential to influence global supply chain dynamics in the post-pandemic era relies on its capacity to attract foreign investment and manufacturing. Strategic infrastructure investments, digitalization, workforce development, and technological transfers are poised to elevate overall productivity and propel economic growth.

Firm-Level Productivity

Several key metrics emerge when assessing firm-level productivity in Thailand within the post-pandemic global supply chain.

Total Sales: This provides a critical measure of a firm's ability to effectively sell its products or services and serves as a primary indicator of financial performance.

Labor Productivity: Labor productivity is another key indicator, typically calculated as the ratio of sales per person or sales per hour. It reflects how efficiently a firm utilizes its workforce to generate revenue.

Percentage of HRD Investment per Total Sales: This metric indicates the level of investment in educating and upskilling the workforce. Such investments are crucial for enhancing skills and, ultimately, for increasing labor productivity.

Percentage of R&D Investment per Total Sales: This metric reflects a company's commitment to advancing technology and innovation. R&D investments elevate the value of products and services, helping firms stay competitive in the market.

Supply Chain Flexibility: This criterion assesses a company's capacity to react to customer orders with minimal or no prior information. It reflects a firm's agility and versatility in promptly fulfilling customer requests. In a disruptive era, supply chain flexibility gains significance as customers increasingly value supplier agility.

When evaluating firm-level productivity in Thailand's post-pandemic global supply chain, these key metrics help assess a company's effectiveness in selling products or services, how efficiently it utilizes its workforce, investments in HRD, technology innovation, and agility in adapting to dynamic supply chain demands. Collectively, these factors contribute to a firm's overall productivity and competitiveness within the global supply chain.

Nonetheless, it is essential to recognize that the impact of GSC dynamics on productivity in Thailand is not uniform and varies based on industry, company size, and specific conditions. While many enterprises appreciate the advantages of their involvement in GSC, others may face challenges related to competition, cost constraints, or technological demands.

In conclusion, Thailand’s participation in GSC holds the potential to boost overall and company-level productivity. However, realizing this potential requires meticulous strategic planning, encompassing demand and supply aspects, strategic sourcing, flexible production, streamlined logistics, planned investments, and adapting to ever-changing global dynamics.

Impact of GSC on Thailand

Sectoral coverage

GSCs significantly impact various sectors in Thailand due to the country’s active participation in international trade and manufacturing. The effects of GSCs are seen across multiple industries, including automotive, electronics, agriculture, and textiles. These sectors are susceptible to shifts in supply chain dynamics, including changes in global demand, disruptions due to geopolitical tensions, and evolving trade policies.

The situations and impacts of GSCs across various industrial sectors in Thailand are summarized in Table 2.

TABLE 2

SUMMARY OF SITUATIONS AND IMPACTS OF GSC ON SECTORAL COVERAGE IN THAILAND.

Sector	Situations	Impacts
Agriculture and Food Processing	<ul style="list-style-type: none"> The growth trajectory of Thailand’s agricultural sector has shifted from a focus on quantitative expansion, such as increasing the size of plantations, to emphasizing the improvement of quality and productivity. Key agricultural products in Thailand include rice, rubber, cassava, chicken, fruit, shrimp, and processed food (Tansuchat et al., 2022). The Thai government has prioritized smart farming to revolutionize the agricultural sector. Initiatives like the Young Smart Farmer program equip participants with advanced technologies such as IoT and precision farming techniques. To accelerate the development of the food and beverage industry, the public and private sectors are collaborating to develop Pathum Thani as a ‘food valley’ or an ecosystem that facilitates knowledge sharing and R&D and centralizes the entire value chain of the food industry (KPMG in Thailand, 2023b). 	<ul style="list-style-type: none"> Export Opportunities: GSCs offer Thai agricultural and food processing industries opportunities to export products to international markets. Supply chain integration can lead to increased demand for agricultural products. Quality and Standards: Thai producers often need to meet international quality and safety standards to participate effectively in GSCs, which can improve product quality and safety.

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Sector	Situations	Impacts
<p>Automotive and Electronics Manufacturing</p>	<ul style="list-style-type: none"> • Thailand is Asia’s 5th largest parts manufacturer for Internal Combustion Engine vehicles and the 11th largest globally. Electric Vehicles (EVs) are seeing increased awareness and investment in Thailand as a part of New S-Curve development, and the nation’s goal is to become the EV hub for ASEAN by 2025. The Thai government has plans to strengthen the country’s EV manufacturing capability by establishing the National Electric Vehicle Policy Committee. Production goals have been set to 1 million EVs by 2025, 50% of total production by 2030, and 18 million by 2035. The private sector is also investing in the EV infrastructure to increase the number of EV fast charging stations nationwide to 12,000 by 2030 (KPMG in Thailand, 2023b). • Electronics products accounted for approximately USD 42 billion of Thailand’s exports in 2022, representing approximately 14% of Thailand’s total export value. In 2010, Thailand’s main electronics exports were computer components and integrated circuits. However, to support Thailand 4.0 policies, the industry is being pushed to adopt 5G technology. The Thai government has set a goal of expanding 5G networks to cover 98% of the population by 2027. The government is also pushing the electronics manufacturing industry to develop smart appliances, microelectronics, IoT, and embedded systems as a part of the New S-Curve development (KPMG in Thailand, 2023b). 	<ul style="list-style-type: none"> • Positive Impacts: Thailand has a well-established automotive and electronics manufacturing sector, with many global manufacturers operating there. GSCs enable these industries to access global markets and use cost-effective production processes. • Job Creation: The automotive and electronics sectors provide employment opportunities for a substantial portion of Thailand’s workforce, leading to job creation and economic growth.
<p>Energy and Renewable Resources (ITA, 2021)</p>	<ul style="list-style-type: none"> • Thailand has strongly advocated for renewable energy and energy efficiency to reduce reliance on fossil fuels, especially natural gas, and minimize environmental impact. The country’s initiatives cover solar, wind, hydropower, biomass, biogas, municipal solid waste, geothermal power, and biofuels. • Thailand aims to boost its renewable energy capacity over 20 years. The government targets achieving 30% renewable energy (including imported hydropower) in total energy consumption by 2037, with a procurement goal of 18,696 megawatts. This plan could surpass the 30% national target before 2037, potentially resulting in annual savings exceeding USD9 billion. 	<ul style="list-style-type: none"> • Investment Opportunities: GSCs drive investments in energy infrastructure, including renewable energy projects. Thailand’s commitment to sustainability initiatives attracts investment in this sector.

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Sector	Situations	Impacts
Energy and Renewable Resources (ITA, 2021)	<ul style="list-style-type: none"> In Thailand’s transition to a low-carbon economy, the Ministry of Energy prioritizes the adoption of smart energy, particularly smart grids. State-owned enterprises must invest approximately USD6.4 billion in smart grids by 2036 to enhance energy supply, improve efficiency, bolster grid resilience, and reduce carbon emissions. In the power sector, renewable energy capacity has doubled since 2012. Bioenergy and hydropower dominate, while solar PV and wind power are rapidly growing. These advancements are mainly attributed to the generous and supportive feed-in-tariff system known as Adder. This positive trend is expected to continue if government policies remain clear and supportive of renewable energy. 	<ul style="list-style-type: none"> Energy Efficiency: The demand for energy-efficient manufacturing processes within GSCs can improve energy efficiency and resource management.
Logistics and Transportation (NESDC, 2022)	<ul style="list-style-type: none"> In 2020, Thailand’s logistics costs were THB2,199.3 billion, accounting for 14% of the GDP at current prices (Nominal GDP), marking a 1.2% decrease from the prior year due to the economic impact of COVID-19. In 2021, Thailand’s logistics costs are estimated at THB2,238.8 billion, equivalent to 13.8% of Nominal GDP, reflecting a 1.81% growth rate. This growth corresponds to the recovery in national economic activities, driven by eased COVID-19 restrictions, financial stimulus measures, support for tourism, and global economic rebound, which has expanded exports. For 2022, logistics costs-to-GDP Estimates are expected to decrease, ranging from 12.9% to 13.3% of GDP. However, it is crucial to exercise caution and assess potential risk factors that could impact future logistics costs. These factors encompass the spread of new COVID variants, the Russia-Ukraine conflict, and possible increases in global inflation, oil prices, and shipping charges. 	<ul style="list-style-type: none"> Critical Enabler: The logistics and transportation sector facilitates GSCs. Investments in this sector help ensure the efficient movement of goods within and outside Thailand. Job Creation: The logistics sector contributes to job creation, particularly in shipping, warehousing, and distribution. Infrastructure Development: GSCs necessitate investments in infrastructure, including roads, ports, and industrial zones. These developments support the construction and infrastructure sector. Project Opportunities: Infrastructure projects linked to GSCs provide opportunities for construction firms to secure contracts and drive economic growth.

Source: Compiled by the national expert for Thailand.

It is important to note that while GSCs offer numerous benefits, they also pose challenges related to competition, supply chain disruptions, and the need to meet international standards. The impact of GSCs on each sector in Thailand can vary depending on factors such as market demand, government policies, and global economic conditions.

Impact of New GSC Trends on Aggregate Productivity and Economic Development

Table 3 summarizes the impact of new GSC trends on Thailand’s aggregate productivity and economic development. The positive effects include economic growth, expanded exports, economies of scale, increased environmental awareness, infrastructure development, skills and workforce development, and technology transfer. Conversely, the negative impacts include heightened competition, dependence on foreign markets, income inequality, regulatory challenges, resource allocation issues, and vulnerabilities in the supply chain.

To fully capitalize on the benefits of emerging GSC trends, Thailand should adopt a well-rounded strategy to maximize the favorable effects while mitigating the adverse ones. This strategy should focus on education, skill development, infrastructure, innovation, and sustainability investments. It also includes implementing strategies to bolster supply chain resilience and adapt to evolving global dynamics. The collaboration between effective government policies and private-sector initiatives is vital for fully harnessing GSCs’ potential to enhance Thailand’s overall productivity and promote economic development.

TABLE 3
SUMMARY OF THE IMPACTS OF NEW GSC TRENDS ON AGGREGATE PRODUCTIVITY AND ECONOMIC DEVELOPMENT.

Positive Impacts	Negative Impacts
<p>Economic Growth: New GSC trends contribute to Thailand's economic growth by attracting FDIs and encouraging the establishment of regional production hubs. This can lead to increased industrialization and a rise in the country's GDP.</p>	<p>Competition and Margins: The operating within GSCs encounter fierce competition, potentially squeezing profit margins. This scenario could impact the country's overall economic well-being if firms find it challenging to maintain competitiveness.</p>
<p>Export Expansion: Participation in GSCs allows Thai firms to access global markets and diversify their customer base. As a result, exports can grow, leading to higher foreign exchange earnings and economic development.</p>	<p>Dependence on Foreign Markets: Overreliance on exports and GSCs renders the Thai economy susceptible to changes in global demand and market conditions. It is crucial to diversify economic activities as a risk-mitigation strategy.</p>
<p>Economies of Scale: As firms engage in GSCs, they can achieve economies of scale by producing larger quantities and spreading fixed costs over a broader production base. This can lead to cost reductions and increased competitiveness.</p>	<p>Income Inequality: The benefits of participating in GSCs may not be equitably distributed. Income inequality could expand as certain sectors and regions experience more substantial benefits, potentially resulting in social and economic disparities.</p>

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Positive Impacts	Negative Impacts
<p>Environmental Concerns: Greater industrialization and involvement in GSCs can lead to environmental challenges like pollution and resource depletion. Nonetheless, a higher degree of GSC involvement, coupled with technological advancements, can aid in mitigating pollution emissions (Wang et al., 2021).</p>	<p>Regulatory Challenges: GSCs often involve coordination with international partners and compliance with complex regulations. Effectively managing these regulatory challenges can pose obstacles to economic development.</p>
<p>Infrastructure Development: To support GSCs, governments typically invest in infrastructure development, including transportation networks, ports, and logistics hubs. Improved infrastructure can reduce transportation costs, enhance efficiency, and stimulate economic development.</p>	<p>Resource Allocation: Investment in infrastructure and technology required for GSC participation may divert resources from other critical sectors or social services. It is imperative to allocate resources prudently to maintain a balance that meets economic development requirements.</p>
<p>Skills and Workforce Development: The demand for skilled labor and specialized skills within GSCs can lead to investments in education and training programs. This can result in a more skilled workforce, which contributes to higher productivity and economic development.</p>	<p>Supply Chain Vulnerabilities: While GSCs offer numerous benefits, they also expose Thailand to supply chain vulnerabilities. Disruptions in the GSCs, as evidenced during the COVID-19 pandemic, can negatively impact productivity and hinder economic development.</p>
<p>Technology Transfer: Collaboration within GSCs often involves technology transfer and knowledge sharing. Thai companies can benefit from adopting advanced technologies and best practices, which can lead to productivity improvements and economic development.</p>	

Source: Compiled by the national expert for Thailand.

As the second-largest economy in ASEAN, Thailand achieved a nominal GDP of USD 495.2 billion in 2022, reflecting a steady annual growth rate of 2.6%. Thailand’s impressive transportation infrastructure, substantial cross-border trade, and supportive government policies have attracted several MNCs to relocate their supply chains, particularly in the electronics, chemicals, and automotive industries.

Thailand’s strategic geographical position and remarkable growth prospects position it as an attractive business hub within Southeast Asia. Given the complexities of today’s supply chain landscape, the country stands out as a convincing choice. Its well-established infrastructure offers companies seeking to reconfigure their supply chains access to a thriving market and efficient production capabilities, ready to meet the dynamic demands of the modern business world (KPMG in Thailand, 2023b).

A consistent increase is evident when analyzing GDP per capita trends, from USD4,385 in 2005 to USD6,278 in 2022. However, a notable contraction occurred in 2009, with GDP per capita dropping to USD4,758 due to the global financial crisis. In 2020, amid the COVID-19 pandemic, it decreased to USD6,048, with the growth rate dipping to -1.4%. The GDP per capita growth trajectory also exhibited fluctuations, peaking at 6.79% in 2010 and experiencing a sharp decline to 0.19% in 2011, primarily due to a massive flood. The growth rebounded to 6.55% in 2012 but gradually declined in the following years, ultimately hitting its lowest point at -6.28% in 2020, primarily due to the pandemic, as shown in Figures 2 and 3.

Trends in R&D expenditure as a percentage of GDP in Thailand from 2005–22 indicate a 0.22% spending that remained relatively stable until 2009. In 2011, there was a notable increase to 0.36%, which continued to rise, reaching 1.14% in 2019. In 2020–22, the estimated value of R&D investments in Thailand hovered around 1%, as shown in Figure 4.

The total labor force in Thailand ranged from 38.14 million to 41.19 million between 2005 and 2022. It steadily increased during 2005–12, reaching a peak of 41.19 million, but subsequently declined to 40.23 million in 2022, as shown in Figure 5.

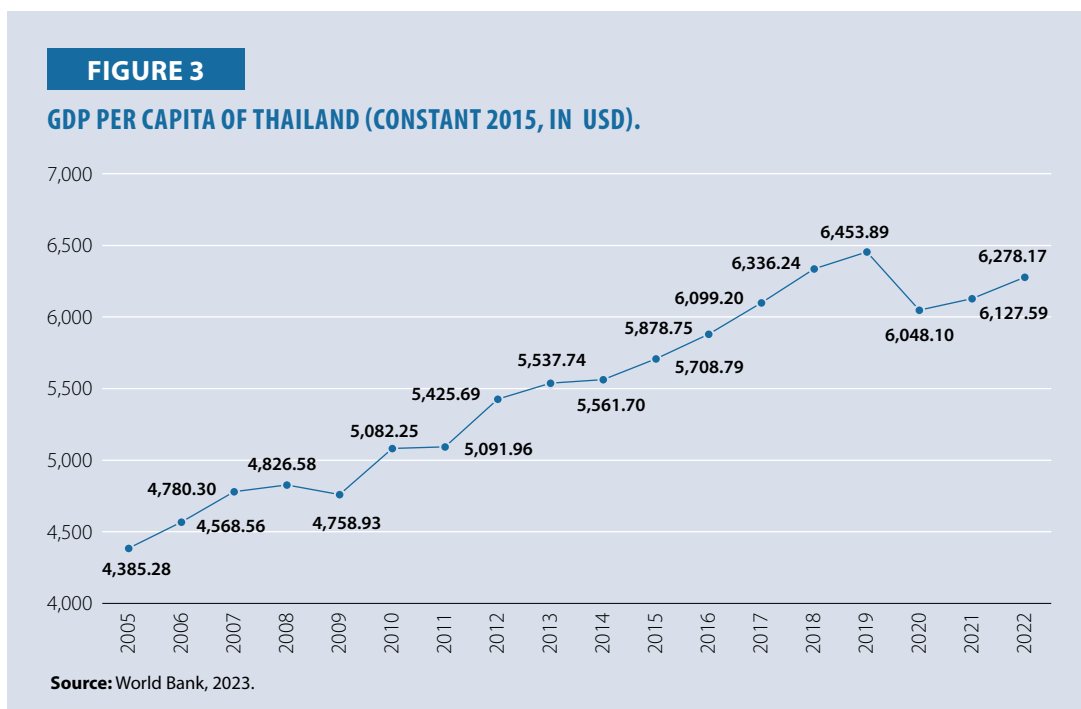
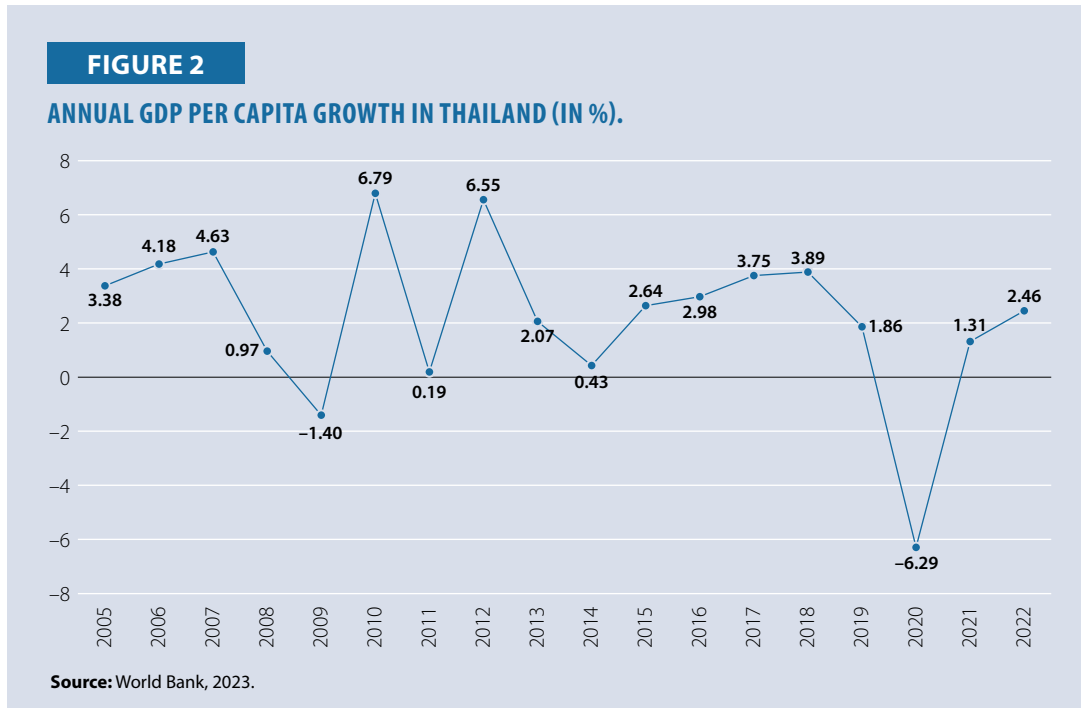
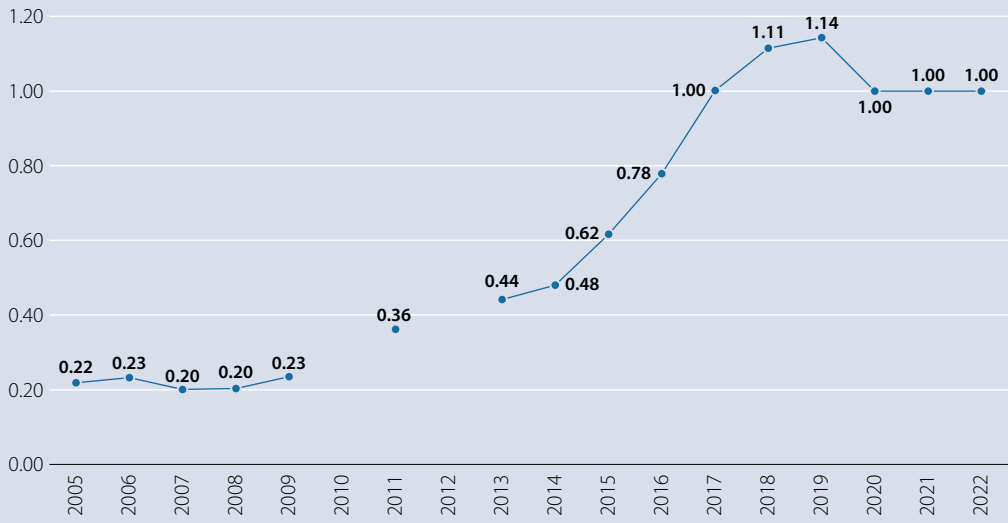


FIGURE 4

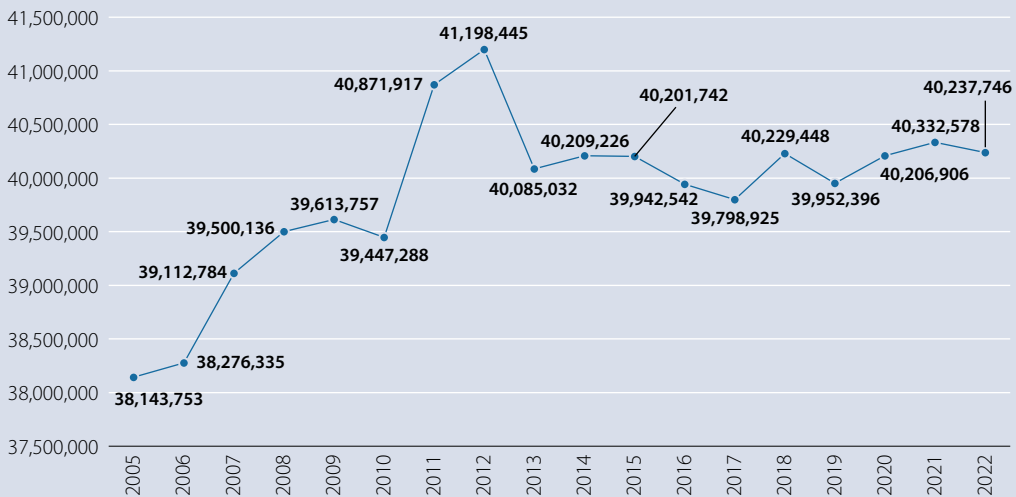
R&D EXPENDITURE OF THAILAND (% OF GDP).



Source: Statista, 2023; World Bank, 2023.

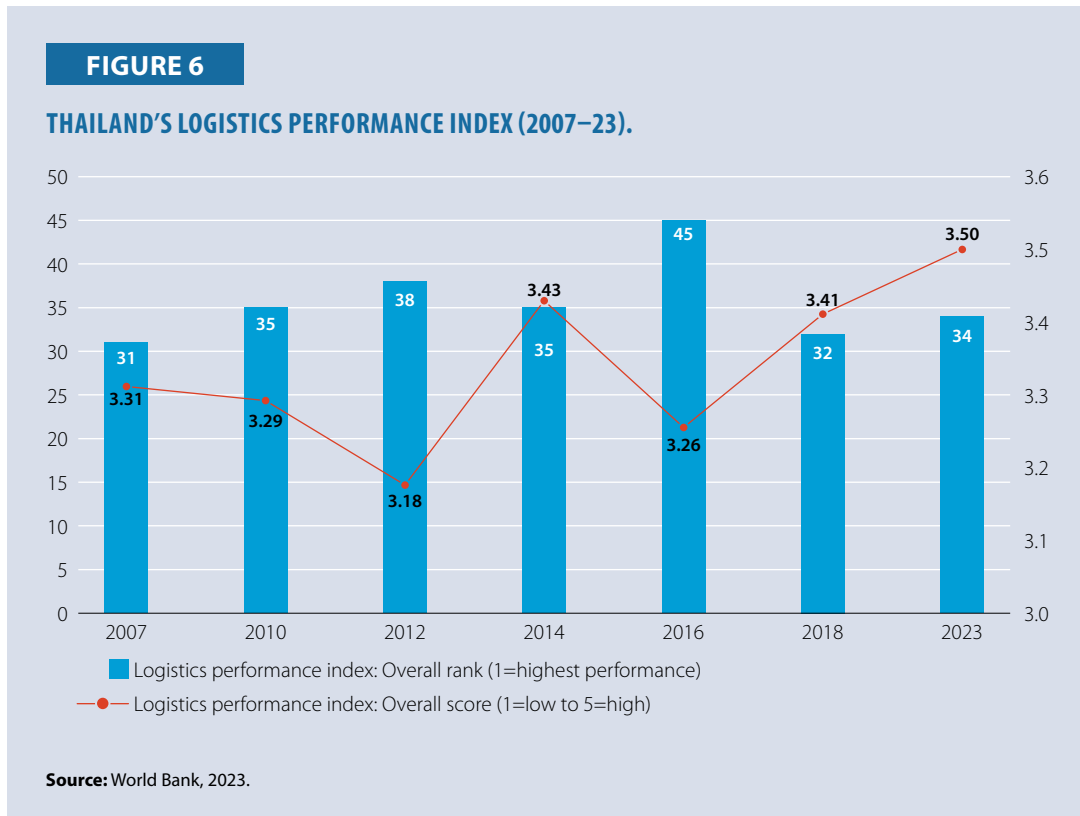
FIGURE 5

TOTAL LABOR FORCE IN THAILAND.



Source: World Bank, 2023.

An examination of Thailand’s LPI reveals a fluctuating trend in the country’s performance. The index indicates a notable improvement during 2007–14, followed by a downturn in 2016. Subsequently, the ranking rebounded in 2018 but saw a decline in the post-pandemic period, aligning with the pre-pandemic LPI score. Despite an increase in the LPI score after the pandemic, Thailand’s ranking dropped due to intensified competition in the global logistics landscape, as illustrated in Figure 6.



Case Study

Thailand is a significant exporter of various agricultural commodities, including rice, cassava, chicken, rubber, and fruits. In addition, Thailand’s exceptional standing in global markets, particularly in the food industry, and its performance during the COVID-19 pandemic have been closely monitored. The food industry has positive and negative impacts. Therefore, for a case study on Thailand, the food industry serves as a preferred representative, highlighting its significance and adaptability in challenging circumstances.

