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Concentration of Global Manufacturing: De-Risking by Building Competitive Supply Chain

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Concentration of Global Manufacturing: De-Risking by Building Competitive Supply Chain

By

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Abstract

This paper examines the unprecedented concentration of global manufacturing value added and manufactured exports in the People's Republic of China (PRC), and its implications for major manufacturing economies and market democracies. It assesses evolving demographics, factor endowments, investment patterns, and dynamic comparative advantage among leading producers and exporters, with particular attention to India and high-income economies (HICs). The analysis finds a potentially complementary division of capabilities: HICs retain advantages in technology, risk capital, and market institutions, while India offers expanding demand, a large labor and human-capital base, infrastructure-related productivity gains, and entrepreneurial potential. The paper argues that these complementarities can support cost-effective diversification of global manufacturing supply chains. It proposes a policy framework to build a 'trusted and competitive supply chain' through deeper India–HIC economic integration through FTAs, CEPA, coordinated industrial policy, transitional tariffs and subsidies, and safeguards against trade circumvention, particularly in strategic sectors such as critical minerals, semiconductors, and key communication, computing, and control intermediates and other strategic manufacturing inputs.

Keywords: Global Manufacturing Concentration; Supply-Chain Resilience; Economic De-risking; Comparitive Advantage; Foreign Direct Investment; Demography; Labor Force; Human capital

JEL Code: F14, F21, F23, L52, O14, J21

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List of Abbreviations

LIC = Low Income Country

LMIC = Lower Middle-Income Country

UMIC = Upper Middle-income country

HIC = High Income country

HIDC = High Income Developed country

MNE = Multinational Enterprise

MNC = Multinational Corporation

MVA = Manufacturing Value Added

SME = Socialist Market Economy

HIDC = High Income, Developed Country

EU = European Union

MIC 5 = Middle Income Countries (Indonesia, Malaysia, Mexico, Thailand, Vietnam)

WPR = Worker Population Ratio

WAP = Working Age Population

FTA = Free Trade Agreement

CEPA = Comprehensive Economic Partnership Agreement

Executive Summary

This paper documents a historically unprecedented concentration of manufacturing value added and manufactured exports in one country. This threat affects not just the major manufacturing countries in the World such as USA, Germany, Japan and India, but all democratic, market economies. All now face a competitor which seems to defy comparative advantage by establishing a dominant position across all manufacturing industries, capital intensive and labor intensive, unskilled and skill intensive, low tech and high tech. The black box nature of its policies gives it an incomparable ability to direct the economic actions of domestic producers and impose non-transparent taxes, subsidies and non-tariff barriers. It has used this to build a manufacturing eco-system which is difficult & costly, for even the largest economies to compete with on their own.

The paper investigates the evolving global demographics and dynamic comparative advantages among the largest producers, exporters, importers and investors in manufactured goods. This leads to a comparison of evolving comparative advantage of High-Income countries (HICs) with India, which can be summarized as follows. (1) The high-income economies have an advantage of current demand for manufactures while India has the advantage of future or incremental demand. (2) HIEs have a comparative advantage in Technology and risk capital, while India has a comparative advantage in labor force and human capital, (3) The HIEs have a comparative advantage in market institutions (MNCs/MNEs, deep tech startups), while India has a comparative advantage in incremental productivity potential of public goods infrastructure and untapped entrepreneurship.

A few policy conclusions follow from this analysis. The HICs and India can de-risk global manufacturing and exports, by building competitive supply chains to reverse the monopolization of World manufacturing. Given PRC's big lead, this can only be done cost effectively and sustainably, by combining the comparative advantage of HICs and India; This requires incentives for HIE headquartered MNC/MNEs to accelerate diversification of their export-oriented supply chains from PRC to India.

A cost-effective, mutually beneficial approach has following elements:

(1) Classic *FTA*s between India and large manufacturer-exporter HICs (EU, USA, Japan), to reduce import tariffs on cumulative value added to zero (for manufacturing & mining).

(2) *CEPA*s to coordinate industrial policy. This would include, (a) A common, "monopoly import surcharge" or National security tarrif on industries/products monopolized by a single country. (b) Transition tariffs to underpin the costs of shifting supply chains, the time taken to reach Min Efficient Scale (MES), and "learning by doing" to reduce rejection rates & attain highest quality. (c) Transition subsidies and/or "Min support price" for critical minerals/metals, semiconductors, and 3C (communicate, compute, control) intermediates, which are critical to Public & National security.

(3) Given the speed with which PRC has been able to avoid USA's 2018 tariffs on imports from it, by routing them through Chinese companies and subsidiaries in other countries, higher tariffs may be needed on countries which help route PRC value added, through PRC subsidiaries located there.