Introduction of the Company and GSC Plans

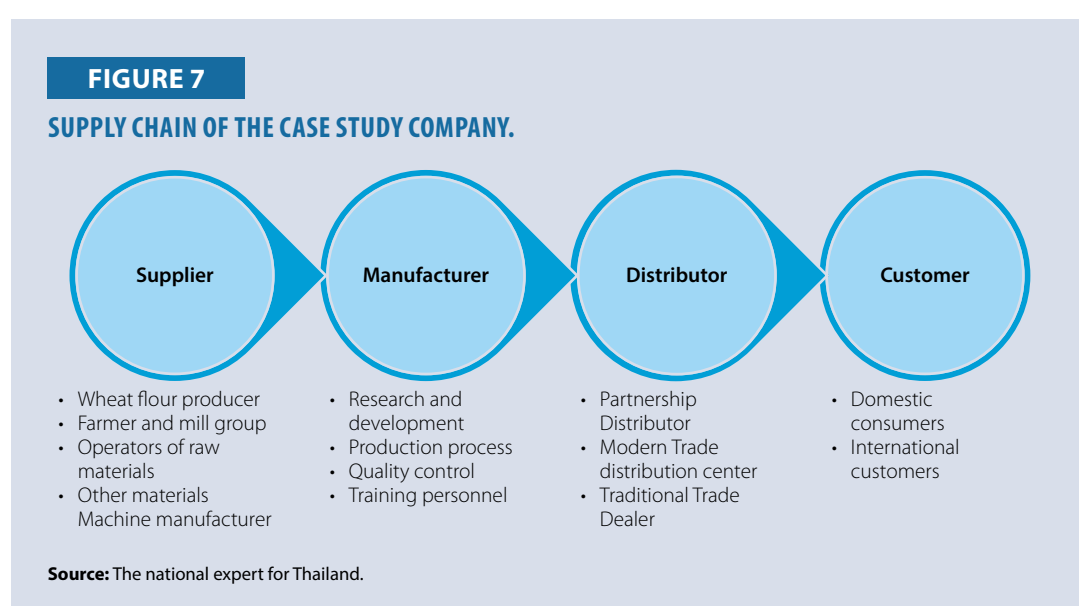
For over five decades, the company has produced instant noodles, rice vermicelli, noodles, rice soup, and biscuits for domestic and export markets. It has weathered challenges such as the Tom Yum Kung crisis in 1997, the major floods in 2011, and the COVID-19 pandemic in 2020. The company’s resilience is built on three pillars.

1. Delivering the right product with top quality and strong customer responsiveness.
2. Fostering robust partnerships.
3. Implementing sound management practices, including significant investment, innovation, technology adoption, green initiatives, sustainability, and good governance.

The company manages 11 affiliated companies and six joint ventures, spanning various sectors, including raw materials, packaging, food, investment, and automatic packing machinery, as shown in Figure 7. Utilizing a vertical integration strategy, the company controls the quality and quantity of raw materials and packaging, ensuring streamlined and efficient production processes.

The company holds several international certifications in food safety, including ISO 9001 for Quality Management Systems, ISO 14001 for Environmental Management Systems, ISO/IEC 17025 for Laboratory Management System, GMP standards, HACCP food standards, BRC Global Standard for Food Safety, Kosher Food Manufacturing Standards, Halal Food Manufacturing Standards, AEO Importer and Exporter Standards, among others.

Post-COVID-19, heightened consumer health concerns have prompted the company to prioritize the development of health products. It has introduced low-sodium alternatives and remains committed to stringent food safety standards. The company’s focus extends beyond economic considerations, including social and environmental responsibilities. The company prioritizes employee well-being, supports local communities by sourcing raw materials locally, and actively engages in community activities to uplift underprivileged groups. It is also dedicated to environment-friendly operations, continuously integrating innovations and technologies for resource efficiency, aligning with the SDGs, and fostering a Bio-Circular-Green Economy for holistic economic development.



Impact of Global Supply Chain on the Company

A summary of the potential impact on various aspects of the company is outlined in Table 4. Besides comparing key factors before and after the pandemic, the table also highlights the effects on production processes, logistics, supply chain, workforce management, digital transformation, and demand for ESG. It also showcases the company’s adaptability to global disruptions, demonstrating how it navigated challenges and leveraged opportunities in the evolving global supply chain landscape.

TABLE 4
IMPACT ON KEY ASPECTS BEFORE AND AFTER COVID-19.

Impact in	Before COVID-19	After COVID-19
Sourcing (Diversification and Relocation)	90% of raw materials are now diversified, but 10% still come from a single source.	Enhanced local sourcing, doubled order lead time (1 to 2 months), and customer-driven raw material usage forecasting.

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Impact in	Before COVID-19	After COVID-19
Production (Technology/Automation)	Striving for increased automation in production despite being labor-intensive.	<p>Launching an automation initiative as a pilot project at a mass production plant.</p> <p>Adopting electronic data entry to minimize paper usage, save time, and reduce errors.</p> <p>Introducing Total Productive Maintenance to enhance machine utilization.</p>
Logistics	Domestic distribution involves partnering with distributors, while international distribution relies on freight forwarders and carriers.	During the pandemic, imported electronic parts faced delivery challenges, prompting the use of shared components within plants. The implementation of robots in warehouses is underway, with plans for a fully automated warehouse system in the future.
Labor (Inhouse/Outsource/Multiple Shifts)	A significant increase in employee turnover is occurring as a result of heightened competition within the Eastern Seaboard Industrial Estate.	The COVID-19 pandemic has led to a notable labor shortage in the industry, with workers returning home and quarantine measures limiting foreign labor movement. Local workers' infection concerns have affected production and deliveries. The company is responding by increasing working hours to meet sales demands, complying with labor laws, and negotiating with customers on product details, delivery volumes, and schedules for effective planning amidst these challenges. After the pandemic, the company recruited additional workers who had been laid off from other industries.
Productivity Policy	Prioritize worker productivity through training initiatives and maximize machine utilization.	Additional training opportunities for workers and integration of Total Preventive Maintenance practices for enhanced efficiency.
Digital Transformation	Currently reliant on paper-based data collection, but in the process of transitioning to a paperless system.	<p>The COVID-19 pandemic has accelerated the adoption of online practices, piloting online data collection, and virtual meetings as the standard operating procedures.</p> <p>Implement the IoT Platform and Industrial Energy Data Analysis</p>
ESG Transformation	<p>E: Initiating a project to actively reduce water usage.</p> <p>S: Promoting inclusivity by accommodating employees with disabilities.</p> <p>G: Ensuring good governance practices across the organization.</p>	<p>Implement solar rooftops to cut electricity costs and lower carbon emissions.</p> <p>The company earned the ASEAN Assets Class PLCs recognition in the ASEAN Corporate Governance Scorecard 2022 survey for listed companies in ASEAN countries.</p>

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Impact in	Before COVID-19	After COVID-19
Sustainable Supply Chain Strategies	It is a goal of the business	Implement a carbon credit Program. The company was honored with the Sustainability Model Organization Award for Disabled Support in the Thai Capital Market for 2022 by the Securities and Exchange Commission.
Supply Chain Collaboration	Adhering to fair trading terms and conditions, promoting honest and fair competition. Engaging in knowledge exchanges and joint development efforts while conducting business ethically within the legal framework.	Maintain supplier communication confidentiality, refraining from using it for personal gain. Foster positive relationships, exchange knowledge, and collaboratively enhance products and services for mutual growth. Increased communication during the pandemic, but no point-of-sale sharing has been implemented yet.

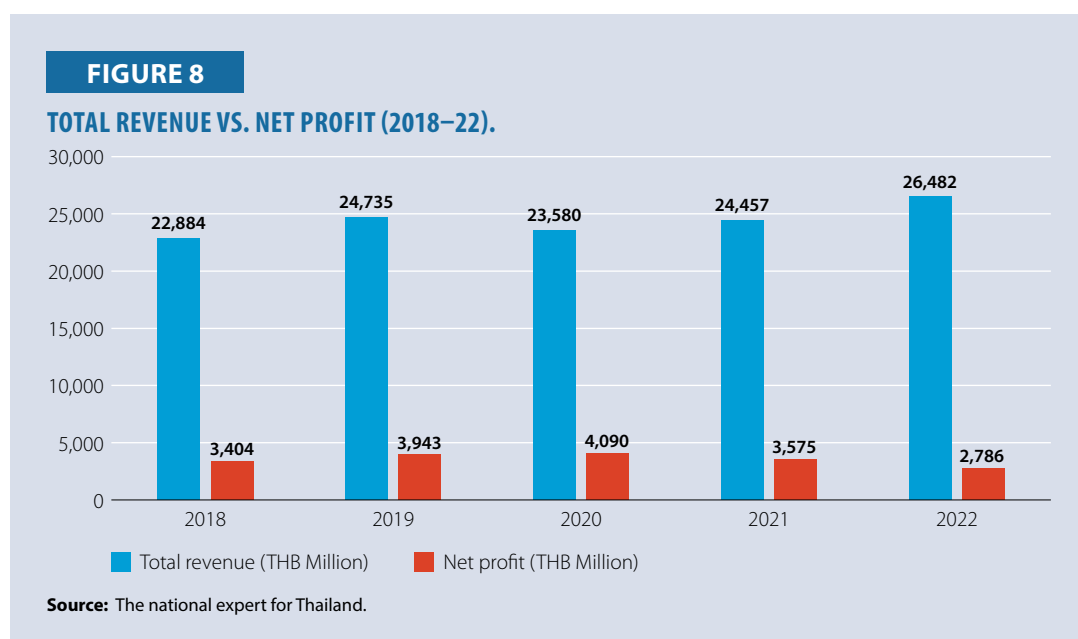
Source: Compiled by the national expert for Thailand.

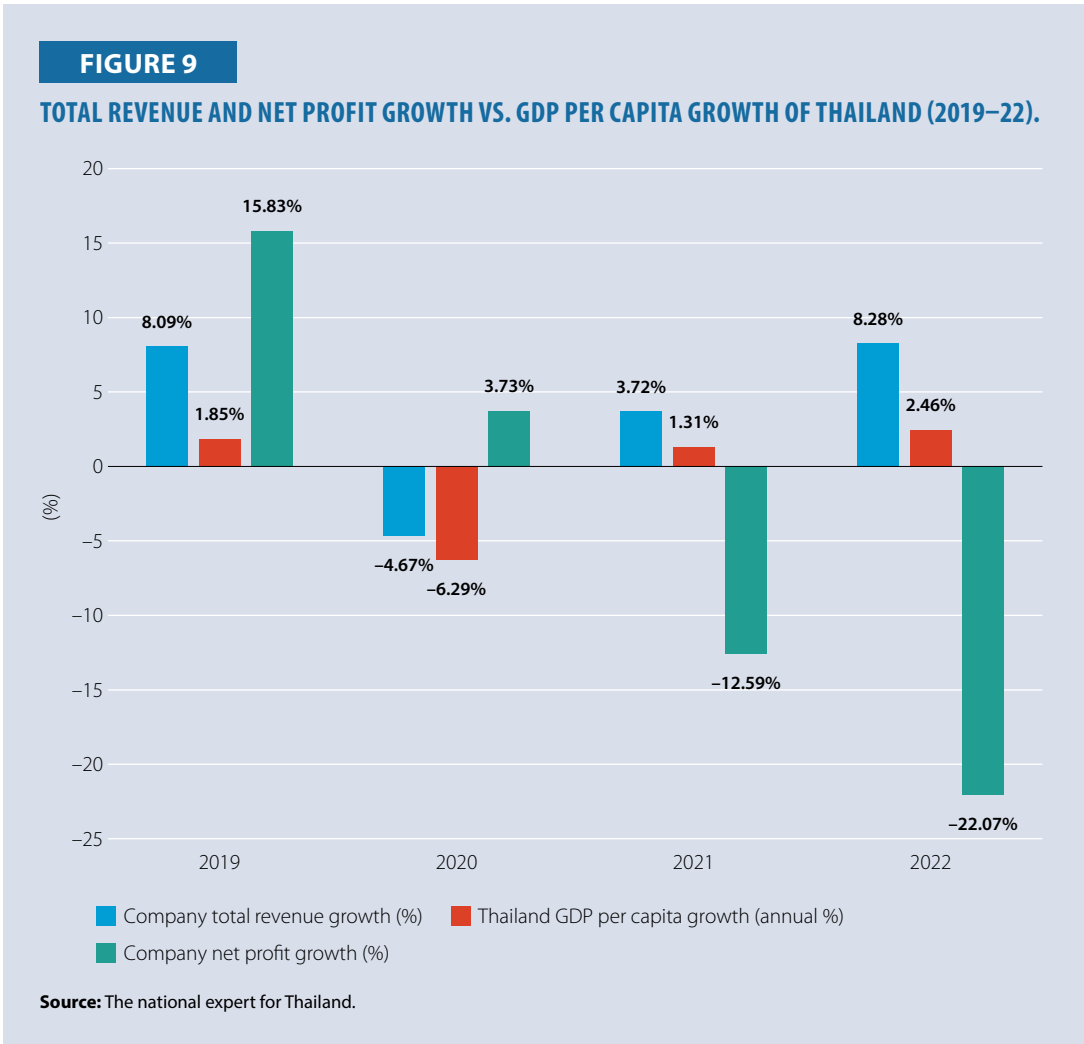
Analysis of the Company Data

Business Performance

While the company’s total revenues rose during 2018–22, its net profit before the pandemic was higher than the post-pandemic period. This is primarily due to the escalation of raw material and logistics costs. Notably, the company’s net profit peaked in 2020, as depicted in Figure 8.

A comparison between the company’s total revenue growth and Thailand’s GDP per capita reveals a similar pattern. Both experienced a dip in 2020, followed by an upward trend. However, the company’s net profit growth turned negative after 2020, as illustrated in Figure 9. This divergence highlights the challenges faced by the company in managing rising costs amid global supply chain disruptions.



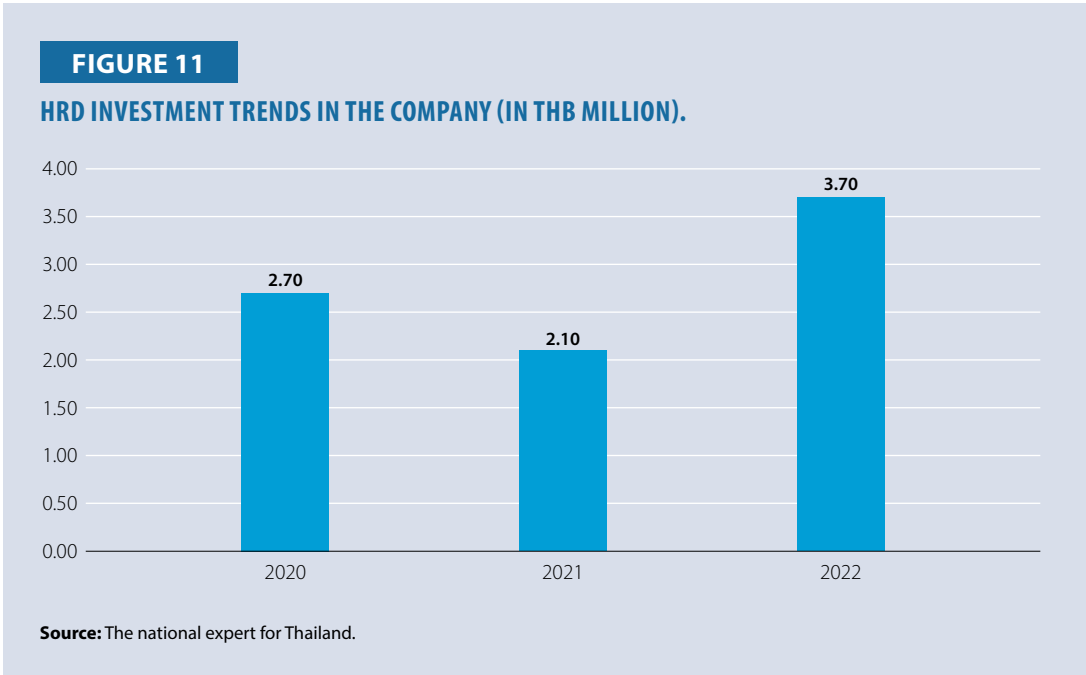
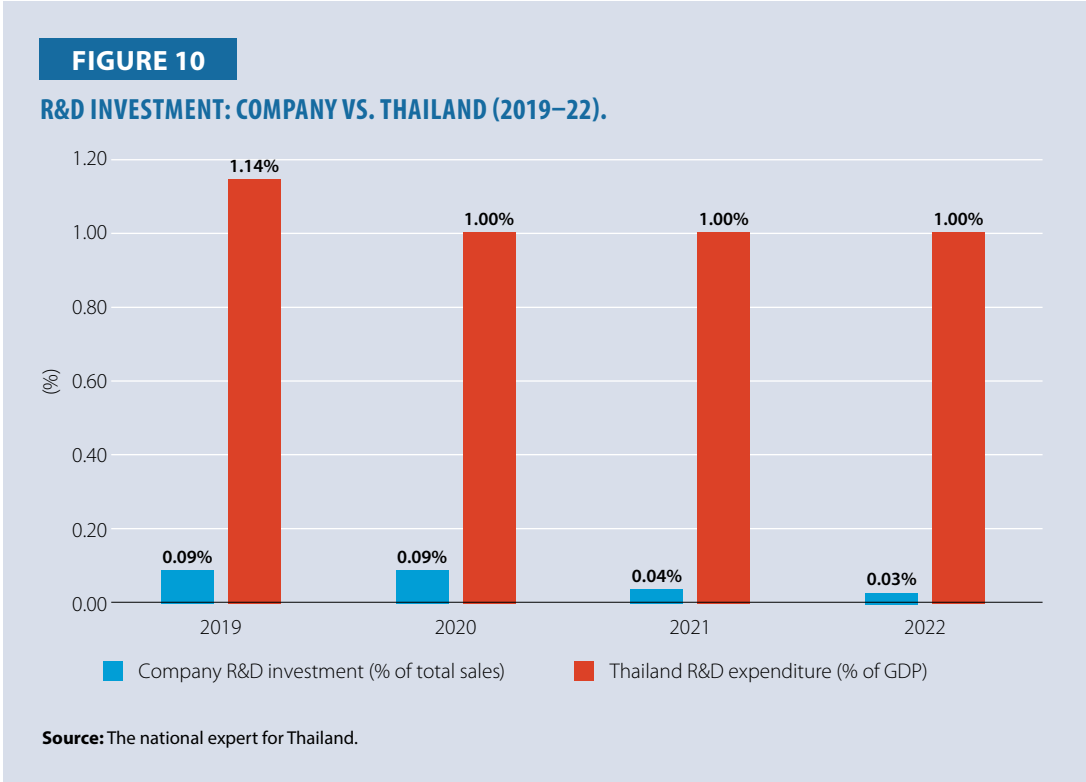


The case study indicates that the company’s R&D investment is significantly lower than the national average, even though Thailand’s overall R&D spending lags behind leading global innovators, as shown in Figure 10. To bridge this gap, redirecting funds from agricultural subsidies to increased government investment in R&D could spur industry growth. While the company focuses on new product development, enhancing innovation in processes to reduce costs and leveraging data analytics to optimize supply chain decisions could further improve its competitive edge.

While no data is available on the company’s HRD investments in the pre-pandemic period, Figure 11 indicates a fluctuation. In 2021, there was a reduction in HRD investment, followed by an increase in 2022.

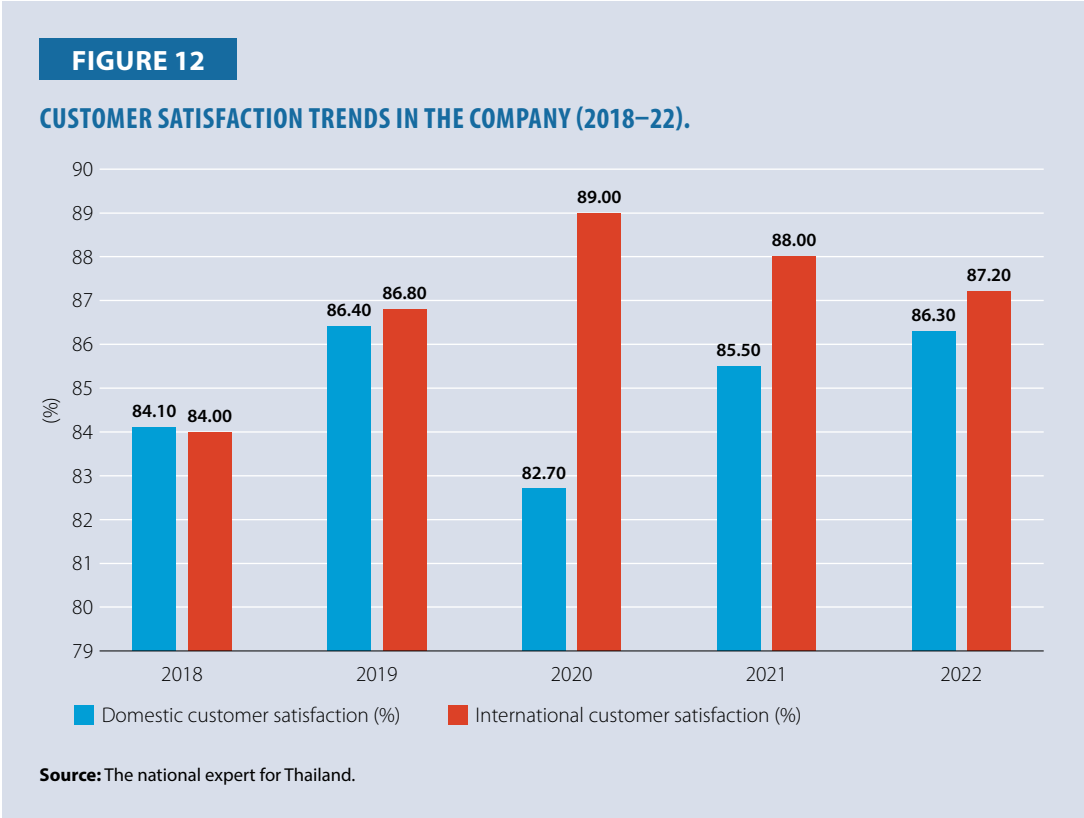
Customer satisfaction is evaluated based on factors such as service, product quality, and delivery, with a target of 85%. While international customer satisfaction shows an overall upward trend, it declined post-2020, with a slight annual reduction of around 0.8–1% due to factors like COVID-19, rising freight charges, and the impact of war.

Despite these challenges, the company maintained smooth and continuous operations. On the other hand, domestic customer satisfaction, which witnessed an upward trajectory before the pandemic,



reached a low during the pandemic, as depicted in Figure 12. However, it gradually increased after the pandemic, with the company focusing on improving service, product quality, and delivery.

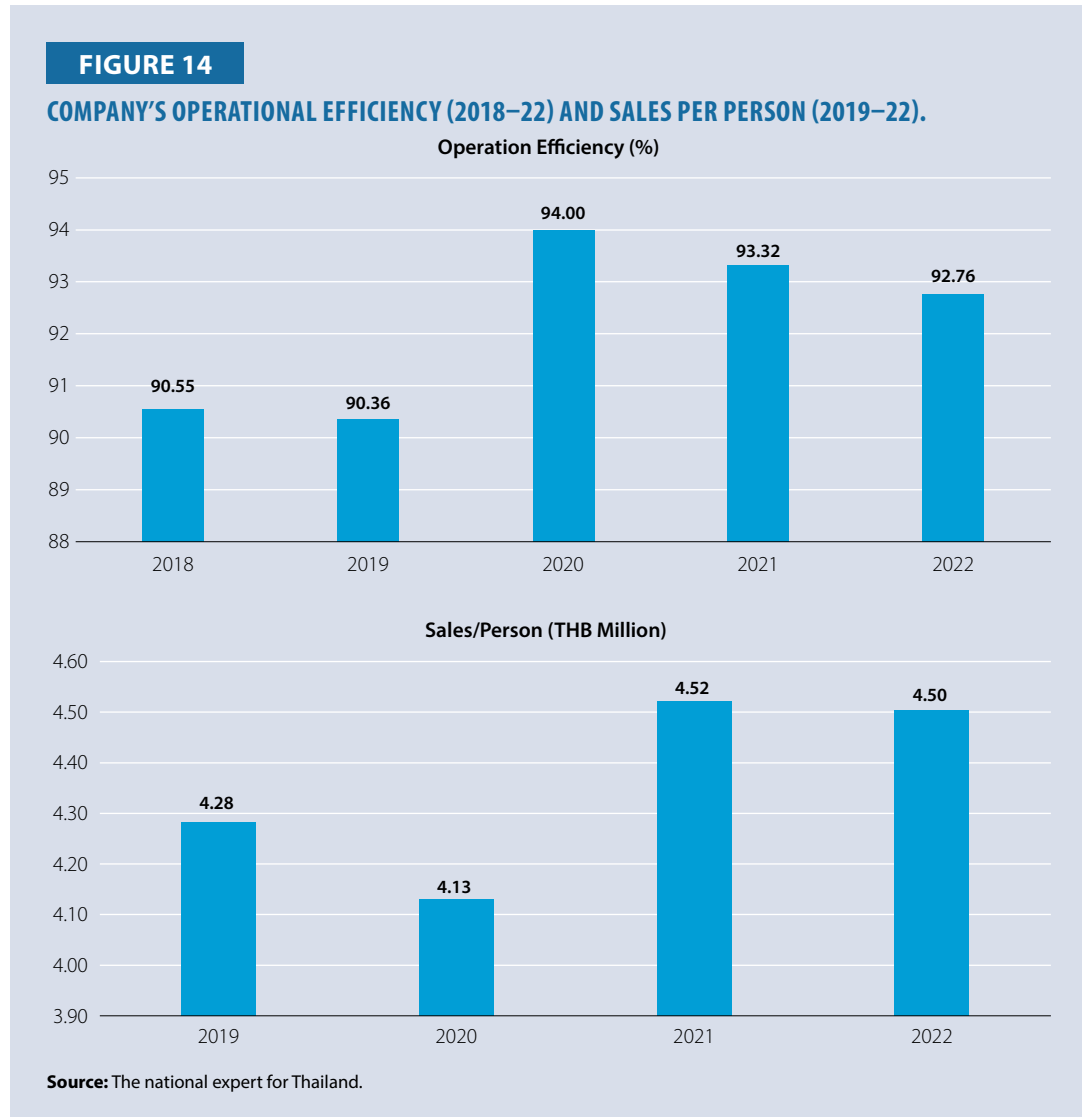
The case study also shows a reduced number of workers during the pandemic, followed by an upward trajectory post-pandemic. In contrast, the number of workers overall in Thailand showed a growing trend before and during the pandemic, experiencing a slight decline in 2022, as depicted in Figure 13.



Productivity

Productivity is assessed through two key indicators: machine availability and sales per person. Figure 14 illustrates machine availability, which is influenced by setup time for various products, and sales per person, which is calculated by dividing total revenue by the total number of employees.

The dynamics of operational efficiency are evident in its fluctuations, with an increase observed during the pandemic but a subsequent slight reduction post-pandemic. This fluctuation implies that the factory experienced higher setup times due to the diverse range of products in production. On the other hand, sales per person showcased a positive trend, consistently rising after the pandemic, indicating an improvement in the overall efficiency and productivity of the workforce.



The indicators confirm the company's implementation of sustaining (recovery) strategies. In response to pandemic-induced challenges like labor shortages, reduced sales, and customer satisfaction issues, the company strategically aligned its actions with national policies, emphasizing Thailand 4.0, digital transformation, and sustainability initiatives. This alignment led to tangible measures, including automation, digitization, and the adoption of a centralized air compressor system to boost productivity.

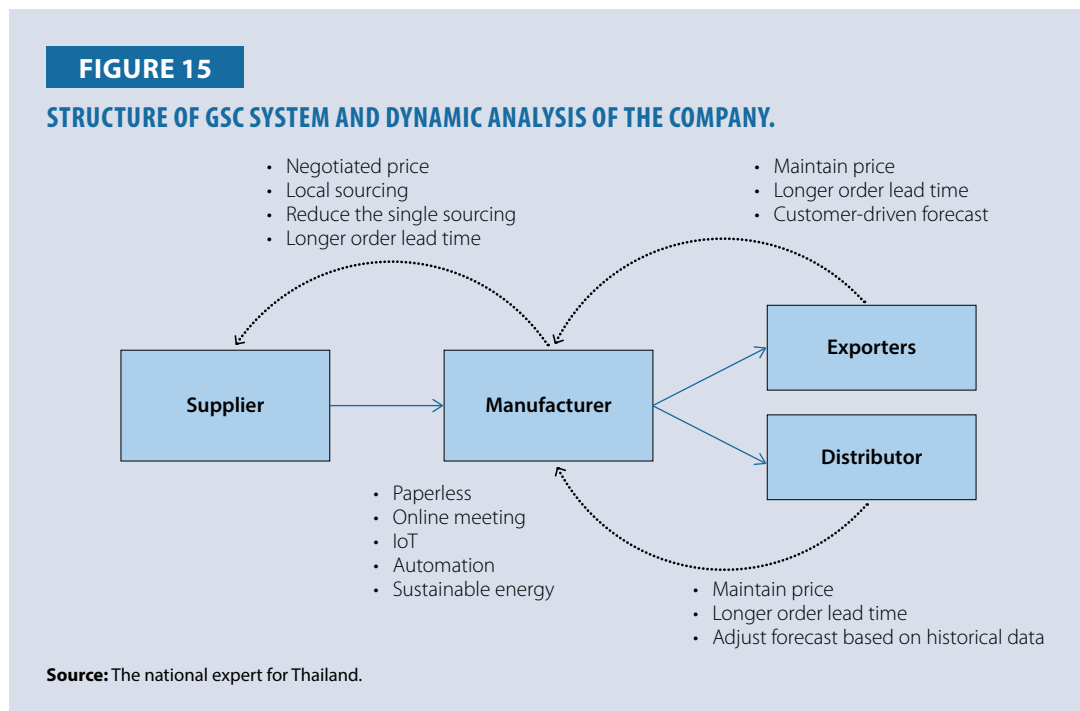
Ongoing projects, such as water reduction and solar rooftop installations, underscore the company's commitment to minimizing its environmental impact. Strategic sourcing emphasized diversification, local sourcing, enhanced negotiation, and communication efforts to address supply chain disruptions during the pandemic.

In pursuit of revenue growth, the company explored new export markets and adhered to standards to meet evolving customer needs. Customer-centric strategies included maintaining price stability, delivering exceptional taste, ensuring high standards, offering low-sodium options, providing excellent service, and building a highly recognized brand. Its R&D efforts focused on creating new, health-conscious products, with the potential for increased investment in innovative process development.

The company’s quality systems, exemplified by Kosher certification, enhanced customer values and trust. Additionally, a strong emphasis on HRD was evident through training programs, particularly in critical skills like leadership, to foster readiness among workers. On-the-job training initiatives catered to new employees, and the human resources department proactively identified and addressed skill and knowledge gaps in each department through tailored training programs. These comprehensive measures collectively contributed to the company’s successful recovery and resilience in the post-pandemic landscape.

Figure 15 presents the analysis of the company’s global supply chain system and its dynamics. The company’s sourcing strategies emphasize negotiation for price and lead time, continuous communication on order status, local sourcing, reduced dependence on single sources, and extended order lead times. To enhance resilience, the company initiated digital transformation, reducing paper usage, adopting online meetings during and after the pandemic, transitioning to sustainable energy, and increasing its focus on HRD through customized training programs.

The company also introduced IoT and automation to improve productivity, reduce processing time, and address workforce shortages. Despite increased costs, the company has maintained product prices during and after the pandemic. Domestic distributors and exporters now place orders earlier than in the pre-pandemic era to safeguard against supply shortages and optimize production schedules. Demand forecasts, rooted in customer needs, undergo expert adjustments within the company for more accurate planning.



Conclusion

In Thailand, the food manufacturing industry is an example of the dynamics within GSCs and their impact on productivity. As a major international food exporter, Thailand imports certain raw materials and exports finished goods, providing a comprehensive illustration of the broader dynamics within the global supply chain.

During the pandemic, the food industry experienced peak demand due to concerns over food shortages. Moreover, workforce shortages posed a significant challenge, necessitating the reallocation of employees from other departments and strict adherence to health department guidelines. Logistics, mainly imports, emerged as a major obstacle, with containers not returning from the US and freight costs increasing twofold. Rising raw material costs and product prices also accelerated the need for strategic responses.

To address these challenges, the company adopted sustaining (recovery) strategies, including negotiation tactics, exploring alternative sourcing, enhancing worker productivity, and implementing cost-saving measures such as transitioning to a paperless system, online meetings, IoT, automation, green energy, and sustainable sourcing. Shifting towards more local sourcing, reducing reliance on single suppliers, and focusing on negotiations became key strategies. However, price adjustments were limited by regulations from the Department of Commerce. Forecasting became more complex, requiring experienced experts to adjust data, with orders needing to be placed well in advance or with extended lead times to mitigate supply shortages and optimize production planning, increasing machine utilization and minimizing setup time.

During the pandemic, industries experienced both positive and negative impacts. Recognizing the importance of workforce productivity, many sectors focused on building resilience by enhancing worker knowledge and skills, enabling them to become multidisciplinary and capable of substituting for other roles. Initiatives were launched to automate labor-intensive tasks, improve overall worker productivity, and assess supply chain risks. The preparation and implementation of mitigation plans became essential components of strategies to navigate the challenges posed by the pandemic.

As demand returned to normal after the pandemic, the company successfully navigated the challenging period by implementing strategic measures to optimize production planning and ensure operational efficiency.

Recommendations

The pandemic has become a major disruptor in the modern supply chain scenario, leading to a domino effect worldwide. Industries faced unparalleled challenges, prompting the need for a strategic approach centered on risk management. This involved reevaluating sourcing strategies for raw materials and considering workforce dynamics, equipment, machinery, and logistics services. Moreover, navigating through these challenges has underscored the importance of placing customer satisfaction at the forefront, acknowledging its crucial role in revenue generation and bolstering cash flow. In responding to the disruptions caused by the pandemic, industries adopted multifaceted strategies to navigate the challenges effectively.

Improve Risk Management: Industries now prioritize robust risk management strategies, conducting comprehensive assessments of supply chain vulnerabilities. This includes evaluating

sourcing strategies for raw materials, workforce management, equipment, machinery, and logistics services. Identifying potential risks and creating effective mitigation plans have become integral components of this approach.

Adopt Adaptive Sourcing Strategies: The conventional sourcing approach has evolved, emphasizing the need for diversification. Industries actively seek alternative sources for raw materials and suppliers to decrease dependency on a single point of failure. This adaptability extends beyond raw materials, including workforce flexibility, equipment sourcing, and logistics partnerships.

Sharing Information in the Supply Chain: A collaborative strategy to mitigate the bullwhip effect involves seamless data and insights exchanged from downstream to upstream in the supply chain. This effect refers to the amplification of demand variations as information travels upstream, originating from minor fluctuations at the consumer level.

Sharing demand data across the supply chain allows each link to better understand customer needs. This reduces the risk of exaggerating minor fluctuations, enhancing accuracy in production planning and inventory management. The resulting benefits include improved efficiency, cost reduction, increased customer satisfaction, and a more responsive and agile supply chain. Ultimately, information sharing promotes a collaborative environment where stakeholders endeavor to optimize processes and minimize inefficiencies.

Technology Adoption: The pandemic has accelerated technology integration to enhance supply chain resilience. Automation and digitalization are pivotal in minimizing disruptions. Industries leverage technologies like IoT, AI, and data analytics for real-time monitoring, predictive analysis, and efficient decision-making. A strategic investment in R&D is essential for the company to select and implement these technologies appropriately.

Agile Supply Chain: Traditional linear supply chain models have given way to more agile and flexible frameworks. Agile supply chains are characterized by the ability to swiftly adapt to changing circumstances, such as shifts in demand, disruptions in logistics, or workforce constraints. These systems are better equipped to respond promptly to unforeseen challenges.

Customer-centric Approach: Recognizing the significance of customer satisfaction, industries must align their strategies with evolving customer needs. This involves maintaining consistent product quality, ensuring timely deliveries, transparent communication, and promptly addressing customer concerns. Customer satisfaction is vital to sustaining revenue and ensuring positive cash flow.

Investment in Resilience: Companies must strategically invest in resilience measures, such as creating redundancy in critical supply chain components, training and upskilling the workforce, and reinforcing infrastructure to endure unanticipated disruptions.

Furthermore, the government must play a crucial role in expediting these strategies through supportive policies. This includes initiatives like reducing taxes on R&D expenditures and implementing subsidy programs for innovative projects, with a particular focus on supporting SMEs. Developing infrastructure for logistics and ICT, funding innovative projects, and providing subsidies for reskilling and upskilling workers are all essential components of government support in this context.

In summary, responding to the pandemic disruption involves a holistic and proactive approach, risk management, technological innovation, sourcing adaptability, supply chain process agility, customer-centric focus, and strategic investments to establish resilience.

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TURKIYE

Introduction

The global economy underwent significant disruptions with the emergence of the COVID-19 pandemic in late 2019, particularly impacting GSCs. The crisis exposed vulnerabilities in supply chain systems, prompting countries and companies to adopt various strategies to enhance resilience. These strategies include diversification, relocation, technology adoption, stockpiling, collaboration, and regulatory changes.

GSC Diversification and Relocation Strategies

The pandemic-induced disruptions prompted global majors like Apple, Samsung, LG, Tesla, Airbus, Boeing, and Lockheed to adopt critical strategies such as diversification and relocation of GSCs (Xu et al., 2020). Diversification, which involves spreading sourcing across multiple regions and suppliers, became essential to mitigate risks associated with over-reliance on a single source or region, thereby enhancing resilience.

Relocation strategies involve moving or nearshoring production facilities to improve market access, cost efficiency, and proximity to crucial supplies. Relocation also offers proximity to abundant and reliable energy and water sources, as well as collaboration opportunities with R&D centers and innovation hubs. Lower labor and production costs in chosen locations contribute to the strategic advantages of relocation. Overall, these strategies aim to enhance the resilience and sustainability of GSCs to address future unforeseen challenges.

Overview of Government Approach

Turkiye frequently addresses GSCs in various strategy and policy documents, though the emphasis is primarily on enhancing export capabilities. In the context of GSCs, discussions revolve around diversifying the countries or products involved in exports, improving logistics, and taking measures related to customs tariffs and non-tariff barriers. The overarching goal is often articulated as 'integration into GSCs.' The issue of importing raw materials and intermediate goods is usually approached to reduce dependence on imports rather than focusing on diversifying supply sources or improving supply chain efficiency.

With the onset of the pandemic, the perspective on GSCs was limited to the agenda of 'swiftly filling potential gaps in the GSC arising from restrictions.' Turkiye's geographical proximity to the European market compared to East Asian countries, in this context, is a crucial advantage. The priority of this agenda, which was significant for the Turkish economy in 2020, diminished as global trade showed a substantial recovery in 2021. For all these reasons, this research provides an overview of Turkiye's approach to GSCs, primarily highlighting policy elements to boost exports and foster integration into the GSCs.

Policy Framework

Since its founding in 1923, modern Turkiye has pursued a policy of integration in both economic and social spheres. This policy has been driven by the vision to reach the level of modern civilizations, which has been interpreted as strengthening production capacity and requiring

technological leaps. While Turkiye joined the General Agreement on Tariffs and Trade in 1951, it was not until the 1980s that trade and exports became the centerpiece of economic policy.

National Technology Initiative

Turkiye’s trade and export policies have undergone a significant transformation. Since 2018, they have adopted a more assertive and outcome-driven approach. This shift prioritizes targeted market engagement and integration into higher-value-added segments of GVCs.

The National Technology Initiative encapsulates this multifaceted approach, emphasizing the reduction of reliance on imports for raw materials and intermediate goods while fostering domestic high-tech capabilities to transition from an importer to an exporter in these critical sectors. This perspective was broadened in the following way by the present Minister of Industry and Technology: “(...) the Republic enters its second century by consolidating its original claim to total independence with the National Technology Initiative. The meaning of the National Technology Initiative is not limited to high technology, value-added production, and becoming self-sufficient. It refers to a strategy and point of view with multiple dimensions from education and international relations to development and sustainable living.” (Kacir, 2022)

This strategic reorientation aligns with Turkiye’s broader objective of reducing its trade deficit (see Figure 1). The issue becomes more pressing when considering the trade deficit in high-tech products within the manufacturing sectors (see Figure 2). The opening words of the Economic Coordination Board press statement, dated 30 October 2023, summarizes the challenge: “During the Economic Coordination Board meeting we held, with a focus on increasing high-value export potential and ensuring sustainable improvement in the current account balance through investments...” (Kutbe, 2023)

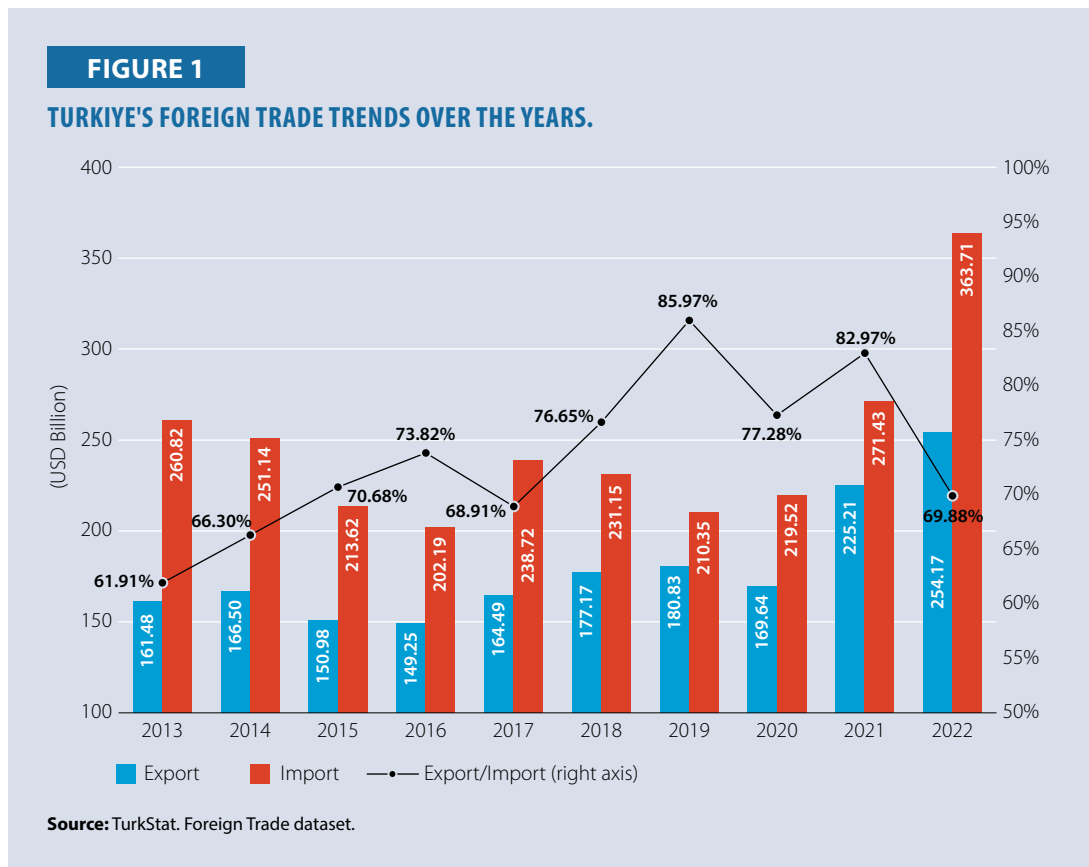
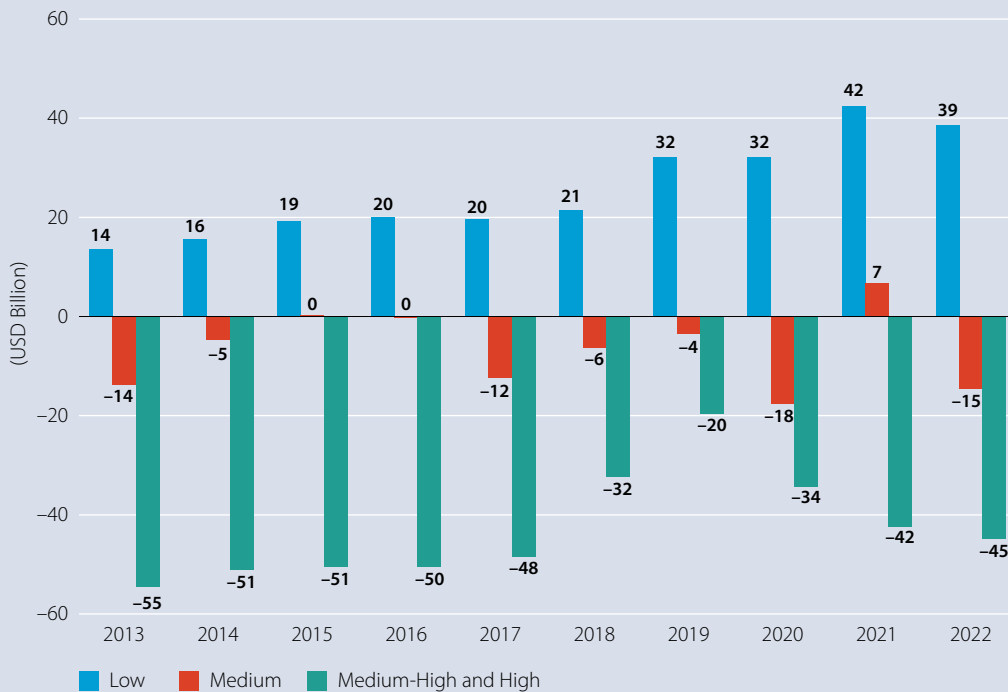


FIGURE 2

TURKIYE'S TRADE DEFICIT ACROSS TECHNOLOGY SECTORS.



Source: The national expert for Turkiye, based on TurkStat (Foreign Trade dataset) data.

To achieve export goals, Turkiye is implementing a comprehensive strategy that includes market diversification, innovation, technology upgrades, and infrastructure development. The strategy focuses on specific policies such as import reduction and export diversification. Additionally, Turkiye is actively pursuing new trade agreements and updating existing ones to foster international trade. A key aspect of the strategy is the development of high-tech free trade zones for enhanced competitiveness.

Moreover, initiatives like Overseas Logistic Centres and the Logistics Masterplan (2020–53) are geared toward improving logistics infrastructure across the country. These initiatives encompass significant investments in rail, sea, air, and road transportation, crucial for strengthening the country's supply chain capabilities and global market access.

2023 Industry and Technology Strategy

The National Technology Initiative, prominent since 2018, is embodied in the 2023 Industry and Technology Strategy document. This strategy outlines targets for manufacturing industry exports, emphasizing the importance of medium-high and high-tech products. Key measures include facilitating GSC participation, enabling industry involvement in global markets, promoting strategic investments in metropolitan areas and specialized regional centers, and ensuring global integration of software and ICT infrastructure companies. These actions collectively aim to enhance Turkiye's global competitiveness, foster regional development, and integrate its industries into GVCs (Ministry of Industry and Technology, 2023).

Export Master Plan

The Export Master Plan, a key document in Türkiye's export policies aligned with the 11th Development Plan (2019–23), set a target of USD226.6 billion in exports during this period. The plan focused on 17 target countries, including China, India, Russia, and the USA, while emphasizing five key sectors: machinery, automotive, electrical-electronics, chemical, and food industries. It aimed to boost high-tech product exports from 3.5% to 5%, utilizing Specialized Free Zones.

Amidst global trade and technology challenges, the plan prioritized productivity, innovation, and digitalization, envisioning Türkiye's ascent to a high-income country through adept digital transformation. The overarching goal was to sustain positive export performance, enhance technological components, and significantly increase the country's global market share, particularly in high-tech products. The plan included establishing new generation Free Zones as hubs for global transformation, committing to doubling Türkiye's share in imports from target countries, fostering deeper commercial ties, and leading in sectors like software and information technology (Ministry of Trade, 2019).

Technology Oriented Industry Move Program

The Technology Oriented Industry Move Program, aligned with the National Technology Initiative and the 2023 Industry and Technology Strategy, focuses on reducing import reliance and strengthening the export base. Its two main objectives are establishing a goal-oriented production capability for domestic development of imported goods and creating technology roadmaps for future technologies. Since 2019, the program has provided significant financial support across sectors, including machinery (19 projects, USD247.4 million), mobility (40 projects, USD820.7 million), structural transition in production (27 projects, USD508.4 million), health and chemical products (57 projects, USD561.1 million), and digital transition (43 projects, USD449.2 million) (Ministry of Industry and Technology, 2023).

12th Development Plan (2024–28)

The 12th Development Plan outlines Türkiye's economic strategies for the next five years, with a strong emphasis on exports and GSC integration. Key measures include strengthening logistics infrastructure, improving connectivity in industrial zones, developing national and regional logistics capabilities, securing access to raw materials, evaluating supply approaches from neighboring countries, and formulating strategies for local production. The plan also aims to enhance the share of railways in transportation and ensure the sustainability of GSCs through ongoing high-speed train projects and diversification of transportation corridors. These initiatives are intended to position Türkiye as an essential player in global economic networks, bolstering its economic resilience (Strategy & Budget Directorate, n.d.).

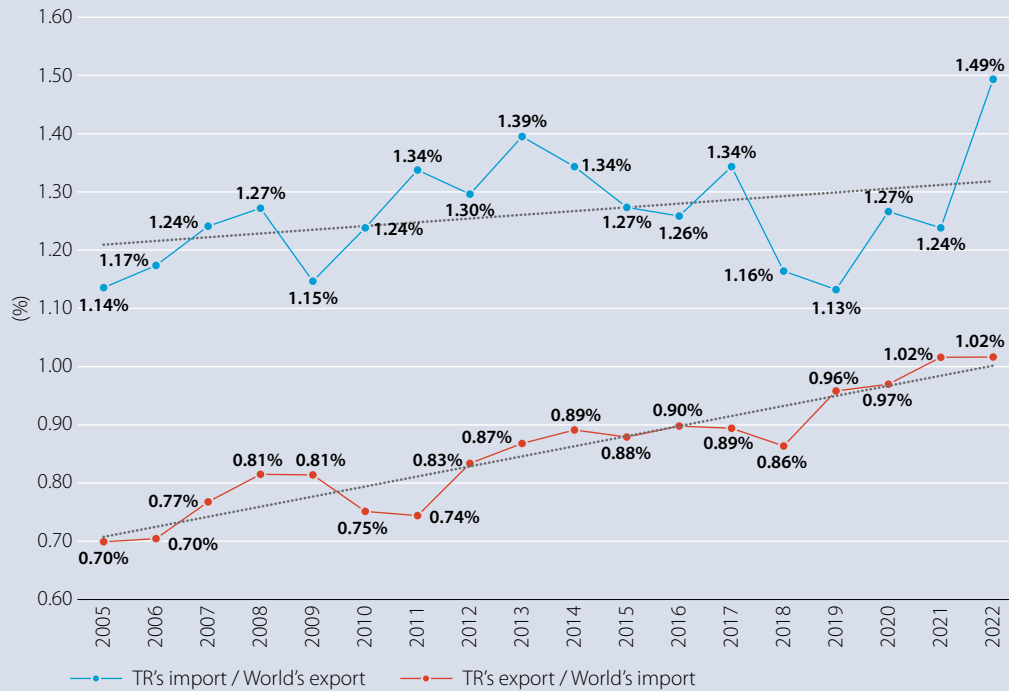
Türkiye's Position in GSCs

Figure 3 depicts Türkiye's increasing share of global trade from 2005–22, with exports and imports contributing to this growth. As illustrated in Figure 4, Türkiye's exports as a percentage of GDP have nearly doubled over the 18 years.

Export and import values may only partially reflect the extent of globalization and participation in GSCs. International input-output datasets, such as the OECD's Trade in Value-Added (TiVA), offer a more comprehensive understanding. TiVA considers the value added by each country in global production, providing insights into GSC participation through backward linkages, including intermediate imports in exports, and forward linkages, such as domestic value added in partners' exports and final demand (OECD, n.d.).

FIGURE 3

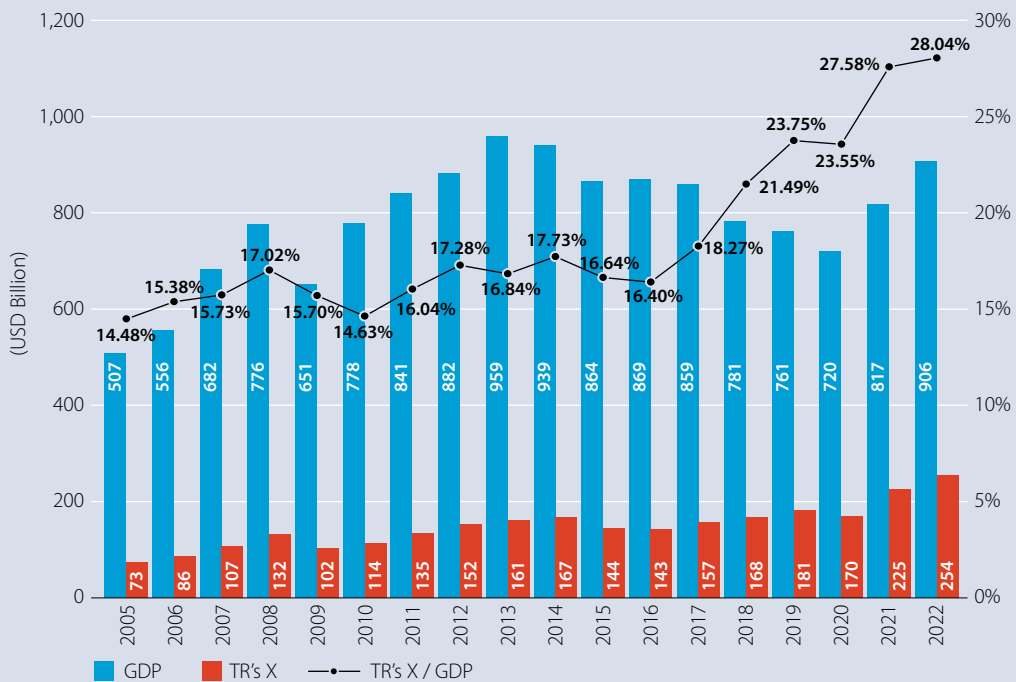
TURKIYE'S SHARE IN THE GLOBAL TRADE.



Source: ITC Trade Map.

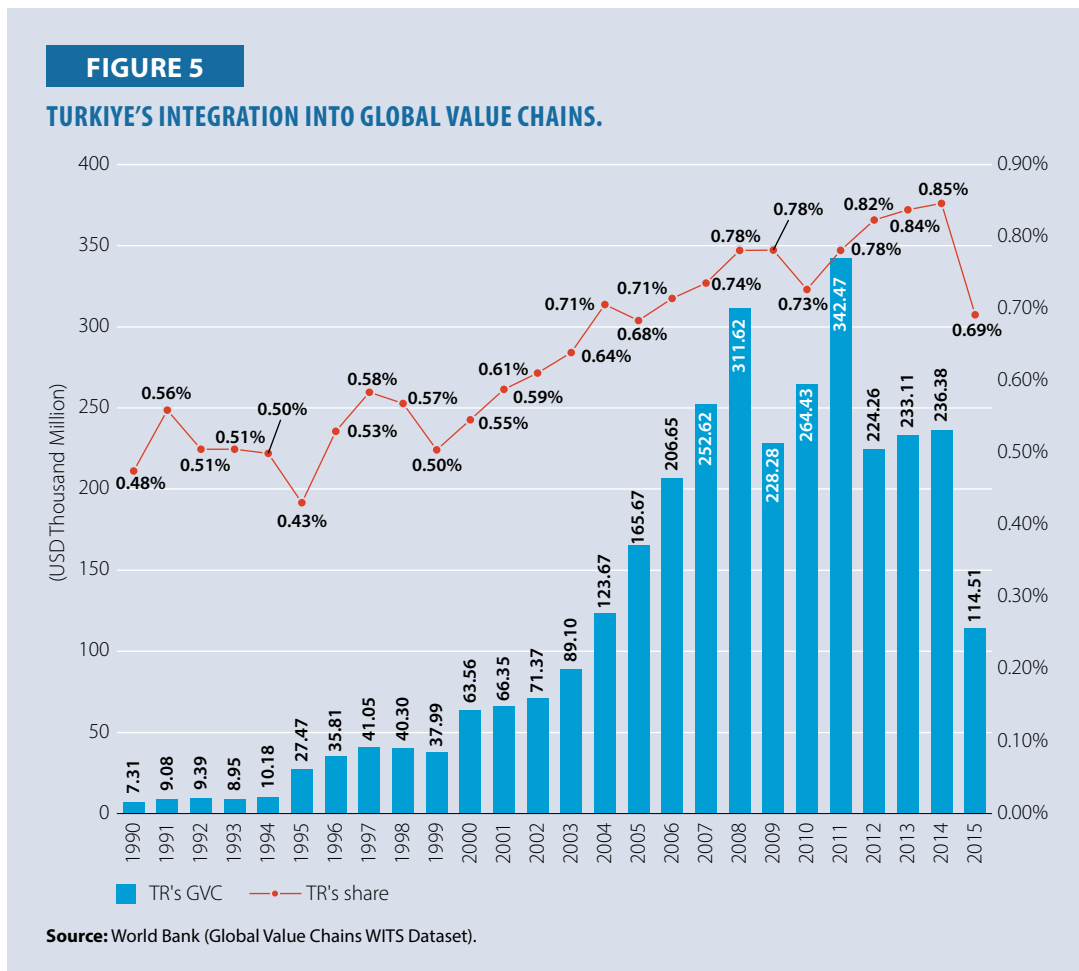
FIGURE 4

THE RATIO OF TURKIYE'S EXPORTS TO ITS GDP.



Source: The national expert for Turkiye, based on ITC Trade Map and TurkStat (Foreign Trade dataset) data.

The World Bank’s GVC Database (WB, n.d.), derived from TiVA input-output tables, offers insights into GVC participation. It includes information on backward participation (foreign and domestic value in re-exported imported inputs), forward participation (value of domestic production re-exported by bilateral partners), and GVC exports (value of production crossing multiple borders). This dataset indicates that Turkiye’s GVC export level surged approximately 16-fold from 1990 to 2015. As shown in Figure 5, Turkiye’s share in global GVC exports was 0.48% in 1990, increased to 0.68% in 2005, and reached the 0.8% range in the early 2010s. It proposes a pattern similar to the proportion of Turkiye’s exports to global trade illustrated in Figure 3.

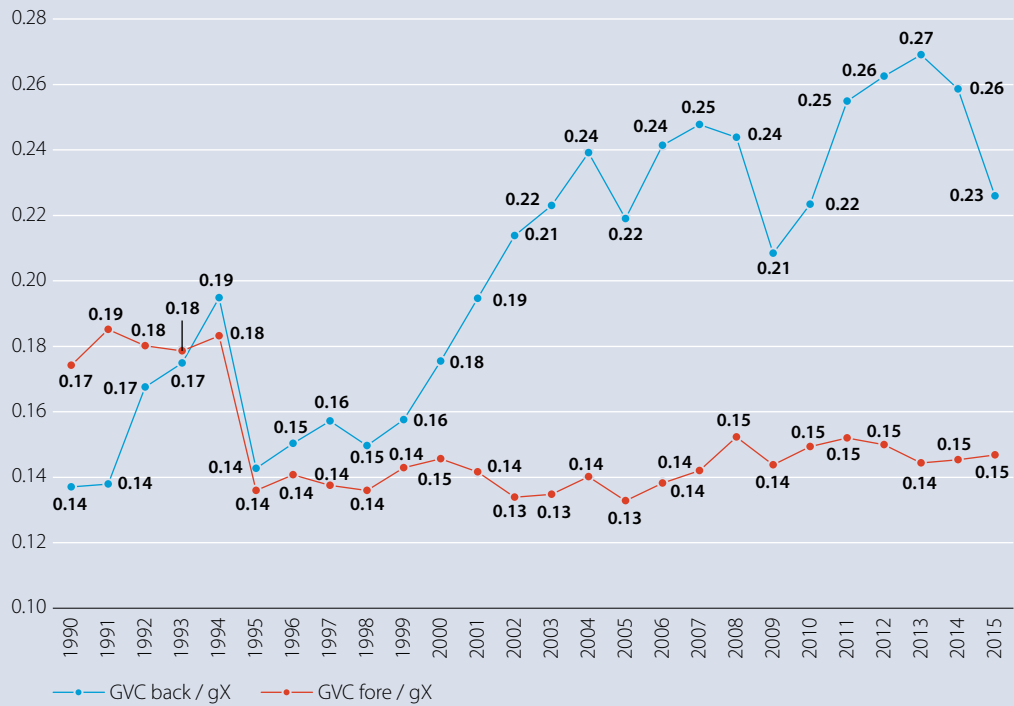


The World Bank distinguishes between two forms of participation in GVCs: backward participation and forward participation. Backward participation measures the degree to which other countries’ goods and services are incorporated into a country’s exports. An increase in backward participation suggests a stronger integration into GVCs, often correlated with enhanced value and productivity growth at different development stages. Forward participation indicates the share of a country’s exports contributing to another country’s subsequent exports (WB, 2022). Figure 6 depicts the ratios of Turkiye’s backward and forward linkages to its gross exports.

In the conceptual framework, backward integration is minimal for nations specializing in commodities and broadens for those in limited manufacturing. Countries focused on advanced manufacturing and services heavily rely on imports for exports. Turkiye has advanced from limited manufacturing to advanced manufacturing and services between 1990 and 2015. Several countries,

FIGURE 6

THE RATIO OF TURKIYE'S BACKWARD AND FORWARD LINKAGES TO GROSS EXPORTS.

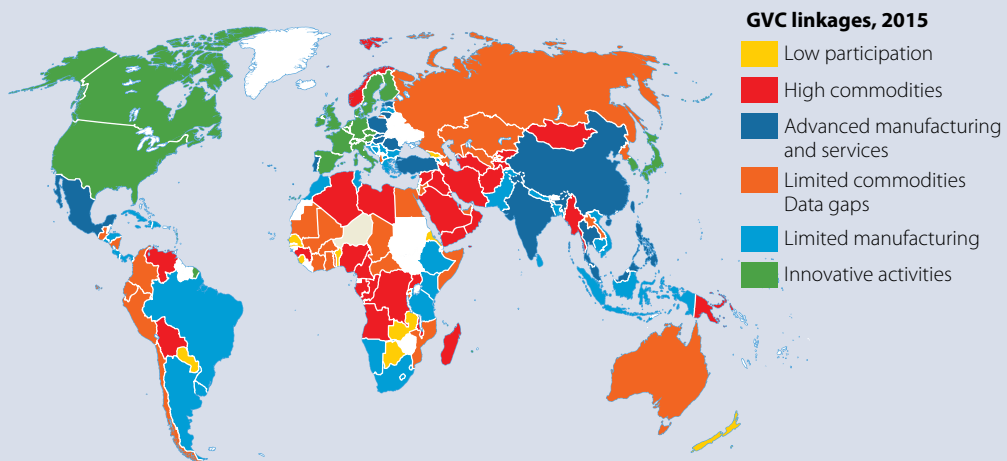


Source: The national expert for Turkiye, based on the World Bank (Global Value Chains WITS Dataset) data.

including Austria, Canada, the Czech Republic, Finland, Ireland, Israel, Italy, the Republic of Korea, Singapore, and Spain, have successfully transitioned to high participation in innovative activities (see Map 1).

MAP 1

GVC LINKAGES MAP.



Source: World Bank. (February 2022).

New GSC Dynamics and Their Impact on Aggregate and Firm-Level Productivity

Aggregate Productivity

Figures 7–10 examine the relationship between four parameters potentially associated with GSCs and productivity, measured as value-added per unit cost. It is important to note that the limited

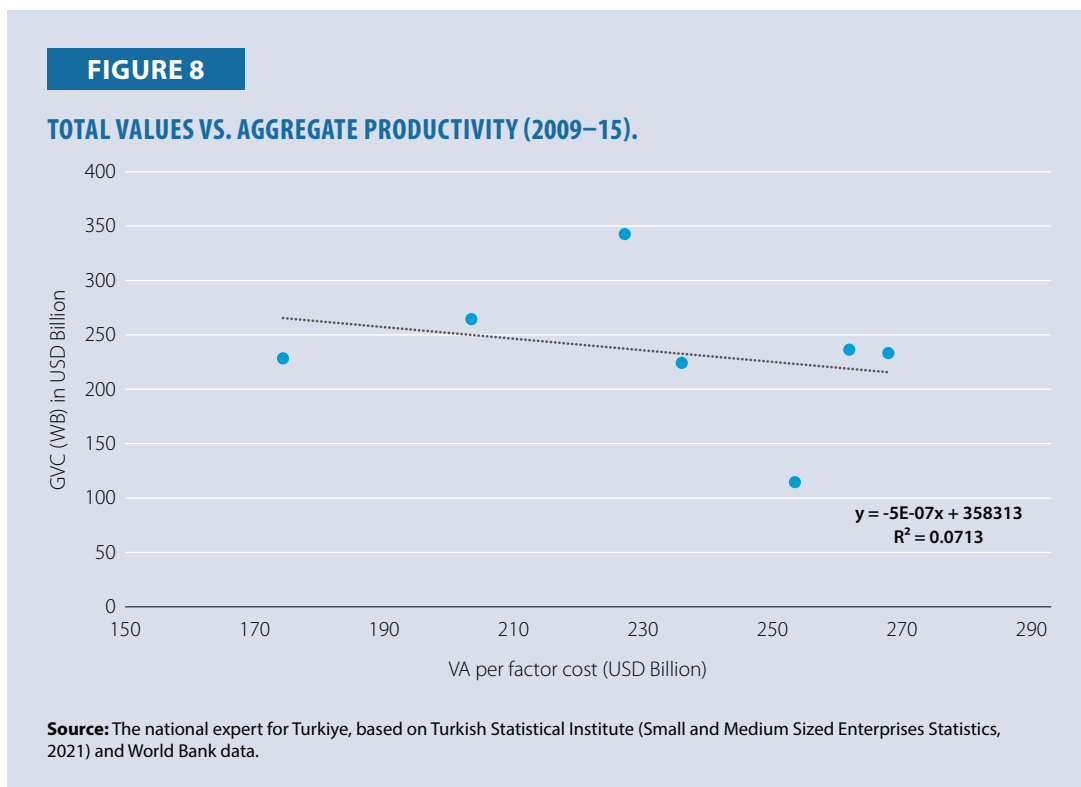
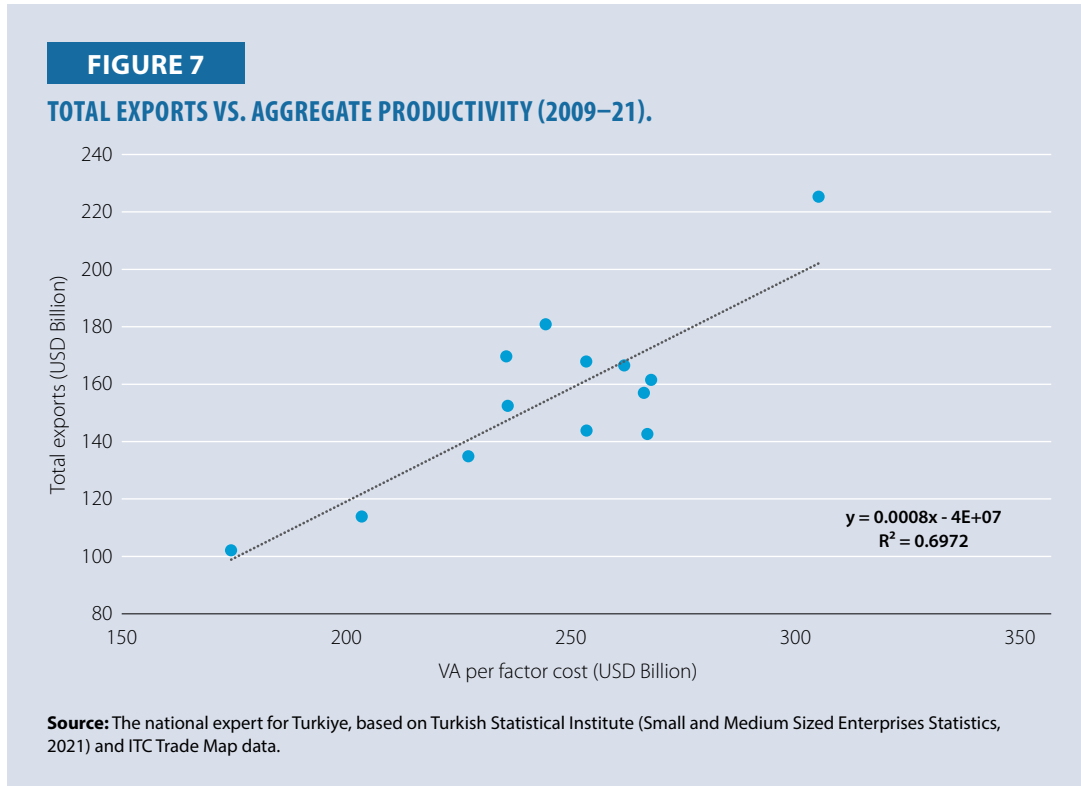


FIGURE 9

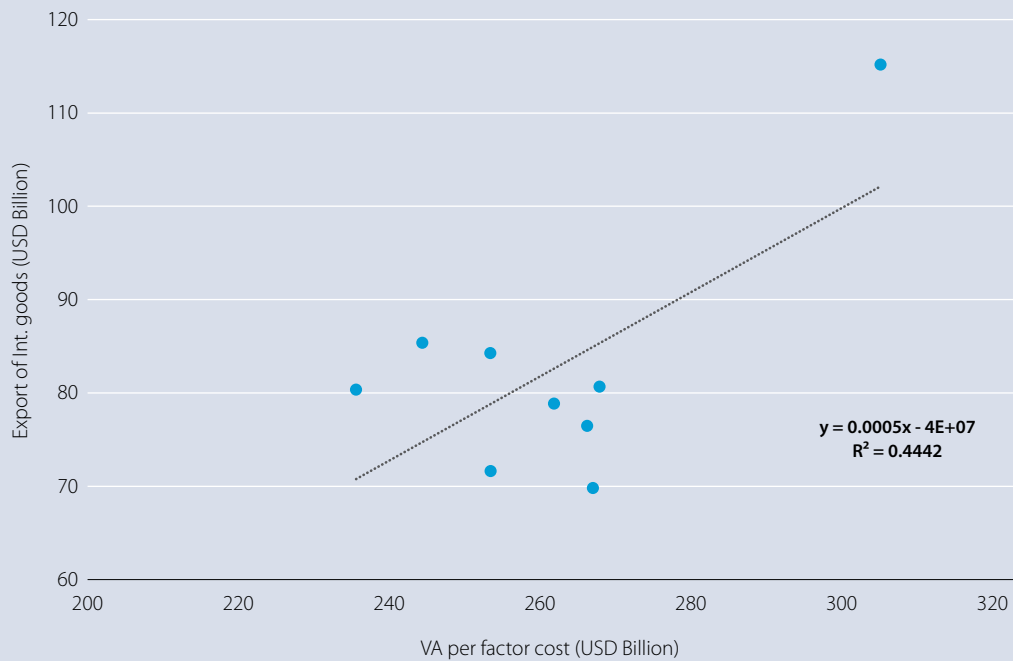
IMPORT OF INTERMEDIATE GOODS IN TURKIYE (2013–21).



Source: The national expert for Turkiye, based on Turkish Statistical Institute (Small and Medium Sized Enterprises Statistics, 2021) and TurkStat (Foreign Trade) data.

FIGURE 10

EXPORT OF INTERMEDIATE GOODS FROM TURKIYE (2013–21).



Source: The national expert for Turkiye, based on Turkish Statistical Institute (Small and Medium Sized Enterprises Statistics, 2021) and TurkStat (Foreign Trade) data.

number of observations due to common years of the provided data may influence the results. However, a strong relationship between export levels and productivity is evident based on observed distributions and R-square values. In contrast, there is only a limited correlation between intermediate goods export/import and productivity. Additionally, no significant relationship is observed between the GVC values and productivity, as listed in the World Bank's GVC database.

The observed correlation between export levels and productivity, a common finding in the literature, should not be interpreted as a causal relationship where one factor determines the other. Engaging in global trade on a national level creates complexities for competitiveness, compelling economies to enhance their productivity. Alternatively, more productive economies possess a stronger competitive edge in international trade.

An in-depth analysis of the Turkish economy shows a consistent trend toward increased openness since the 1980s, coupled with more pronounced growth from 2000 onward. The trend of openness has prompted various economic participants, including policymakers, producers, and financiers, to adopt more rational actions, improve business practices, and move towards institutionalization. From a different perspective, the continuous rise in global production and trade volumes catalyzes growth, productivity, and export expansion, especially in developing countries like Turkiye.

Firm-Level Productivity

The third section of the World Bank's *Leveraging Global Value Chains for Growth in Turkey* report, titled Understanding GVCs in Turkey from the Firm Up, provides critical analyses using qualitative assessments alongside data from the Enterprise Information System (EIS), covering the period from 2006–18. The EIS is a comprehensive database consisting of linked administrative, census, and trade data on all multi-employee firms in Turkiye. This anonymized data is accessible through a secure datalab environment housed at the Ministry of Industry and Technology in Ankara, Turkiye.

The findings from the report highlight the growing impact and importance of GVC exporters in Turkiye's economic landscape, emphasizing their contributions to innovation, productivity, and overall economic performance. GVC-active firms are identified based on their import and export behaviors. Specifically, these firms import a substantial quantity of intermediate inputs and export a significant portion of their output. Additionally, firms that act as domestic suppliers to GVCs are considered GVC-active if sales to GVC firms account for at least 10% of their total turnover. These firms engage in both direct exports and domestic supplies within GVCs. Companies with substantial exports but less reliance on intermediate imports are classified as exporters or traditional exporters (WB, 2022).

This analysis underscores the importance of GVC participation in enhancing firm-level productivity and the broader economic impact on Turkiye's integration into global trade.

GVC Exporters in Turkiye

- GVC exporters in Turkiye constitute a small but growing group of companies.
- In 2006, there were 2,650 such firms, and by 2018, the number had grown to 4,280.
- GVC exporting firms represent just under 1% of all Turkish firms, a fraction of the approximately 30,000 firms engaged in intensive exporting.

Size and Output

- GVC exporters are significantly larger than other companies.
- On average, they employ four times more workers than domestically oriented firms and three times more than traditional exporters.
- The average value-added by GVC exporters is about eight times greater than domestic firms and four times more than traditional exporters.

Sectoral Distribution

- Most GVC exporters operate in the manufacturing sector, particularly in textiles, apparel, chemicals, rubber and plastics, machinery, and fabricated metal sub-sectors.
- GVC activity is concentrated in sectors such as chemicals, rubber and plastics, motor vehicles, electrical equipment, and pharmaceuticals.

Domestic Supply Chains

- Domestic supply chains in Turkiye have expanded rapidly, with over 15,000 firms identified as significant suppliers to GVC exporters.
- The average number of domestic suppliers per GVC exporting firm increased from 2.8 in 2006 to 3.6 in 2018.
- From 2006 to 2018, real value-added and employment by domestic suppliers of GVCs grew by around 60%.

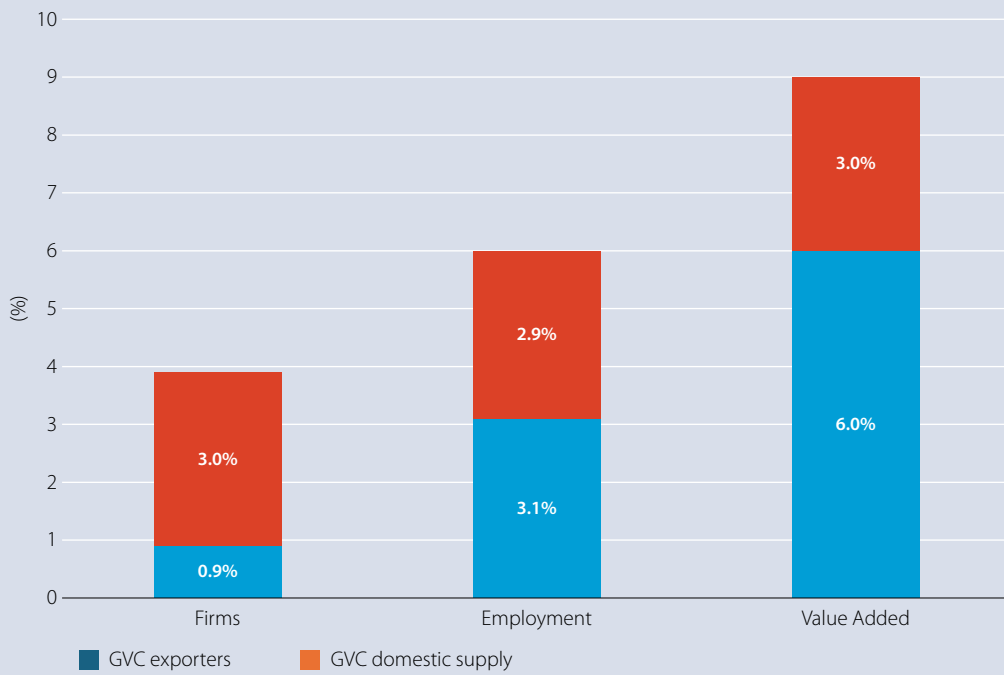
Economic Impact

- GVCs contribute significantly to domestic incomes, with an estimated overall impact of around USD40 billion in 2018, equivalent to about 5% of the total economic output. GVC firms, including exporters and suppliers, account for about 6% of total employment and 9% of total value added.
- Although the number of GVC exporting firms is approximately six times smaller than exporters not associated with it, GVC firms exhibit significantly higher export value per firm, contributing 23% of the total exports (see Figure 11, 12).

Productivity

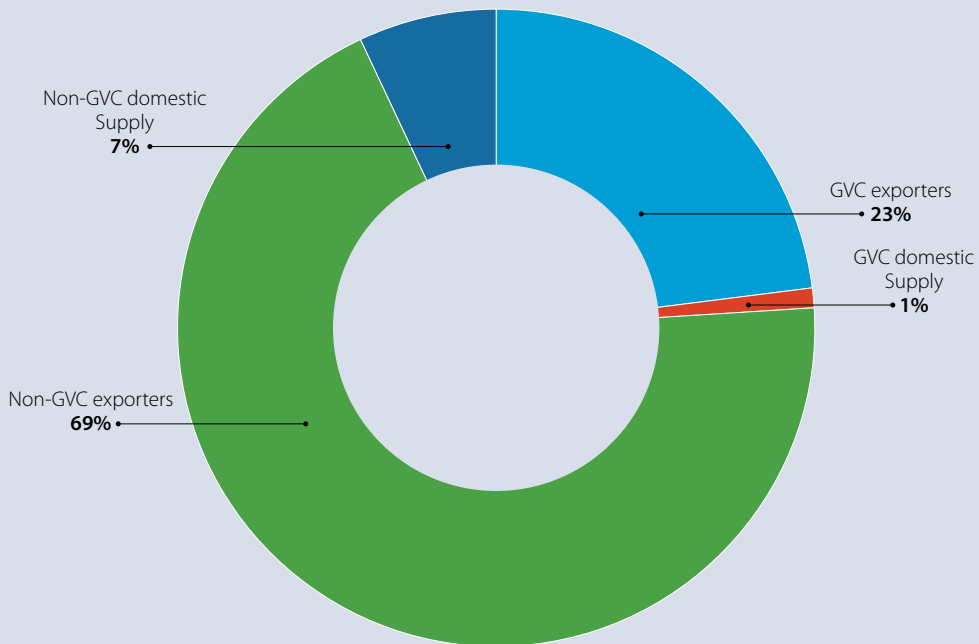
- GVC exporters exhibit higher labor and TFP than non-GVC enterprises, with value-added per full-time equivalent worker exceeding that of other firms.
- Employees in GVC-exporting firms display a productivity advantage of around 30% over workers in other exporting firms.
- Labor productivity of GVC exporters is double that of domestically-oriented firms and has consistently risen over time.
- Regarding TFP and considering capital inputs, GVC exporters outperform domestic firms by 8%, steadily increasing over time, surpassing other exporters by 4%.

FIGURE 11
SHARE OF GVC EXPORTERS AND THEIR LOCAL SUPPLIERS IN TURKIYE.



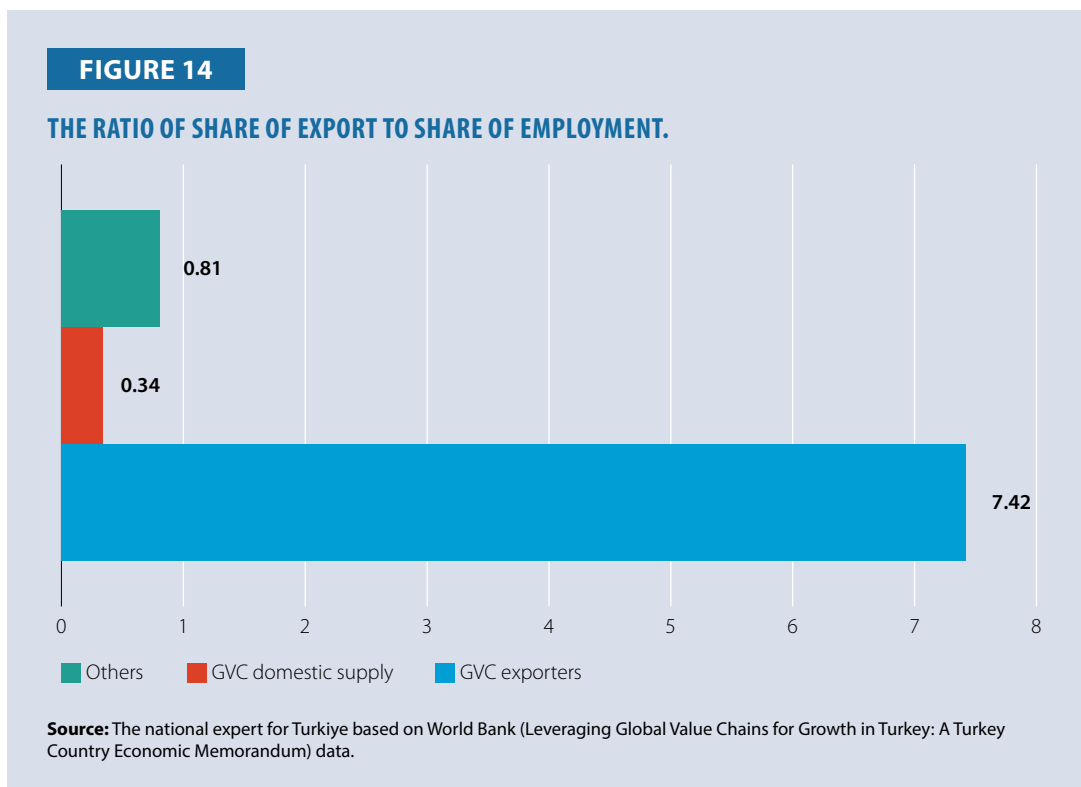
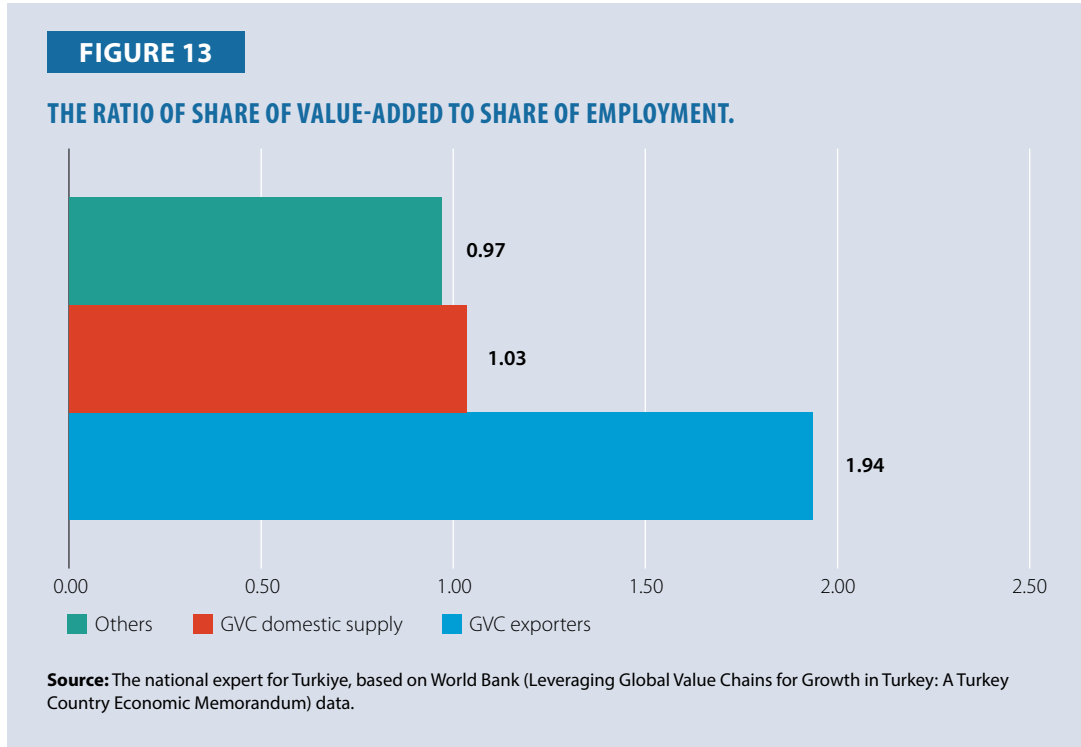
Source: World Bank. Leveraging Global Value Chains for Growth in Turkey: A Turkey Country Economic Memorandum.

FIGURE 12
DISTRIBUTION OF TURKIYE'S EXPORTS AMONG GROUPS OF EXPORTERS.



Source: World Bank. Leveraging Global Value Chains for Growth in Turkey: A Turkey Country Economic Memorandum.

- GVC exporters, which account for 3% of employment, contribute 6% of total value-added, illustrating their high productivity (see Figure 13).
- GVC exporters demonstrate nine times higher exports per unit of employment compared to non-GVC exporters and suppliers for non-GVC exporter firms (see Figure 14).



Global Sourcing and Efficiency

- GVC exporters rely on globally sourced inputs, using USD1.2 of imported inputs for every dollar of value-added.
- Despite holding larger capital stock, GVC exporters use capital more efficiently than other firms (WB, 2022).

Impact of GSC on Turkiye

Sectoral Coverage

Figure 15 presents the top 20 sectors in Turkiye’s exports within the framework of the General Trade System from 2013–22, along with their percentage distribution. The remaining 77 sectors collectively contribute to less than a quarter of Turkiye’s total exports, each having a share of less than 1% in the overall export composition.

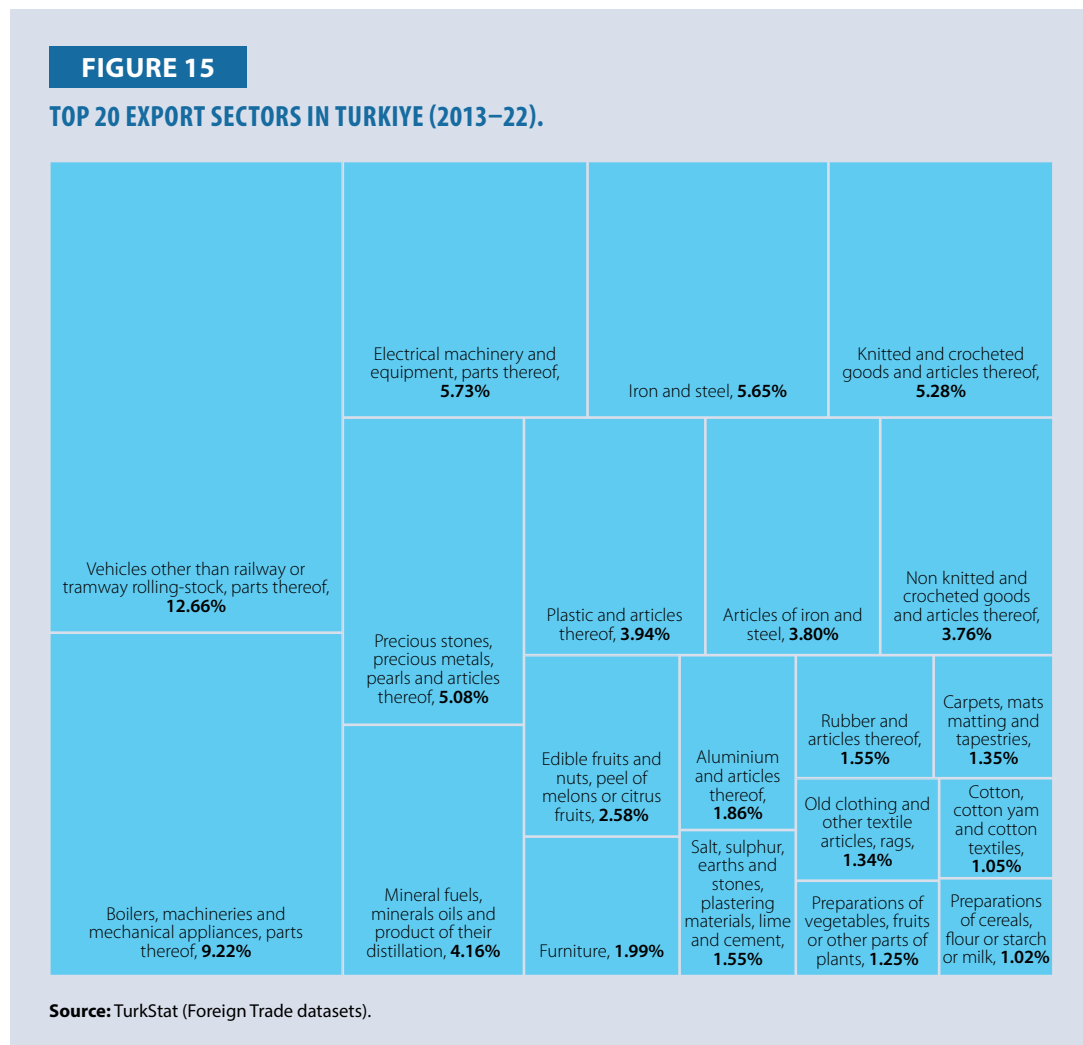


Table 1 provides additional information on the growth variations of the mentioned 20 products in global trade, the changes in growth within Turkiye’s exports, and the country’s share in global exports.

TABLE 1

KEY METRICS FOR TOP 20 EXPORT SECTORS IN TURKIYE (2013–22).

HS Code	Chapters	Share in Türkiye's Exports (2013–22; in %)	Annual Growth in Value (2018–22; in %, p.a.)	Annual Growth in Value (2018–22; in %, p.a.)	Türkiye's Share in World Exports (in %)
87	Vehicles other than railway or tramway rolling stock, parts thereof	12.66	1	-1	1.60
84	Boilers, machinery and mechanical appliances, parts thereof	9.22	4	9	0.85
85	Electrical machinery and equipment, parts thereof	5.73	7	12	0.37
72	Iron and steel	5.65	10	11	2.48
61	Knitted and crocheted goods and articles thereof	5.2	5	6	4.18
71	Precious stones, precious metals, pearls, and articles thereof	5.08	11	12	1.09
27	Mineral fuels, minerals oils, and products of their distillation	4.16	12	31	0.38
39	Plastic and articles thereof	3.94	7	18	1.37
73	Articles of iron and steel	3.80	5	13	2.71
62	Non-knitted and crocheted goods and articles thereof	3.76	1	7	3.70
8	Edible fruits and nuts, peel of melons or citrus fruits	2.58	5	6	3.22
94	Furniture	1.99	5	13	1.82
76	Aluminum and articles thereof	1.86	10	24	2.42
25	Salt, sulfur, earth and stones, plastering materials, lime and cement	1.55	9	10	4.64
40	Rubber and articles thereof	1.55	6	7	1.57
57	Carpets, mats matting, and tapestries	1.35	3	7	17.43
63	Old clothing and other textile articles, and rags	1.34	8	10	3.53
20	Preparations of vegetables, fruits, or other parts of plants	1.25	5	13	4.01
52	Cotton, cotton yarn, and cotton textiles	1.05	4	7	3.73
19	Preparations of cereals, flour, starch, or milk	1.02	6	10	2.67

Source: ITC Trade Map.

The Export Potential analyses developed through the ITC Export Potential Map broadly align with this data, emphasizing similar sectors (see Figure 16).

The GVC Database provided by the World Bank, utilizing the TiVA dataset, though using distinct classification and nomenclature and offering data only up to 2015, validates the export-driven prioritizations made so far. In this database, disregarding items predominantly characterized as raw materials like basic metals and petroleum products, sectors such as textiles, motor vehicles, electrical, and machinery continue to stand out due to their substantial forward and backward linkages (see Figure 17).

FIGURE 16
TURKIYE'S PRODUCTS WITH EXPORT POTENTIAL.

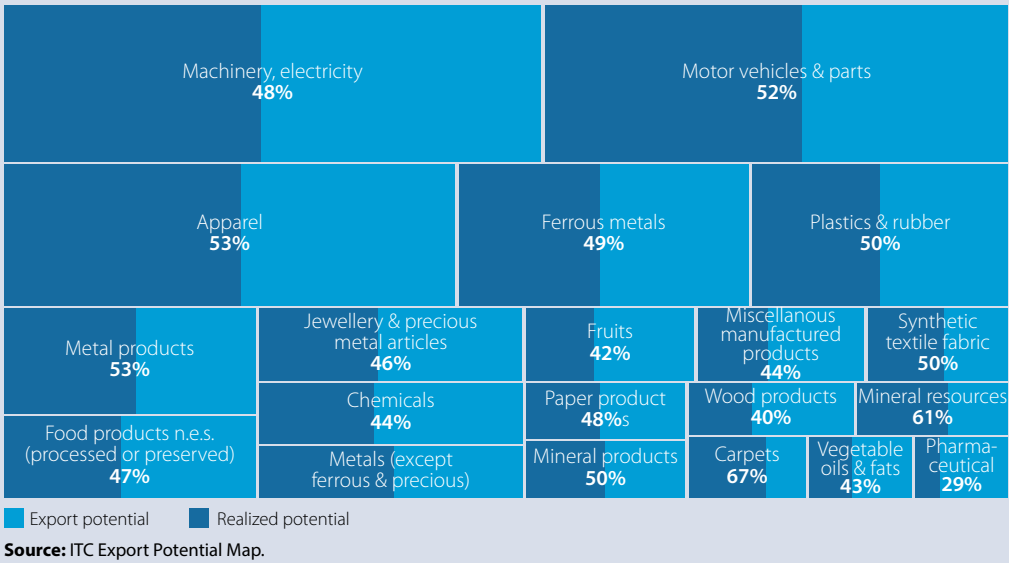
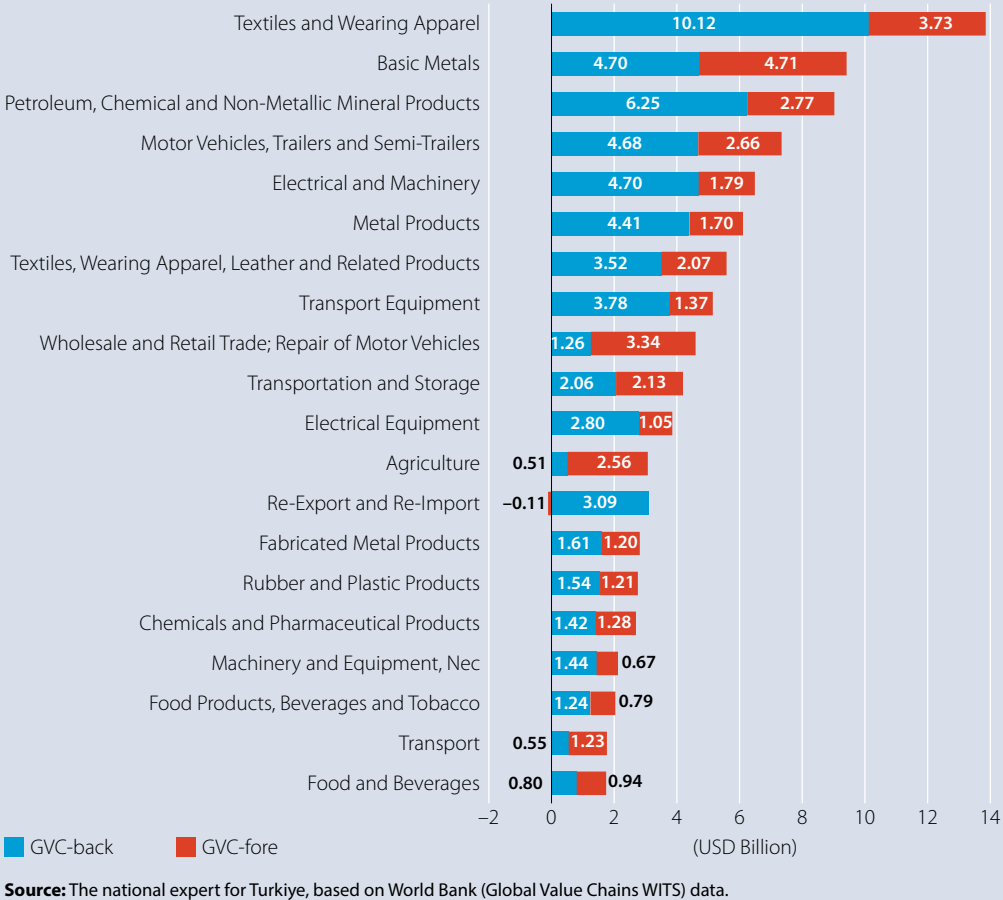


FIGURE 17
THE RATIO OF SECTORS' BACKWARD AND FORWARD LINKAGES TO GROSS EXPORTS.



The data and projections in this section highlight the significance of the textile industry and related sectors in Turkiye’s overall export and GVC integration pattern. However, the policy priorities outlined in the subsection Policy Framework advocate a shift towards sectors with higher value-added and advanced technology in exports rather than focusing on textiles. Hence, the section does not prioritize the textile sector or the basic metals, such as iron and steel, which play a crucial role in Turkiye’s forward linkages. Instead, the focus is on three sectors within the Chapters classification in General Trade System: Motor Vehicles, etc. (HS 87), Machinery, etc. (HS 84), and Electrical Machinery and Equipment, etc. (HS 85).

Motor Vehicles and Others

Motor vehicles and others, considered one of the three primary product groups, have consistently been Turkiye’s most significant in terms of export capability and volume. As of 2022, this sector leads Turkiye’s global exports with an export value of approximately USD27 billion. However, since 2018, its share in total exports has gradually decreased (see Figure 18). The sector’s prominence is attributed to the strong presence of multinational corporations, robust export connections, and a recognized quality standard. This sector is anticipated to play a pivotal role in shaping Turkiye’s economic landscape.

Given the disruptions in the supply chain during the pandemic, Turkiye, with an established and relatively strong market presence, especially in Europe (Figure 19), has the opportunity to emerge as a production hub in this sector in the short term. The sentiments of sector representatives also align with the widespread acceptance of such an opportunity. However, the concentration of exports in this field, particularly in European countries, is perceived as a potential risk during similar crises. Therefore, there is an emphasis on exploring opportunities for growth in markets such as North Africa.

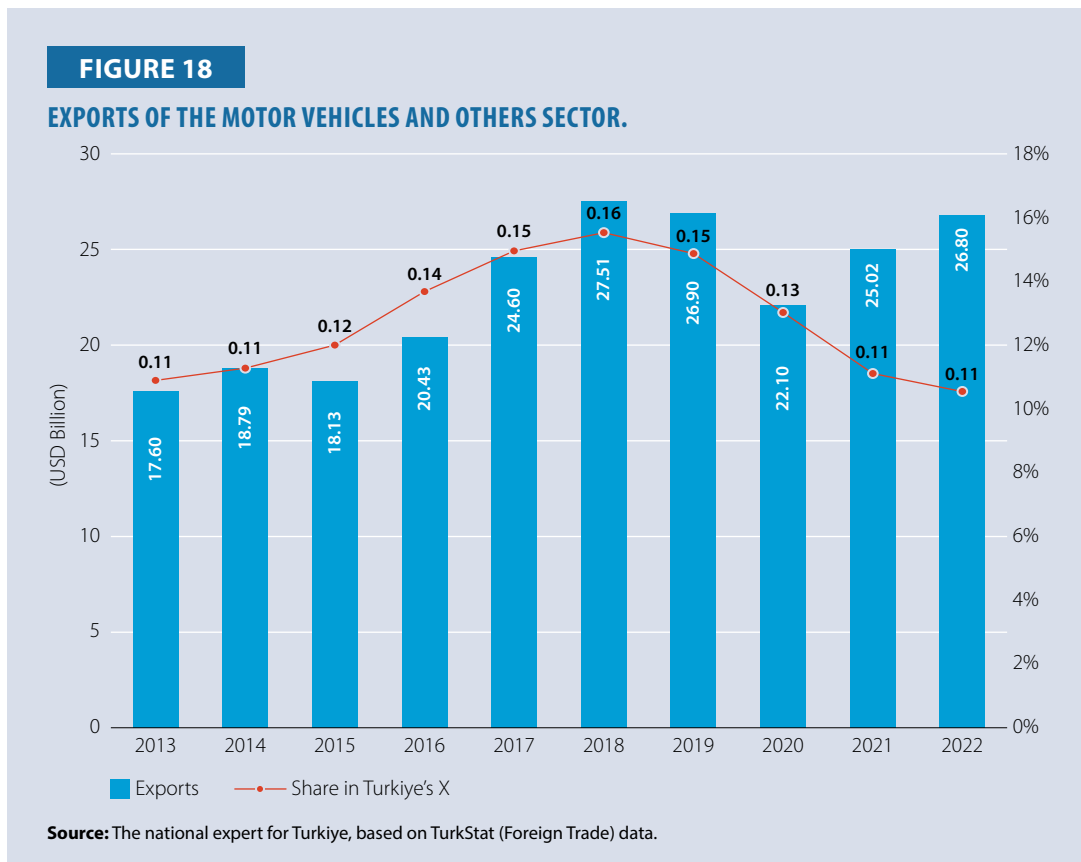
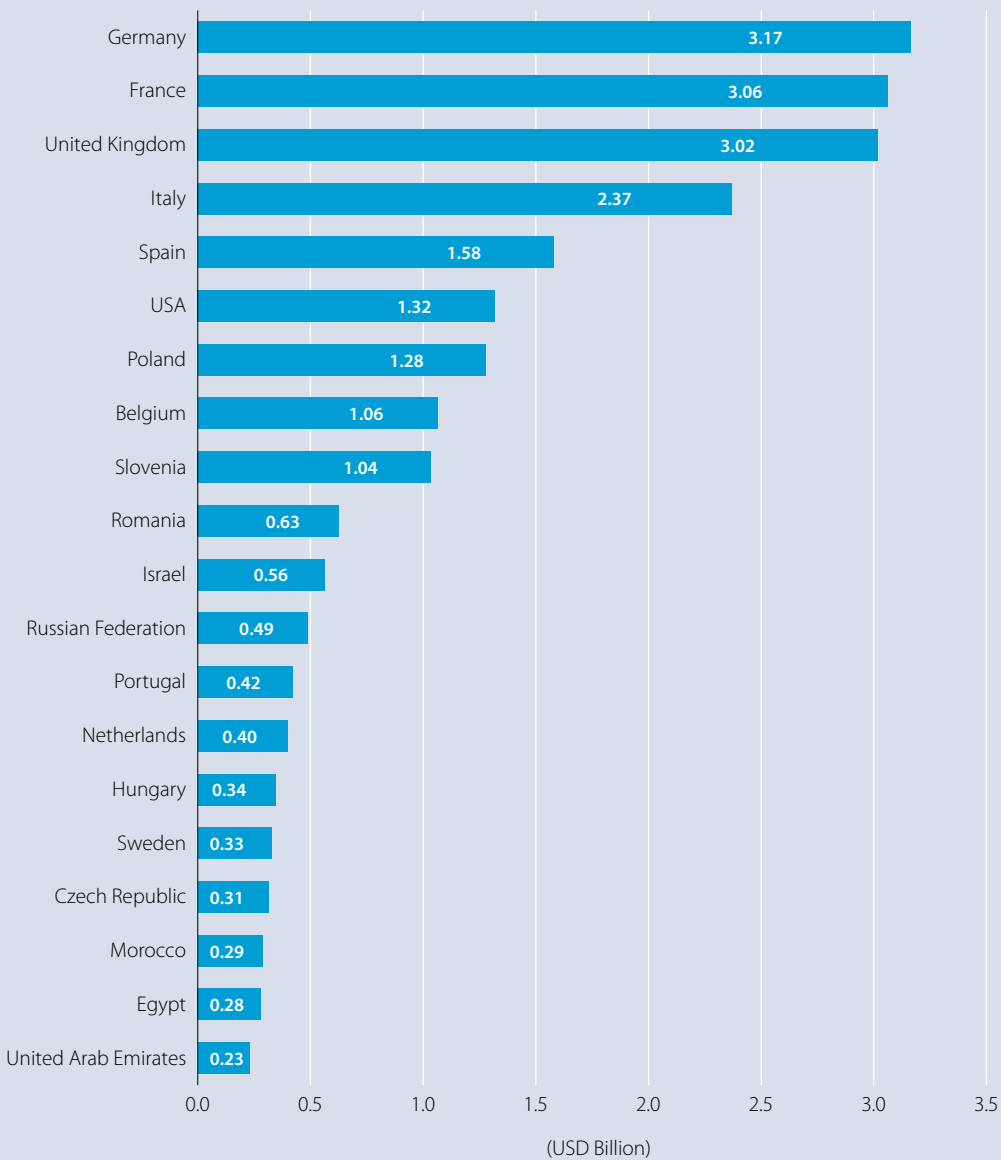


FIGURE 19
IMPORTERS IN TURKISH MOTOR VEHICLES AND OTHERS SECTOR.



Source: ITC Trade Map.

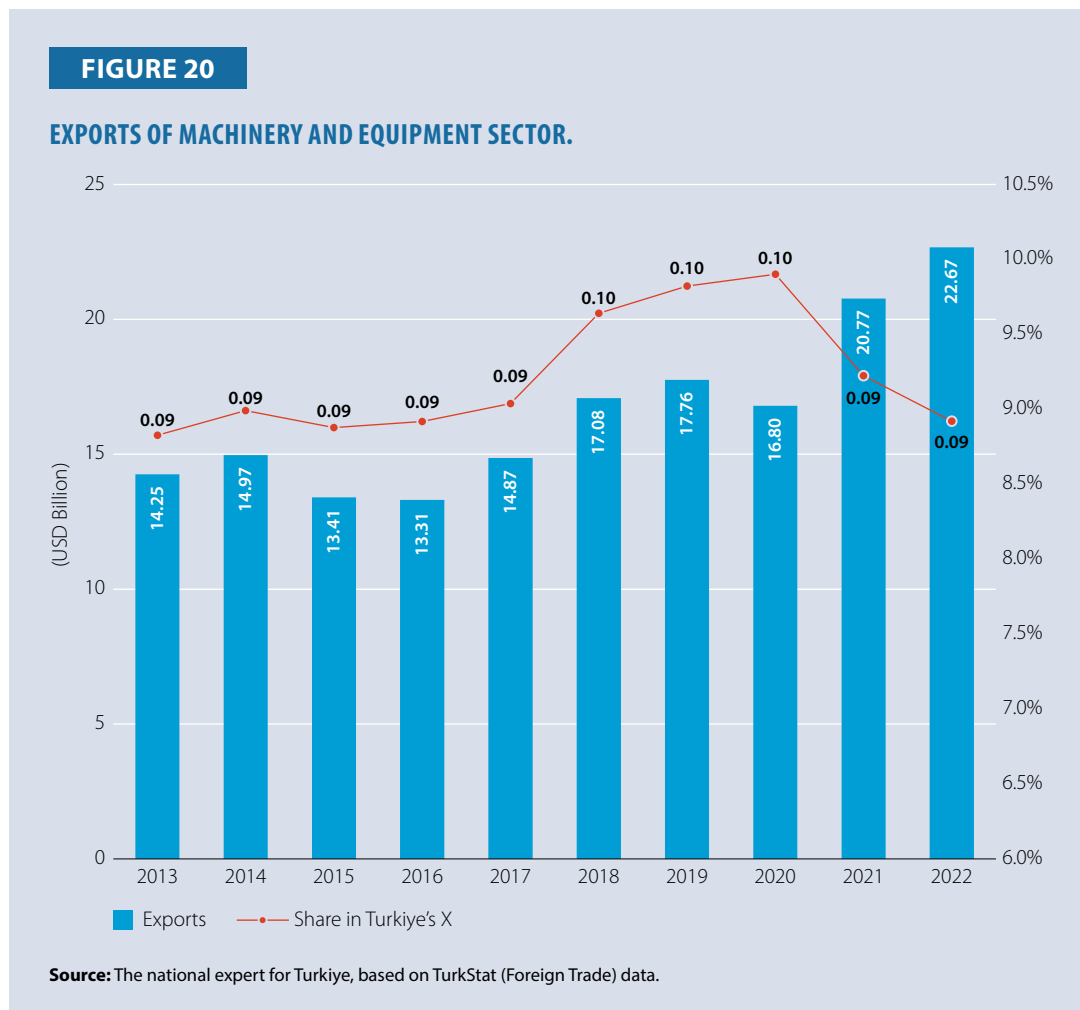
The pandemic-induced disruptions in GSCs negatively impacted Turkiye’s production processes. However, a favorable outcome has been the emergence of local production for specific inputs by domestic manufacturers, reducing reliance on foreign sources. Also, the rise in exchange rates, which made intermediate goods imports costlier, has motivated the development of local supply chains.

Turkiye’s ambition to become a regional production hub in the automotive sector faces structural challenges. Despite having human and technological competencies, dependencies on imported parts, limited local value addition, and a lack of product variety hinder technological advancements and digitization. A failure to align with digital transformation conditions could jeopardize Turkiye’s

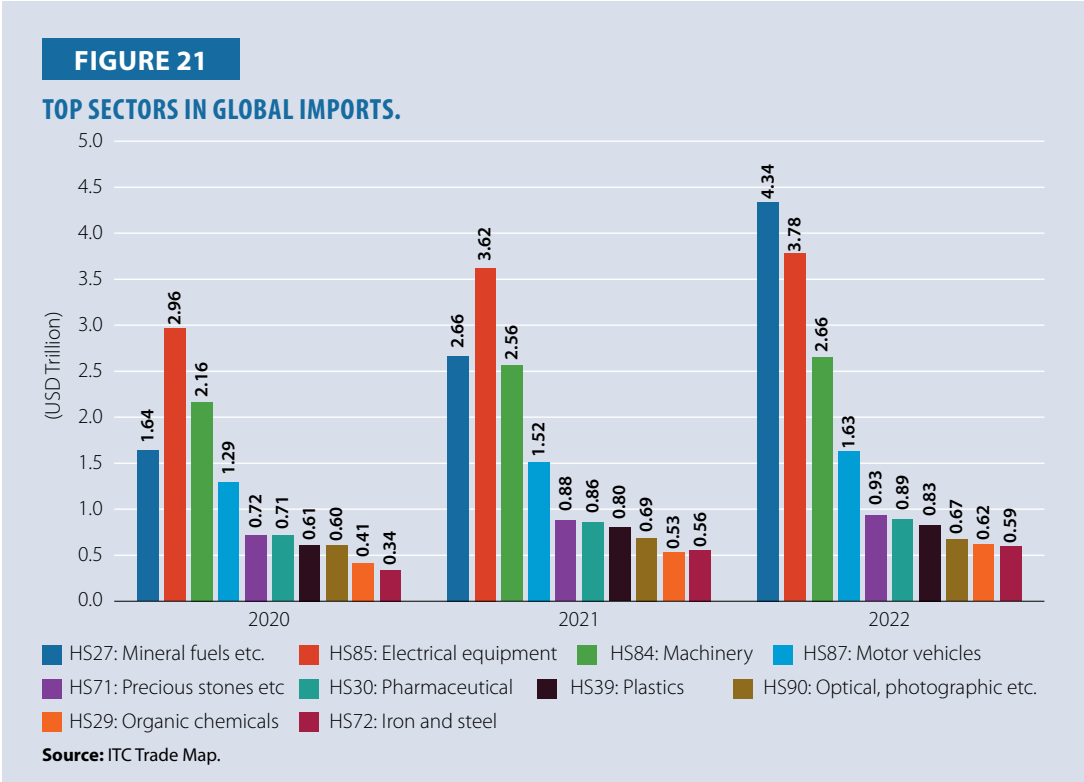
competitive advantages. Environmental factors like the European Green Deal also pose significant challenges. In response, the ‘Mobility Vehicles and Technologies Roadmap’ outlines strategic goals, including leadership in electric and autonomous vehicle production, a 20% share in manufacturing exports, a 35% market share for electric vehicles by 2030, a minimum 75% domestic production rate, and 251,000 charging sockets by 2030 (Ministry of Industry and Technology, n.d.).

Machinery and Equipment

Like the automotive sector, the Machinery and Equipment industry, which boasts a robust production and logistics infrastructure, has significantly contributed to Turkiye’s total exports in 2022 (see Figure 20), reaching approximately USD23 billion and securing second place. This sector generally holds one of the three top positions in total global imports, amounting to USD2.66 trillion in 2022 (see Figure 21).

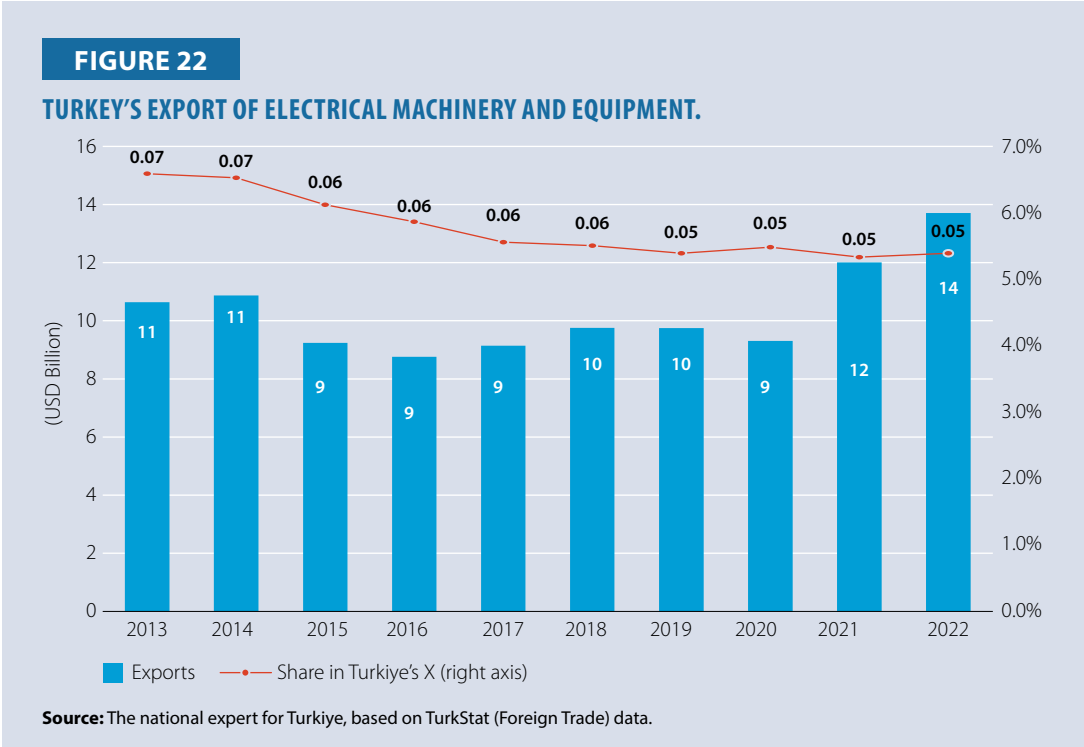


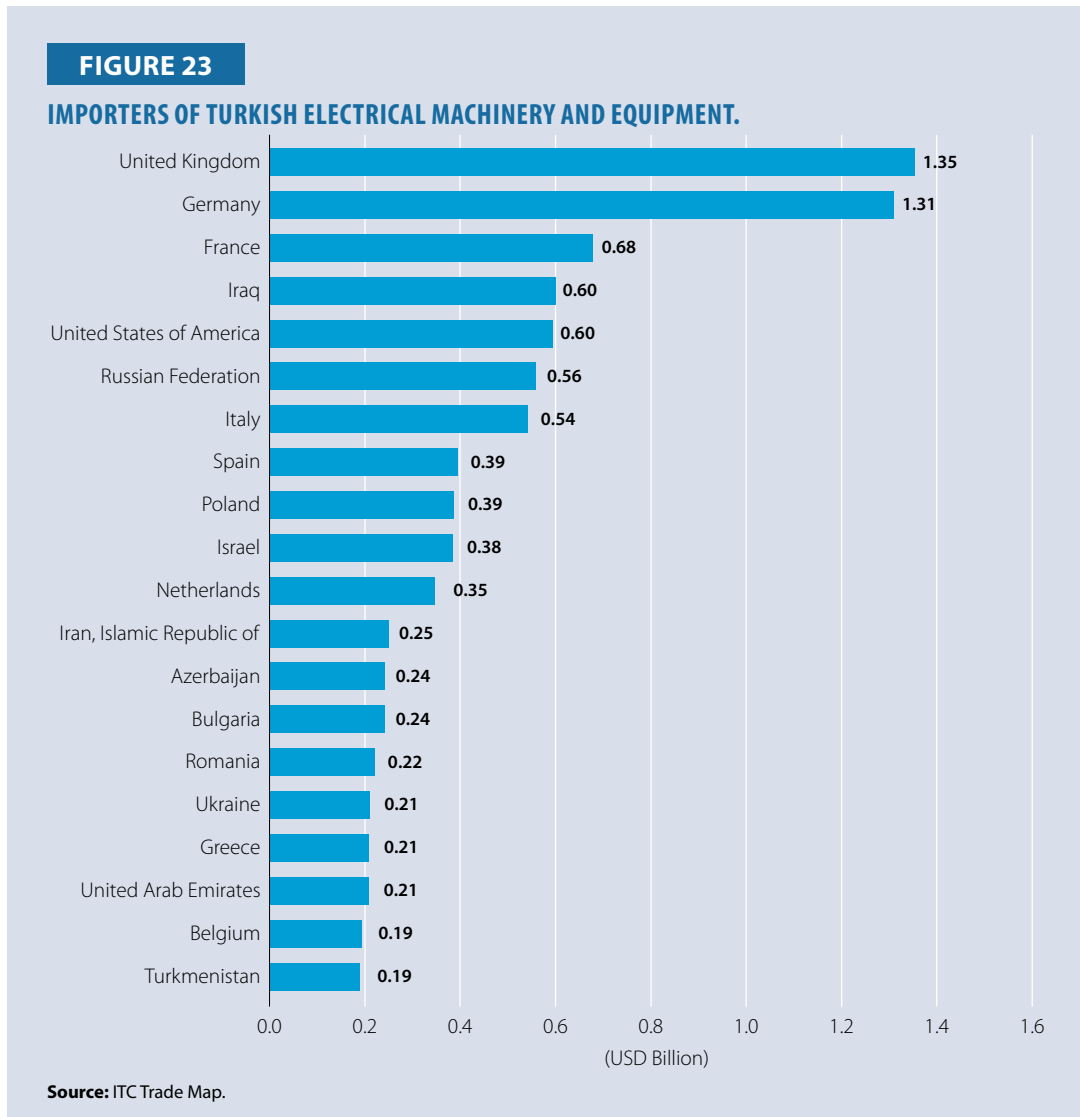
The machinery sector in Turkiye sees potential integration opportunities amid GSC disruptions. However, protectionist attitudes fueled by the pandemic pose risks. Challenges include import dependence, currency fluctuations, customs duties, and an unstable tax structure. SMEs in the sector face financial constraints affecting R&D and design capabilities. Besides, the limited attraction of qualified technical personnel and struggles in branding, marketing, and e-commerce present structural impediments. Hence, careful consideration is essential for navigating these challenges.



Electrical Machinery and Equipment

The electrical machinery and equipment sector, which ranks third in Turkiye’s export spectrum, ranks second in the world’s total imports, amounting to USD3782 billion in 2022 (see Figure 22). France, Germany, and the United Kingdom are the largest importers of Turkish products in this sector (see Figure 23).



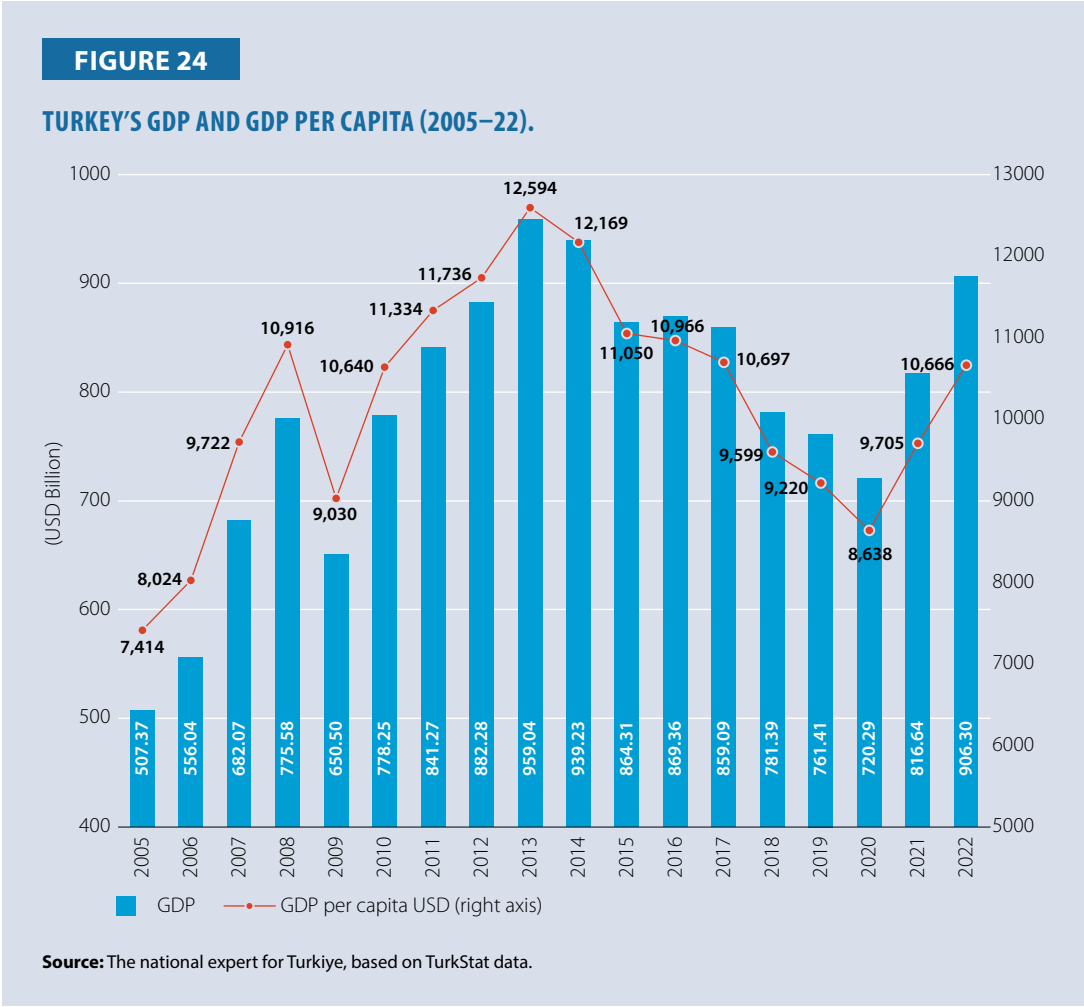


The sector, which relies heavily on foreign inputs, faces challenges such as delivery delays, shifts in consumer demand, and cost increases due to the pandemic. Geographical concentration varies across product groups, offering branding benefits and market dependence risks. During recovery, the diversity within less concentrated product groups like climate control and energy equipment, should be leveraged as an advantage. However, high dependence on foreign components, mainly electronic, impacts forecasts, production, and pricing, and restricts mobility in R&D and design processes, emphasizing the need for strategic considerations.

The progress made by a Turkish company Arcelik in this sector is analyzed in detail as part of the case study.

Impact of New GSC Trends on Aggregate Productivity and Economic Development

Turkiye's GDP and GDP per capita measures reveal an overall upward trend during 2005–22, with fluctuations influenced by economic factors and global conditions (Figure 24). Despite the impact of the COVID-19 pandemic in 2020, the subsequent recovery in 2021 and 2022 demonstrates the country's resilience. The GDP per capita values indicate improvements in individual economic well-being over the years.

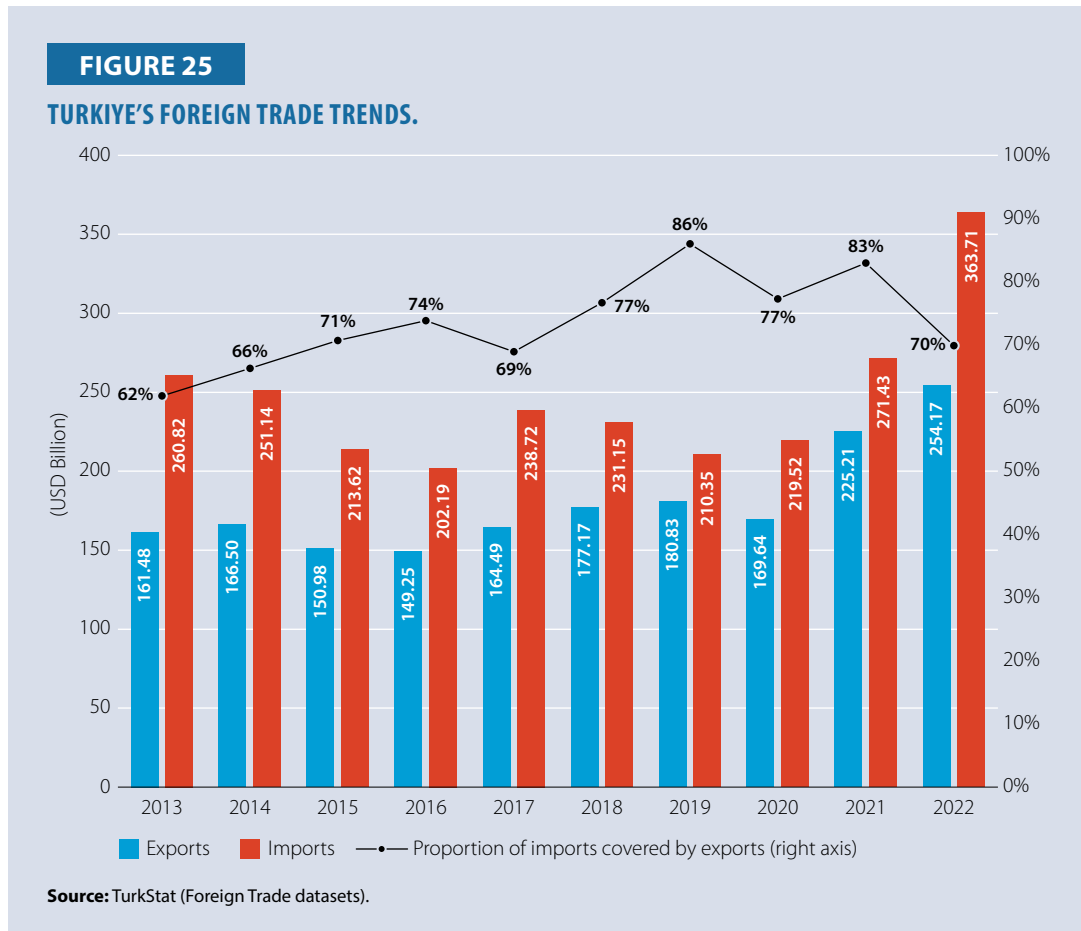


This section analyzes Türkiye’s progress toward stronger integration into the GSCs, particularly in 2018 and the years after. The following parameters were considered for this analysis.:

1. Export levels
2. Levels of intermediate goods import and export
3. Export levels in target countries
4. Distribution of exports by technological groups
5. Export levels in target sectors
6. Sophistication of exports

Export Levels

Türkiye’s 11th Development Plan (2019–23), which determines its economic policies, aims to increase the export level from USD167.9 billion in 2018 to USD226.6 billion and to raise the export-to-import ratio from 75.3% to 77.2%. The values related to these goals for the period 2013–22 are shown in Figure 25:



In 2022, Turkiye exceeded its export target for 2023, reaching a value of USD254 billion. When examining the export-to-import ratio, it is noteworthy that this value fluctuates between 66% and 86% over the decade without demonstrating a consistent decrease or increase. Although surpassing the target with a value of 83% in 2021, the parameter dropped to 70% in 2022. In 2020, which witnessed the most intense impact of the COVID-19 pandemic, there was a partial decline in exports. However, in 2021, this decline was largely rectified.

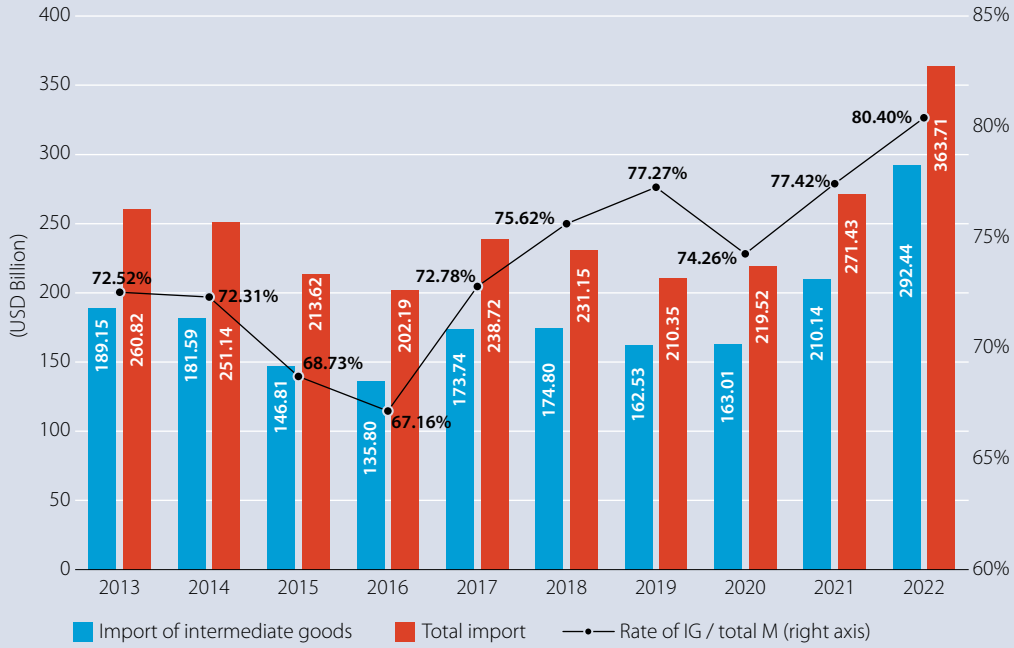
Levels of Intermediate Goods Import and Export

As discussed in the section on Turkiye's Position in GSCs, the TiVA dataset, prepared by the OECD and used in GVC analyses by the World Bank, does not provide data beyond 2018. While not as meaningful as this data, TurkStat publishes export and import values for the 2013–22 period according to Broad Economic Categories, including the Intermediate Goods category for both parameters. Values under the import heading in this category can provide insights into backward linkage, and values under the export heading can provide insights into forward linkage.

The proportion of intermediate goods imports to total imports declined from 2013 to 2016, rising again, especially after 2020 (see Figure 26). This increase, associated with backward linkage, is consistent with the transition pattern to advanced manufacturing and services outlined in the section on Turkiye's Position in GSCs. When looking at the proportion of intermediate goods in exports, the remarkable increase after 2020 is noteworthy. As illustrated in Figure 27, this surge indicates that post-COVID-19, Turkiye's involvement in forward linkages has increased.

FIGURE 26

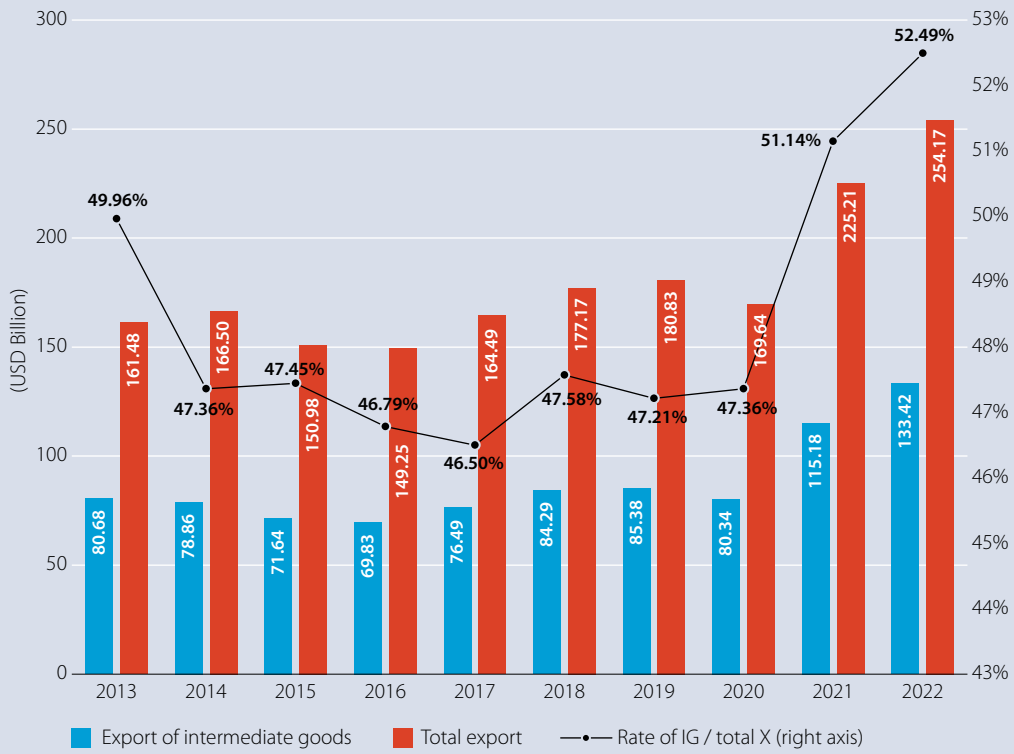
IMPORT OF INTERMEDIATE GOODS IN TURKIYE.



Source: The national expert for Turkiye, based on TurkStat (Foreign Trade) data.

FIGURE 27

EXPORT OF INTERMEDIATE GOODS FROM TURKIYE.



Source: The national expert for Turkiye, based on TurkStat (Foreign Trade) data.

Export Levels in Target Countries

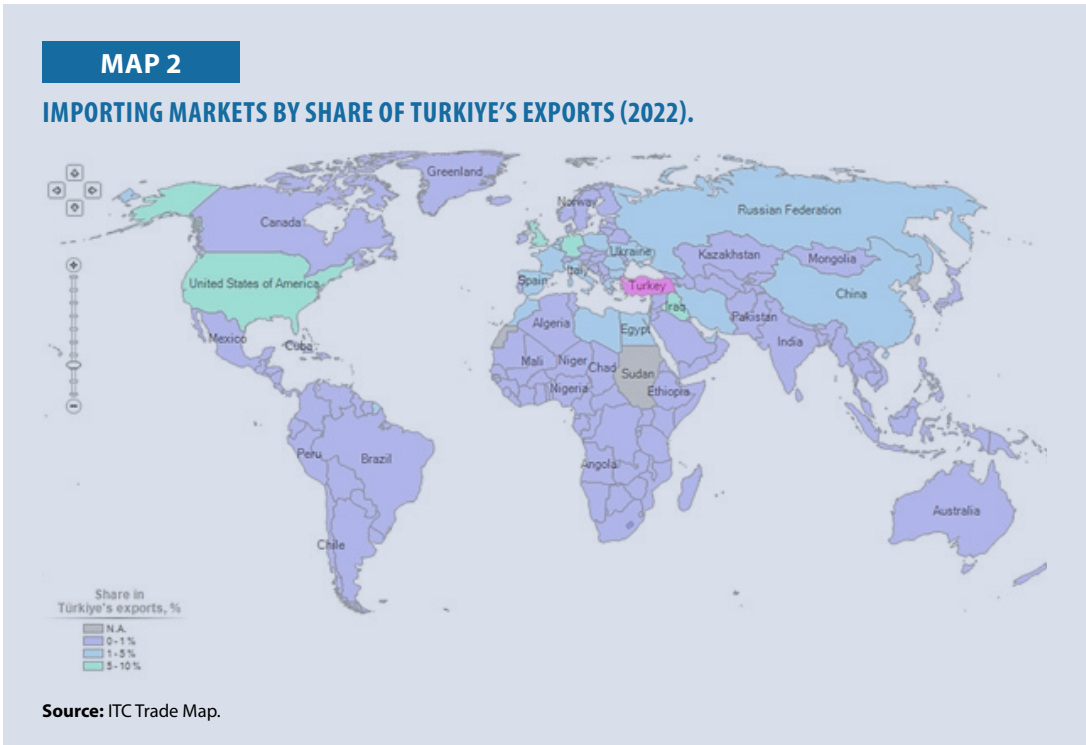
In the 2019 Export Master Plan, 17 target countries were identified to increase Turkiye's share in their total imports from 0.5% to 1%. Table 2 illustrates Turkiye's achievements during 2013–22 in exports to these 17 countries and the proportion of these exports in the countries' imports.

TABLE 2
TURKIYE'S EXPORTS TO TARGET COUNTRIES.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Brazil	0.38	0.34	0.27	0.24	0.26	0.27	0.28	0.37	0.47	0.37
Chile	0.29	0.28	0.33	0.41	0.42	0.56	0.49	0.46	0.66	0.47
China	0.19	0.15	0.14	0.15	0.16	0.14	0.13	0.14	0.14	0.12
Ethiopia	3.39	2.28	2.36	2.46	2.30	2.23	2.45	1.64	2.32	2.02
India	0.13	0.13	0.17	0.18	0.17	0.22	0.24	0.24	0.23	0.22
Iraq	n/a	35.49	18.14	18.16	17.56	15.54	18.06	17.51	18.02	18.23
Japan	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.07
Kenya	0.92	0.74	0.82	0.91	0.91	1.20	1.34	1.48	1.71	1.35
ROK	0.10	0.10	0.13	0.13	0.12	0.17	0.19	0.24	0.16	0.14
Malaysia	0.14	0.16	0.20	0.19	0.15	0.17	0.17	0.20	0.19	0.16
Mexico	0.07	0.09	0.09	0.11	0.11	0.13	0.15	0.14	0.17	0.18
Morocco	0.81	0.87	0.93	1.03	1.06	1.18	1.30	1.21	1.32	1.22
Russia	2.29	2.15	2.02	0.95	1.20	1.43	1.70	1.95	1.97	4.69
South Africa	0.65	0.59	0.57	0.54	0.58	0.57	0.65	0.84	0.92	1.53
UK	1.39	1.47	1.68	1.84	1.50	1.65	1.63	1.78	1.97	1.59
USA	0.29	0.29	0.28	0.29	0.36	0.32	0.35	0.42	0.50	0.50
Uzbekistan	n/a	n/a	n/a	n/a	5.65	5.50	5.64	5.78	7.76	6.64
Total (17 Countries)	0.56	0.54	0.50	0.51	0.50	0.49	0.54	0.59	0.61	0.62

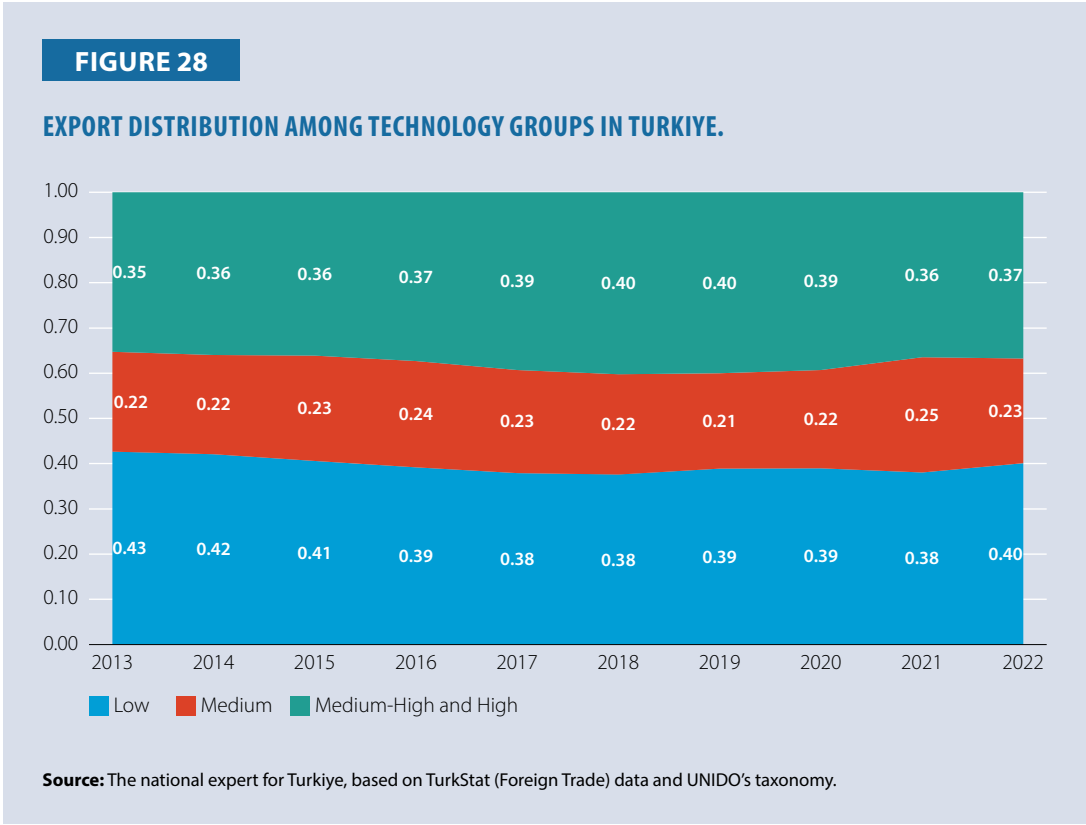
Source: ITC Trade Map.

Table 2 indicates that while Turkiye's share in the total imports across 17 identified countries surpassed the 2018 value of 0.49% to reach 0.62%, it remains significantly below the 1% target. However, there has been notable progress in some designated target countries like Brazil, Mexico, Morocco, South Africa, and the United States. While Turkiye's share in Russia's imports experienced a significant surge in 2022, it can be attributed to the disruption in trade between Russia and other countries due to the Russia-Ukraine War. Map 2 illustrates the percentage of imports from other countries in Turkiye's total exports.



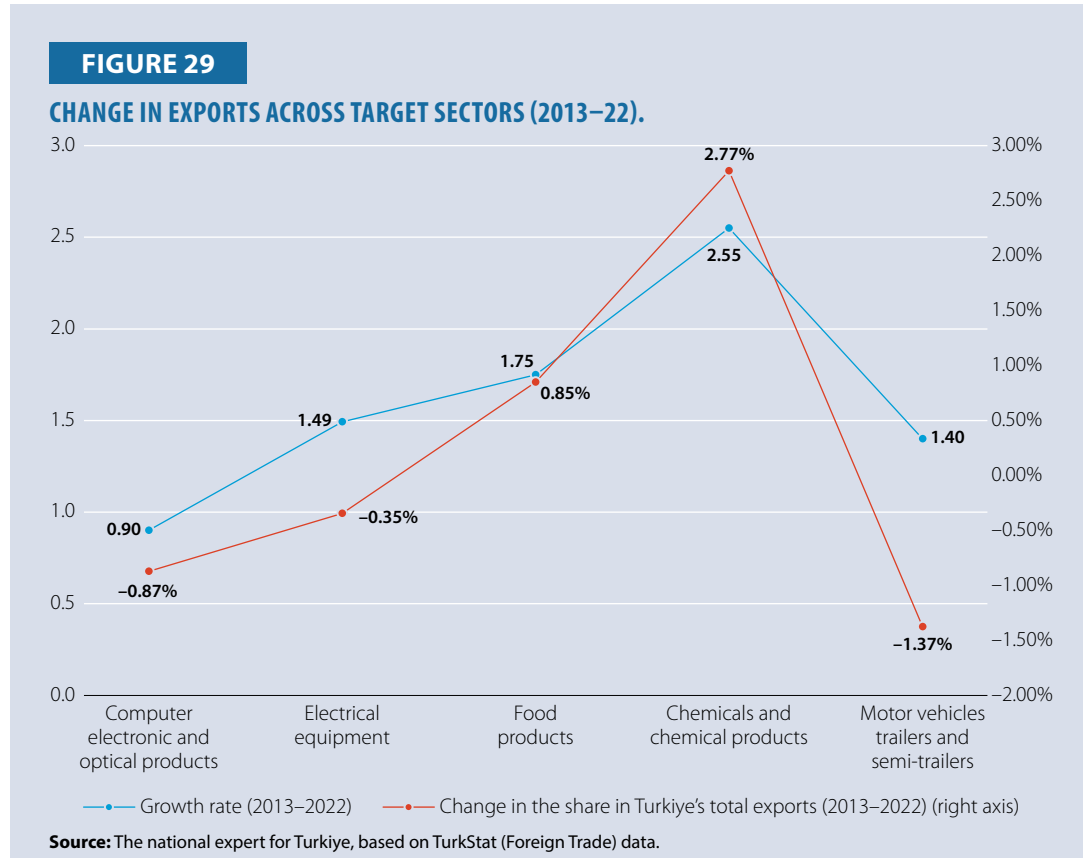
Distribution of Exports by Technology Groups

The 2023 Industrial and Technology Strategy aims to increase the share of medium-high and high-tech products in total exports to 50%. Figure 28 illustrates the developments in this space during 2013–22.



Export Levels in Target Sectors

Turkiye's Export Master Plan aims to increase exports in five sectors. Figure 29 presents the export performances for these sectors during 2013–22. During this period, Turkiye experienced diverse trends across the target sectors. Notably, the chemicals and chemical products sector saw a substantial 2.55% growth and a notable increase in its export share by 2.77%. Conversely, the motor vehicles sector grew by 1.40%, but its share in total exports declined by 1.37%.



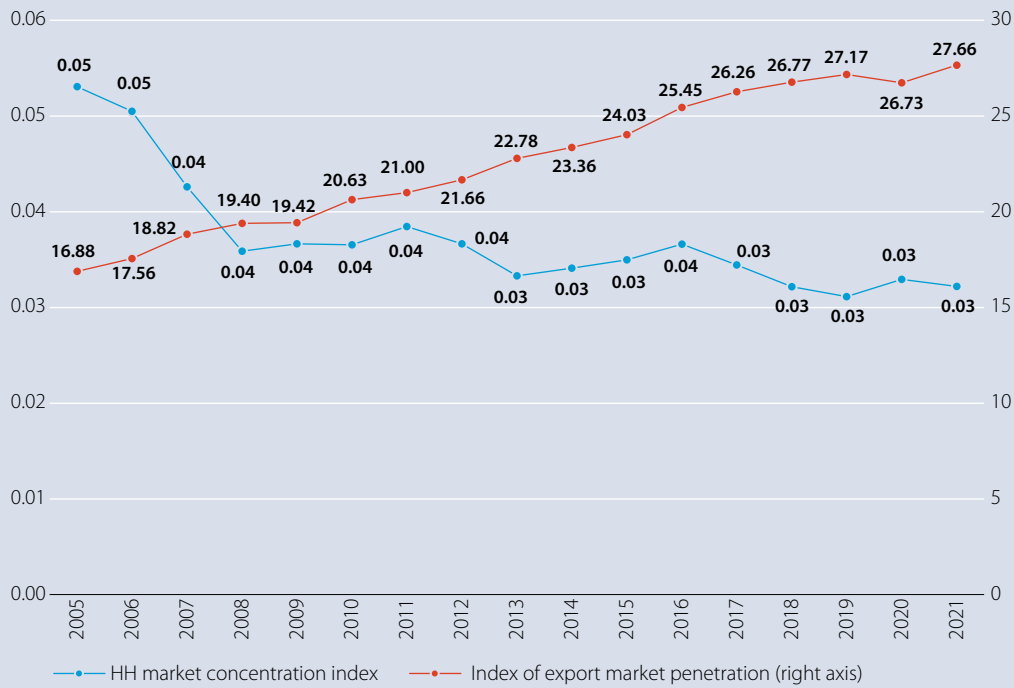
Sophistication of Exports

An analysis of trade concentration and diversity in Turkiye during 2005–21, as depicted in Figures 30 and 31, reveals significant trends. The Herfindahl-Hirschman (HH) Market Concentration Index demonstrates a decline, indicating a shift towards a more diverse export product range, reflecting a broader portfolio. It also indicates an increase in the Index of Export Market Penetration and the number of export partners, signifying Turkiye's expanding market penetration and engagement with a growing number of trading partners. This suggests an increasing market share and a growing network of countries in trade relationships.

Other Indicators

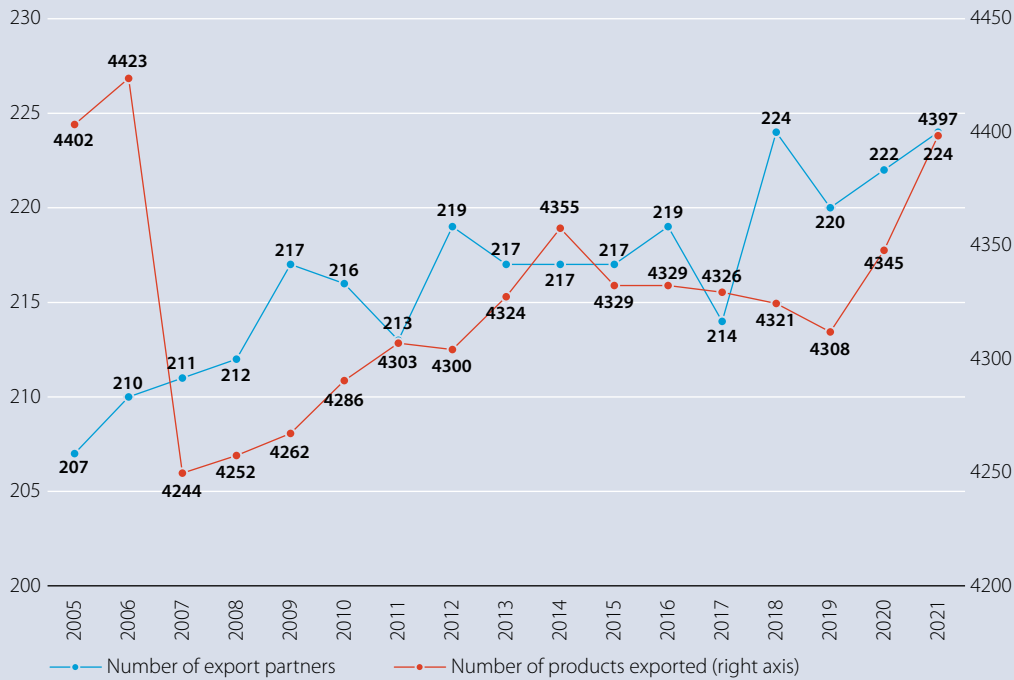
In 2019, Turkiye's Ease of Doing Business rankings, shown in Figure 32, reflected a mixed status. The country performed well in areas such as starting a business (rank 77), construction permits (rank 53), and protecting minority investors (rank 21). Efficient procedures for obtaining electricity (rank 41) and registering property (rank 27) highlighted a business-friendly environment. However, challenges remain in resolving insolvency (rank 120), suggesting the need for potential improvements in the bankruptcy process. Turkiye's rankings depict a favorable business climate with strengths in specific areas, though opportunities for improvement remain.

FIGURE 30
HH AND EXPORT MARKET PENETRATION INDICES.



Source: World Bank. Trade Summary for Turkey 2022.

FIGURE 31
NUMBER OF EXPORT PARTNERS AND PRODUCTS EXPORTED.



Source: World Bank. Trade Summary for Turkey 2022.

In terms of trading efficiency, Turkiye's performance in the Trading Across Borders category in 2019 was impressive, with a score of 91.6 and a global rank of 44 out of 213 countries, highlighting the efficiency of export and import processes. Border and documentary compliance times and costs are notably low, indicating a streamlined process. Export border compliance took 10 hours, costing USD338, while documentary compliance took four hours at USD55. Import processes were similarly efficient, with border compliance taking seven hours and costing USD46, while documentary compliance took two hours and cost USD55 (Table 3).

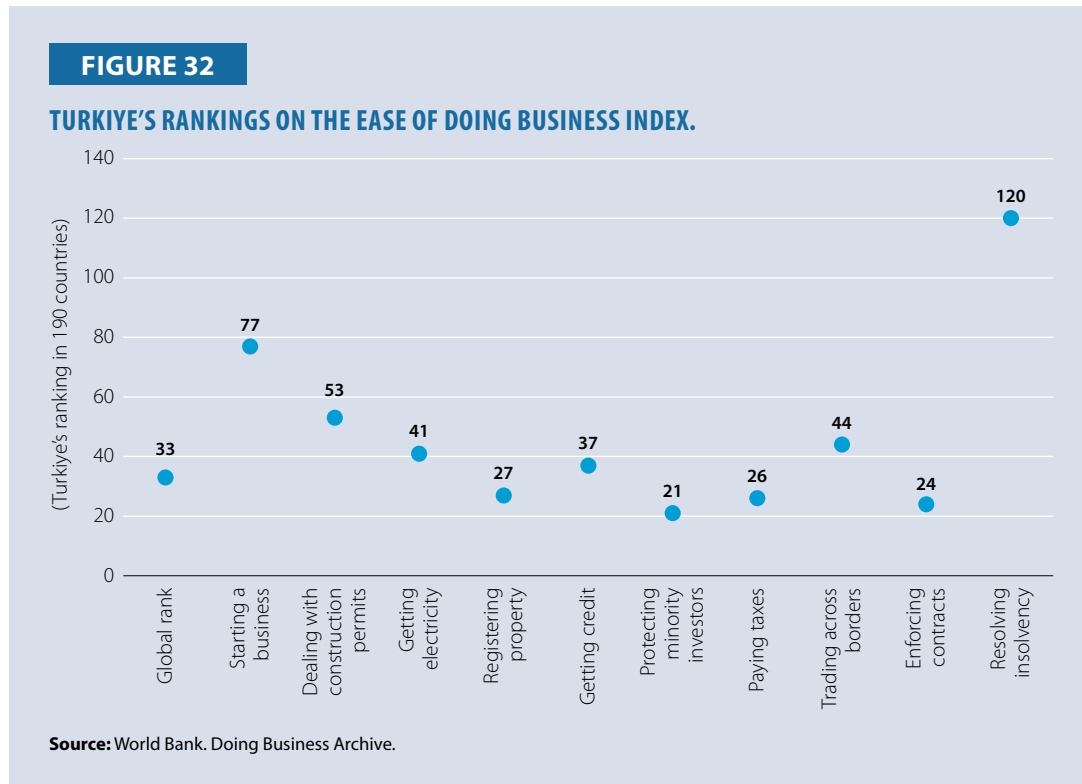


TABLE 3

TRADING ACROSS BORDER SCORES.

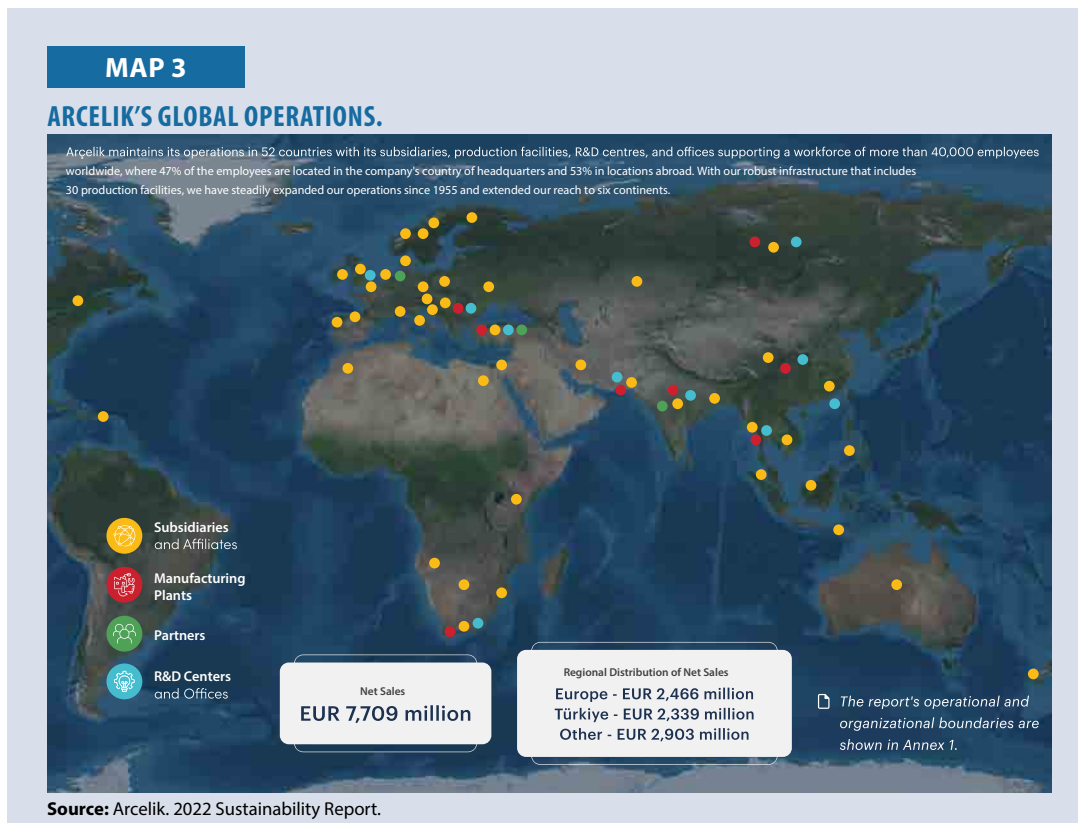
Trading across Borders score	91.6
Export border type	port
Time to export: Border compliance (hours)	10
Cost to export: Border compliance (USD)	338
Time to export: Documentary compliance (hours)	4
Cost to export: Documentary compliance (USD)	55
Import border type	land
Time to import: Border compliance (hours)	7
Cost to import: Border compliance (USD)	46
Time to import: Documentary compliance (hours)	2
Cost to import: Documentary compliance (USD)	55
Trading across Borders rank (213 countries)	44

Source: World Bank. Doing Business Archive.

Case Study:

Arcelik¹ A.S.

A global player with 13 renowned brands, Arcelik A.S., operates in 52 countries through subsidiaries and employs over 45,000 (see Map 3) people. With 30 production facilities across nine countries, Arcelik holds a significant market share in Europe, reporting a consolidated turnover exceeding EUR7.7 billion in 2022, with 70% of revenues from international markets. Committed to innovation, Arcelik has submitted over 3,000 global patent applications and achieved the highest score in the Dow Jones Sustainability Index for the Household Durable Industry category for the fifth consecutive year in 2023. The World Economic Forum recognized its factory in Ulmi, Romania, as a Sustainability Lighthouse. Established in 1955, Arcelik’s legacy of continuous growth is evident through its global footprint and dedication to sustainability and innovation (Arcelik, n.d.).



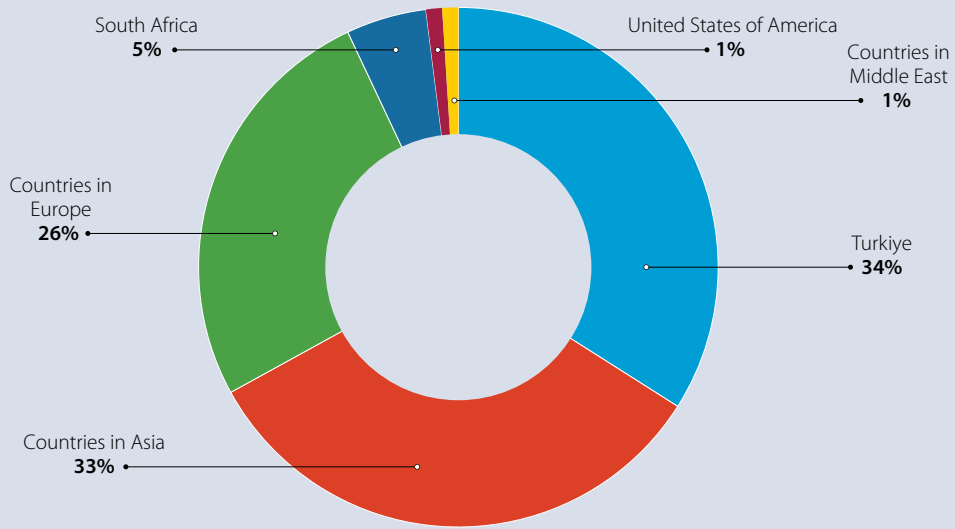
GSC Management in Arcelik

Overview

Arcelik operates a dynamic purchasing structure with offices in nine countries and over 200 employees. In 2022, its global procurement involved more than 2,000 Tier-1 material suppliers from over 60 countries, totaling approximately EUR4.5 billion, including indirect and investment purchases. Raw materials, especially metal and plastic inputs for home appliance production, constitute the largest portion, accounting for about 33% of the final product cost. The company’s purchasing activities contribute to local development in multiple countries (see Figure 33). The raw material purchase rates for 2022 are depicted in Figure 34, highlighting their significance in determining component prices reliant on raw materials.

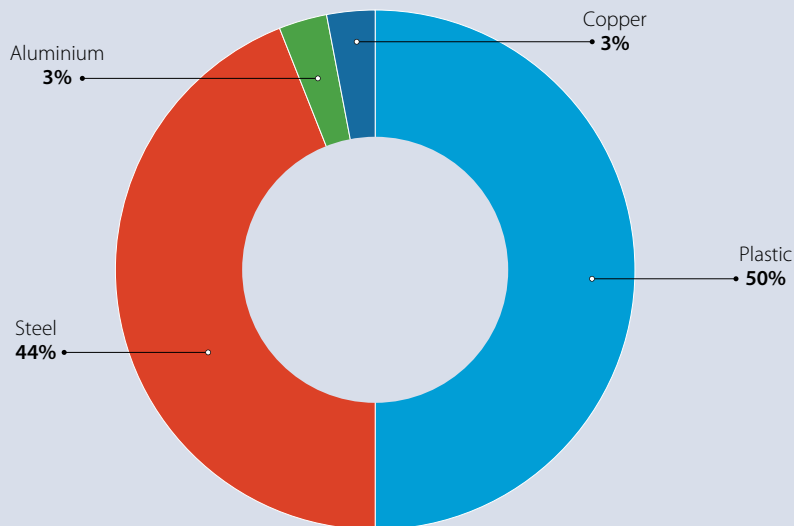
1. "I would like to express my gratitude to Mrs. Canan Ergün Tavukçu, Director of Arçelik Government & Sectoral Relations, who played a significant role in the preparation of this chapter, as well as to Mr. Zaim Yolartıran, Mr. Arda Onkök and all other Arçelik employees who provided valuable support." Ahmet Emre Coban.

FIGURE 33
ARCELİK'S PURCHASING COST BY REGION OF ORIGIN.



Source: Arcelik. 2022 Sustainability Report.

FIGURE 34
PERCENTAGE BREAKDOWN OF ARCELİK'S RAW MATERIAL PURCHASES.



Source: Arcelik. 2022 Annual Report.

Procurement Strategy

Arcelik employs a robust Total Cost Management System overseeing all aspects of procurement, from raw materials to final logistics. Working closely with individual procurement and production departments, the company actively pursues design changes, explores alternative materials and

supply sources, and undertakes cost-improvement projects. Dynamic inventory management policies to regulate stock turnover and consignment purchases are employed. Arcelik invests significantly in evaluating alternative supply routes in low-cost regions through its global procurement organization spanning nine countries.

The centralized approach to supply chain management allows Arcelik to anticipate and respond proactively to potential challenges and opportunities. The company's central and high-volume global procurement strategy contributes to cost improvement, risk management, supplier management, and optimization, which is crucial in preserving profitability (Arcelik, n.d.).

Sustainable Supply Chain and Procurement Management

Arcelik emphasizes sustainability, innovation, and collaboration with global suppliers to drive its Responsible Procurement initiatives. Its Global Responsible Procurement Policy mandates supplier compliance, assessed through Behaviour Code inspections. By 2025, Arcelik aims to collect and share data on emissions, energy, water, and waste from 90% of suppliers. Ethical audits ensure compliance while the company continuously works on supplier development, training, risk assessment, and initiatives to reduce environmental impact and improve energy efficiency. The company's Supplier Development Activity Plan 2022 emphasizes continuous improvement and collaboration (Arcelik, n.d.).

Impact of COVID-19 on Supply Chains

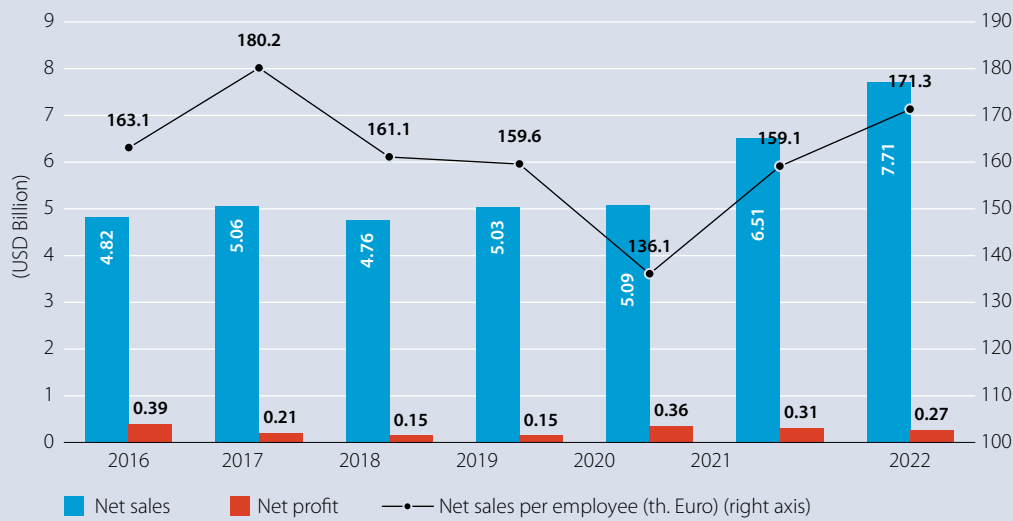
Despite the impact of COVID-19, the global white goods sector grew by 4% in 2020, reaching USD215 billion in revenue. European markets, including Germany and the UK, experienced significant growth (Germany: 9%, UK: 10%), with Eastern Europe showing a 13.4% increase. The sector remained resilient in Turkiye, recording a 3% growth in production and exports. In comparison, domestic sales surged by 16%, driven by increased demand for home hygiene and safety products and support from new home sales (Arcelik, n.d.).

Arcelik's Performance During the Pandemic

Despite the challenges posed by the pandemic and disruptions in supply chains, Arcelik showcased resilience and robust performance in global markets. The company swiftly adapted to changing conditions, particularly in European countries severely affected by COVID-19, by shifting sales to online channels. Despite early restrictions, Arcelik achieved growth in both Eastern and Western European markets in 2020, with double-digit growth in Italy and the UK in the last quarter. In the African market, where growth momentum was achieved, revenue was successfully maintained.

Financially, Arcelik maintained stability throughout the COVID-19 period. Its consolidated revenue rose by 28% in 2020, reaching TRY40.9 billion, with 65.5% coming from international markets. Net profit nearly tripled from 2019, reaching TRY2.85 billion, with an EBITDA margin of 13.7%. Net sales during 2016–22 reflect consistent growth, reaching EUR7,709 million in 2022 (see Figure 35). Similarly, the trend in net profit reflects financial stability, with a noticeable increase in 2020 and a steady performance in subsequent years. The net sales per employee metric indicates the company's efficiency and productivity, showing a slight dip in 2020 with a steady recovery and improvement in the following years.

FIGURE 35
KEY FINANCIAL METRICS OF ARCELİK'S PERFORMANCE (2016–22).



Source: The national expert for Turkiye, based on Arcelik Annual Reports for 2020, 2021, and 2022 data.

Strategies Implemented by Arcelik to Address Supply Chain Challenges

Arcelik's strong performance in 2020 extended beyond the increased home activities during pandemic restrictions or dynamics in the real estate market. Despite notable challenges, such as raw material shortages and subsequent price hikes, the Arcelik maintained resilience. Sustained high demand, the cancellation of China's export incentives, and rising shipping costs led to historic highs in metal and plastic raw material prices, which jumped around 60% in 2022 and the first half of 2023 compared to 2021. The outlined strategies should not be viewed as exclusive to 2020 but as ongoing measures adapted to persisting challenges (Tavukcu et al., 2023).

Notably, these strategies align with the fundamental principles of reinforcing resilience and recovery capabilities in GSCs, as suggested by embedded resilience literature. Arcelik's approach involved refining supply chain mapping and monitoring, bolstering operational flexibility, diversifying sourcing options, and implementing buffers. These measures helped avoid and manage disruptions, stabilize operational flow, and ensure a secure path back to normalcy when needed (Melnik et al., 2014).

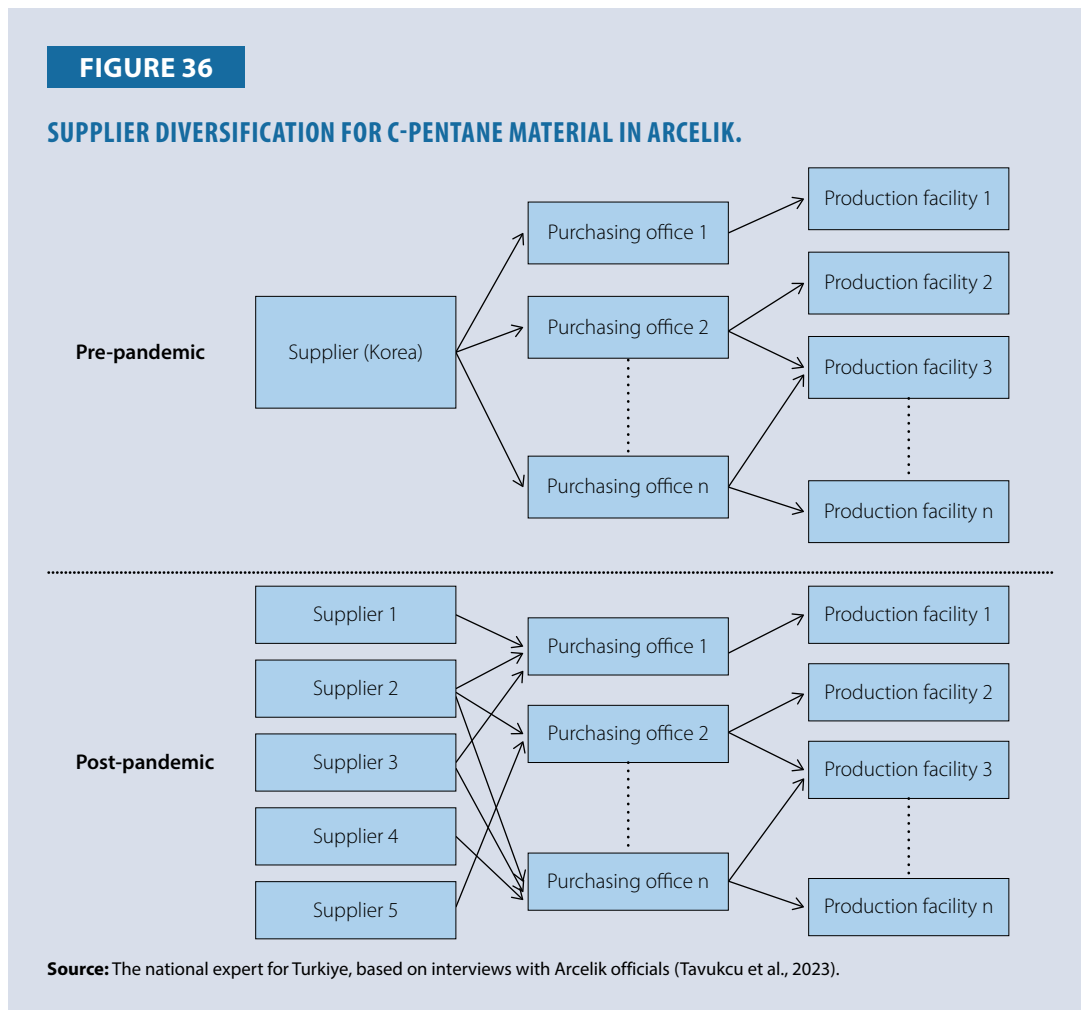
Diversification and Relocation

In response to the potential disruptions in GSCs due to the pandemic, Arcelik strategically focused on enhancing supplier diversity and localization efforts to mitigate dependency on specific sources. Additionally, the company's robust supply management system, marked by the ability to resist price hikes through extended contracts and centralized procurement management, proved advantageous in addressing the challenges posed by the pandemic.

“During the COVID-19 period, our options for sourcing materials became severely limited. Finding reliable alternative suppliers and securing timely deliveries became critical. A diversified supply chain is essential, with multiple sources for each component. We assessed regional risks and

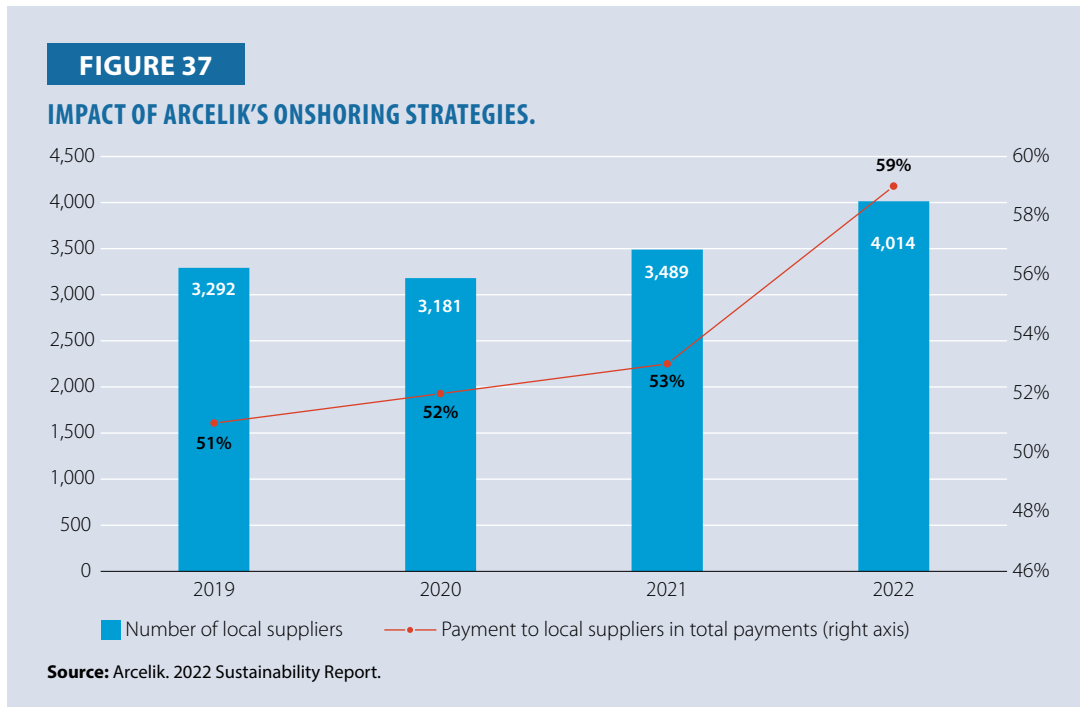
devised new plans to source from additional locations. At Arcelik, offices across nine countries, supported by over 200 employees, facilitated rapid coordination with suppliers to secure alternative sources.” (Tavukcu et al., 2023)

A particular supply crisis involved C-pentane, which is crucial for refrigerator production. When LG-Chem, one of the largest global producers based in the Republic of Korea, declared Force Majeure in November 2020, Arcelik’s global procurement team quickly reached out to various producers worldwide. This swift response enabled Arcelik to secure shipments from five new suppliers in China, Europe, and India. Despite heightened material demand due to increased production, Arcelik effectively managed the situation, ensuring uninterrupted operations (see Figure 36).



Onshoring (Localization)

Since the onset of the pandemic, Arcelik has actively promoted domestic production to reduce foreign dependency in procurement, mitigate supply risks, and enhance technological expertise in production within Turkiye. In collaboration with suppliers, Arcelik initiated a project in 2020 to manufacture 29 previously imported materials domestically (Arcelik, n.d.). As part of its onshoring strategy, the company further implemented projects in 2022 to localize the production of 123 imported materials and established local sourcing options for an additional 15 materials (Arcelik, n.d.). The impact of these initiatives is depicted in Figure 37.



Digital Transformation in Global Logistics and Warehouse Management

Arcelik has integrated digitalization into its supply chain management, enhancing its operational efficiency and overall performance through several key initiatives:

Loading and Unloading Improvements: The company has implemented a system to manage loading and unloading on warehouse ramps, enhancing operational efficiency and capacity utilization and reducing waiting times and carbon emissions.

STORM Project: This project digitalizes country-specific processes such as forecasting, order tracking, logistics planning, and transport management. Initiated in October 2020, the project was fully implemented in April 2021 and expanded to Romania's Arctic phase in January 2022.

Digital Documentation: Initiated in the second half of 2022, the digital archive project aims to reduce paper and email usage in supply chain processes.

Robotic Process Automation (RPA): Arcelik has successfully implemented RPA for sales, goods entry, and logistics. Its expansion focuses on global and central supply chain management processes.

Subsidiary Demand-Supply Cycle and Logistics Management: The company has implemented a digital platform to provide end-to-end supply chain tracking for subsidiaries, enhancing operational efficiency and financial performance.

International Vehicle Traceability: The initiative aims to provide stakeholders with end-to-end visibility and traceability, operational efficiency through automatic monitoring, and enhanced customer satisfaction with shorter reaction times.

Damage Process Improvement: The project aims to increase traceability in damage and insurance processes, track details through the system, and improve information sharing between teams.

Digital Transformation Focus Group Study: The initiative enabled the selected pilot teams from central and global supply chains to identify key digital transformation areas and eliminate non-value-adding tasks.

Business Intelligence – KPI Management: The effort aims to automatically calculate and share KPIs in real-time, ensuring easy access to accurate information and detailed analyses for teams, with ongoing efforts to increase traceability (Arcelik, n.d.).

In 2022, Arcelik advanced its digital transformation initiatives by pursuing several key activities.

- Incorporated future-oriented technologies aligned with open innovation.
- Broadened the implementation of digital process management applications to enhance employee productivity.
- Developed applications to streamline modular product management.
- Expanded the adoption of Industry 4.0 applications.
- Ensured harmonization and standardization of digital applications across its global operations.
- Established a secure, device-independent infrastructure and sustainable operational management.
- Implemented data analytics and AI to support data-driven business management.
- Created and promoted the use of digital products on a global scale.

For 2023, Arcelik outlined the following digital transformation priorities in its 2022 Annual Report.

- Continued focus on enhancing the digital supply chain.
- Activated strategies for organic and inorganic growth.
- Initiative to transform the Enterprise Resource System, Arcelik ERP 2.0.
- Maintaining efforts to support digital manufacturing.
- Strengthening global capabilities for direct-to-consumer engagement.
- Prioritizing initiatives for efficiency and productivity gains (Arcelik, n.d.).

Agile Perspective, Flexibility and Collaboration

“We now prioritize flexibility over cost.” (Tavukcu et al., 2023)

Since the beginning of the pandemic, Arcelik adapted to unforeseen disruptions by emphasizing agility, flexibility, collaboration, and digitalization. The company launched a global online

mobilization initiative, increasing the frequency of planning meetings and enhancing interactions with shipping stakeholders. Alternative shipping routes were established to optimize costs, and real-time tracking of ocean containers was implemented. A SKU simplification project was introduced to streamline products and improve supply chain operations. Additionally, Arcelik altered delivery terms for smaller suppliers, took over end-to-end logistics planning, and invested in customer integration systems to enable 100% digital order placement and real-time updates (Tavukcu et al., 2023).

Arcelik's Commitment to Sustainable Supply Chain Management

The EU's Green Deal and related regulations, such as the Corporate Sustainability Due Diligence Directive and Corporate Sustainability Reporting Directive, are reshaping global trade dynamics with a focus on climate change and environmental and human rights. These initiatives, transforming industries and supply chains, require companies in and outside the EU to assess environmental and human rights situations across their operations, subsidiaries, and value chains, reflecting the global impact of EU regulations.

“At Arcelik, we believe that, in addition to the environmental and social impacts resulting from our actions over the years, we must also monitor the environmental and social performance of the suppliers we collaborate with.” (Tavukcu et al., 2023)

Arcelik actively engages with its suppliers, which account for 90% of its procurement volume, to assess their environmental performance. The company gathers data on various metrics such as emissions, water intake, recycled wastewater volume, waste, green electricity procurement, and energy consumption. The company's top management recently sent a commitment letter to suppliers, expressing expectations for them to develop their sustainability strategies, set ambitious ESG goals, and disclose these efforts publicly. Through webinars and discussions, Arcelik guides suppliers to ensure greater transparency and continuous improvement.

Aligned with the UN Global Compact and ILO principles, the company upholds human rights across its operations and transparently reports its activities. Arcelik undergoes BSCI and Sedex audits to monitor employee rights, non-discrimination, fair remuneration, working hours, OHS, and environmental protection. Regulatory and preventive action plans are implemented based on audit results. Arcelik also conducts external and internal audits for all operations and ethical audits for selected suppliers under the Supplier ESG Assessment system, with results published in sustainability reports (Tavukcu et al., 2023).

Conclusion

This section of the research report aims to illustrate Turkiye's positioning and level of integration into GSCs. The country strives for deeper integration into international value chains to enhance its global trade standing. The analysis delves into the extent to which the objectives outlined in various policy and strategy documents in 2018 were realized. Additionally, it draws insights from extensive data sources, encompassing the significant year of 2020, which was heavily impacted by the COVID-19 pandemic. Qualitative assessments focus on three pivotal sectors identified as critical.

The case study on Arcelik highlights the significance of GSC management, especially in the context of the COVID-19 pandemic. Arcelik's ability to address supply chain challenges and

prioritize sustainable practices underscores the critical role of GSCs in fostering resilience, adaptability, and sustainability. The transformative journey of Arcelik's supply chains reflects the broader need for industries to embrace digitalization, agility, and flexibility in response to global disruptions.

Looking ahead, the report underscores that Turkiye's growth trajectory should prioritize higher-value exports and increased participation in innovative sectors. The analysis of GSC trends highlights vital indicators, including export levels, intermediate goods trade, and sectoral sophistication, providing a background for policymakers and businesses to enhance Turkiye's global economic positioning.

In summary, Turkiye's future economic success hinges on strategic interventions to strengthen GSC integration, foster innovation, and align with sustainability goals. The collaborative efforts of government, industries, and key players will be instrumental in navigating the complexities of global trade and supply chain dynamics.

Recommendations

The report underscores that Turkiye's GSC policy primarily focuses on enhancing export capacity. A key recommendation is to broaden the perspective on GSC matters. While transitioning from importing certain products for raw materials and intermediate goods can be advantageous, the continued importation of several materials remains beneficial. Therefore, establishing (or acquiring) dynamic data pools to facilitate strategies like relocation and diversification in these import processes is crucial. These data sources should be utilized to formulate alternative supply areas, transportation methods, and routes.

Additionally, developing strategic lists of prioritized raw materials and intermediate products for imported goods is essential, considering cost, technological level, and supplier dependency. The feasibility of producing these materials and products in Turkiye should be carefully examined. Supplier relocation and diversification strategies should be devised if manufacturing these within the country is not viable. Parameters for R&D, innovation, and investment incentives should also be aligned with these strategic priorities.

The example of Arcelik illustrates that Turkiye's skilled workforce and robust production culture enabled a swift adaptation during the pandemic. Extending this adaptability to other sectors, sharing experiences, and reinforcing the leadership role of companies like Arcelik are crucial steps forward.

Lastly, the COVID-19 pandemic and events like the Russia-Ukraine war, recent Middle East tensions, and the major earthquake disasters in Turkiye have underscored the importance of 'resilience and resistance in the face of crises' in economic policy development. These interconnected crises have triggered multiple aftershocks across economic, political, and social landscapes. Besides these unpredictable events, the ongoing climate crisis poses additional challenges. Building resilience and resistance to ecological and unpredictable crises are top priorities for all countries, including Turkiye. In this context, measures and solutions should be developed by considering diverse state interventions, emphasizing science, technology, and innovation as fundamental instruments.

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CONCLUSION AND RECOMMENDATIONS

This research has conducted multiple case studies across nations that cover a broader understanding of the new dynamics of GSCs with Southeast Asian economies. The results of the research suggest that COVID-19 has had an adverse impact on productivity, but the developing countries still have significant opportunities for their economic growth after it. Although there are productivity measures in the case studies, the performance evaluation presented is not for a single solution of the new dynamics of the GSCs. All the case studies addressed the implications for productivity with the supply chain system structure. Multi-stage performance evaluations from the pandemic period to the new normal are explained such that the changes in the systems can be understood. The case studies consider both productivity recovery strategies and growth strategies. Companies can choose sustaining or sustainable development, reactively or proactively.

To catch up with the opportunities and strive for sustainable development, strategic planning and technological integration for the new dynamics of GSC are important. Companies should plan with balanced short-term and long-term objectives for operational and strategic initiatives. There are cases and evidences from this research which support that appropriate technology utilization and digital transformation can be connected with supply chain efficiency and improved performance.

Since the Asian economy is developing with the GSCs, systems thinking and a growth mindset could support sustainable system development comprising open innovation, industry clusters, partnerships, and ESG business transformation in the GSC system, as well as focus on sustainable system design and management that encourages continuous improvement and sustainable development.

Governmental policies and international regulatory frameworks are among the critical success factors for facilitating collaborative works in the GSC system. Setting priorities for industry value chain and talent development should be considered an investment for competitiveness.

Based on the case studies and global trends, this research has identified three recommended directions for productivity improvement and competitive advantages including supply chain resilience, digital transformation, and sustainable supply chain system development.

Towards Supply Chain Resilience

To avoid any supply chain disruptions and develop a resilient supply chain system, companies should be prepared for diverse risk factors, be flexible and agile, be available for a wide range of suppliers and supply chain visibility, and be digitally enabled. A resilient supply chain should be capable of developing abilities to:

- Anticipate threats such as identifying potential disruptions and risks in advance to proactively prepare for them,
- Adapt quickly such as swiftly adjusting strategies, processes, and resources to mitigate the impact of disruptions,

- Recover rapidly such as implementing recovery plans and actions to resume operations as soon as possible after a disruption, and
- Maintain operations such as ensuring continuity in delivering products or services to customers without significant interruptions.

Towards Digital Transformation for Supply Chains

Digital technologies and AI in supply chain management can help enterprises become more competitive and transform cost structures. Digitalization and digital transformation strategies become critical success factors to facilitate organizations, humans, and technology together in building efficient and resilient supply chains. Performance improvement opportunities are created by using digital technologies and AI for supply chain planning, such as demand forecasting, production planning, and risk management, and supply chain sourcing, such as supplier management and contracts. Supply chain manufacturing such as product design, predictive maintenance, material science and engineering. Supply chain logistics include global trade optimization, network design, and last-mile dynamic route optimization.

Towards Sustainable Supply Chain System Development

While SDGs and ESG standards are prevailing, sustainable supply chain system development is looking for a comprehensive business model that addresses environmental, social, and economic values. Many sustainable supply chain practices have long-term strategies but struggle to measure their progress. For example, organizations struggle with a lack of visibility and ROI backed sustainability initiatives. Companies are suggested to develop science-based targets and begin work to define and achieve those performance goals over time. It is important to develop a sustainable supply chain roadmap that looks beyond procurement towards end-to-end supply chain transformation. Companies should plan for long-term development but also take timely actions by starting their supply chain sustainability initiatives now.

Global organizations are approaching a frontier of financial and non-financial opportunities in supply chain sustainability. However, there is a common shortage on struggling to measure the return on their activities. Companies should not only focus on cost reductions but increased productivity, profitability, and better management of operational risks as well. Companies that know what to measure and which KPIs to track have been making gains on their competition.

LIST OF ABBREVIATIONS

12th MP	Twelfth Malaysia Plan
AI	Artificial Intelligence
ALGI	Association of Lao Garment Industries
API	Active Pharmaceutical Ingredient
BEC SNA	Broad Economic Classification System of National Account
BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BKMEA	Bangladesh Knitwear Manufacturers and Exporters Association
BPO	Business Process Outsourcing
BRSR	Business Responsibility and Sustainability Report
CAGR	Cumulative Average Growth Rate
CPEC	China-Pakistan Economic Corridor
DAP	Di-Ammonium Phosphate
DOSM	Department of Statistics Malaysia
E&E	Electrical and Electronics
ECB	European Central Bank
EEC	Eastern Economic Corridor
EFERT	Engro Fertilizers Limited
EIS	Enterprise Information System
Elogistics	Engro Logistics Division
EPCL	Engro Polymer & Chemicals Limited
ERP	Enterprise Resource Planning
ESG	Environmental, Social, and Governance
EU	European Union
EV	Electric Vehicle
EVT	Engro Vopak Terminal
FDI	Foreign Direct Investment
FEP	Farmer Entrepreneurship Program

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FFC	Fauji Fertilizer Company
FTAs	Free Trade Agreements
GFZ	Gwadar Free Zone
GMP	Good Manufacturing Practice
GNI	Gross National Income
GSC	Global Supply Chain
GSP	Generalized System for Preferences
GST	Goods and Services Tax
GVC	Global Value Chain
HACCP	Hazard Analysis Critical Control Point
HCI	Human Capital Index
HH	Herfindahl-Hirschman
HHI	Herfindahl-Hirschman Index
HORECA	Restaurants, Hotels, and Catering Services
HRD	Human Resources Development
HS	Harmonized System
IATF	Inter Agency Task Force
ICOM	Input, Constraints, Outputs, and Mechanisms
IPR	Intellectual Property Rights
IT-BPM	Information Technology–Business Process Management
JFC	Jollibee Foods Corporation
JIT	Just-in-Time
KT	Kilotons
Lao PDR	Lao People’s Democratic Republic
LC	Letters of Credit
LGUs	Local Government Units
LNG	Liquefied Natural Gas
LPI	Logistics Performance Index
MIDA	Malaysia Investment Development Authority

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MNCs	Multinational Corporations
MPB	Malaysia Productivity Blueprint
MPC	Malaysia Productivity Corporation
MPWT	Ministry of Public Work and Transport
MSIA	Malaysia Semiconductor Industry Association
MSME	Micro, Small and Medium Enterprise
MT	Metric Ton
MTR	Mid-Term Review
NCR	National Capital Region
NIMP 2030	New Industrial Master Plan 2030
NPK	Nitrogen, Phosphorus, Potassium
NSDP	National Strategic Development Plan
NSW	National Single Window
PAT	Profit After Tax
PIB	Press Information Bureau
PLI	Production Linked Incentive
PPE	Personal Protective Equipment
PPP	Purchasing Power Parity
QSR	Quick Service Restaurant
QUAD	Network Between Australia, India, Japan, and the United States
R&D	Research and Development
RCEP	Regional Comprehensive Economic Partnership
RES	Renewable Energy Sources
RGC	Royal Government of Cambodia
RMG	Ready-Made Garments
ROA	Return on Assets
ROC	Republic of China
ROCE	Return on Capital Employed
ROE	Return on Equity

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RPA	Robotic Process Automation
RTAs	Regional Trade Agreements
SAARC	South Asian Association for Regional Cooperation
SEBI	Securities and Exchange Board of India
SEZ	Special Economic Zone
SME	Small and Medium Enterprise
SMFI	San Miguel Foods Incorporated
SMT	Surface Mount Technology
SNGPL	Sui Northern Gas Pipelines Limited
STPF	Strategic Trade Policy Framework
TBI	Thailand Board of Investment
TCS	Tata Consultancy Services
TDAP	Trade Development Authority of Pakistan
TIFA	Trade and Investment Framework Agreement
TiVA	Trade in Value-Added
TVET	Technical and Vocational Education and Training
VHA Lao	Varitha Huaan Ando Lao Co. Ltd.
W-CPEC+	China-Pakistan-Iran Economic Corridor
YSIC	Yiwu Semiconductor International Corp

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