1. Introduction

World manufacturing stands at the threshold of two important global trends. On the product side, the increased concentration in World Manufacturing Value Added (MVA) and Manufactured Exports. On the factor side, a change in the global distribution of labor force, arising from global demographic changes. These two trends in turn will determine the evolution of "relative comparative advantage", and influence Geoeconomics and Geopolitical reactions of producing and importing countries.

The concentration of production has amplified the medical, security and logistic shocks which have disrupted supply chains since the beginning of 2020. To this has been added the widening use of economic coercion, the "weaponization of trade." U.S.A.'s 2018 tariffs on imports from Peoples Republic of China (PRC) was the first implicit recognition that the latter's global share of manufactured exports was rising at the cost of the former. This alerted multinational corporations (MNCs) to their overdependence on production bases in China Inc. The Pandemic's disruption of supply chains and the unilateral bans on export of certain medical supplies by countries possessing monopoly power with respect to specific medicines, medical supplies and medical equipment, raised another red flag, on the concentration of supply chains in China Inc.

Concentration and near monopolization of World manufacturing production and international trade since 2000, has given rise to widespread concerns in the High Income Developed Countries (HIDCs) about hollowing of industry. The risks of over dependence on supply chains located in a single country or region, susceptible to potential logistic disruptions, is widespread. Ukraine and Iran wars have heightened awareness about potential disruptions of supply chains, due to regional & country concentration of specific goods, choke points in logistical routes and use of trade as a coercive instrument. As a result, MNCs are looking more actively to diversify export supply chains from China, to India, ASEAN and other countries.

The sharp decline in birth rates in many High-income countries (HICs) and China is transforming the distribution of the global labor force. This along with the spread of secondary and tertiary education in Middle income countries (MICs) is changing the distribution of skilled and semi-skilled labor force across the World. As Human capital is the least mobile factor, these dynamics are changing the relative comparative advantage of HICs & MICs and creating profitable opportunities for diversification of global manufacturing supply chains.

Capital (equity & debt) is the most mobile factor of production, and its most effective form is FDI which comes bundled with technology. Consequently, MNCs, which bundle capital & technology and skill the immobile labor force, have played a critical role in the manufacturing ascendancy of East and Southeast Asia. Technology is less mobile than equity & debt capital, but more mobile than labor/human capital. It is also closely associated with appropriate skills. Though primary, secondary and tertiary education is critical to generation of human capital, MNCs have played a critical role in providing the job skills needed for effective transfer of technology and its efficient use. They have also provided assured, high-quality demand to reduce the risk of investment to minimum efficient scale (MES).

Manufacturing has played a key role as an engine of economic development and growth in Asia. Early theoretical formulations argue that faster manufacturing growth drives aggregate economic growth through increasing returns to scale and productivity spillovers (Kaldor, 1966). This was subsequently linked to reallocation of labor and resources from low-productivity agriculture into higher-productivity manufacturing (Herrendorf et al, 2013). International comparative studies find that episodes of rapid industrialization have been associated with sustained income gains in many countries, and that manufacturing expansion often precedes broad structural change (Szirmai, 2012). India has the greatest untapped potential (on both supply & demand side), to structurally transform its economy, while helping the Rest of the World, diversify and de-monopolize its manufacturing production and trade.

This paper is divided into five broad parts; Part I (sections 2 & 3) gives a comprehensive view of World manufacturing, trade in manufactured goods and growth aspects of manufacturing. Part II (sec 4-7 & appendix) outlines the extent and nature of the challenge of China's creeping monopolization of World manufacturing. Part III (secs 8-10) reviews some transitional aspects which combine challenge and opportunity. Part IV (11-13) details the opportunity for diversification of manufacturing and building competitive supply chains. Part V (section 14) touches on National Security aspects of China monopoly & potential cooperative solutions.

Section 2 provides a selected literature review on issues analyzed in the paper. Section 3 presents the trend in world MVA & manufactured exports. Section 4 depicts trend in MVA & manufactured exports of the major producers & exporters, highlighting the rise of China and decline of USA, Germany & Japan. Sections 5 analyzes the stages of development of Asian manufacturing in the context of the Flying Geese model of growth. As China's growth takeoff started after that of the NIEs (Singapore, Hong Kong, S, Korea & Taiwan) and the NICs (Malaysia, Thailand, Philippines, Indonesia), this allows us to compare China's trajectory with theirs, in section 6. Section 7 analyzes the increased concentration of manufacturing production and exports by China, at deeper levels of disaggregation. Section 8 explores the coupling of China's economy with other major economies, and de-coupling resulting from the imposition of tariffs by USA on China in 2018. Section 9 compares the Indian experience with that of the East and southeast Asian countries, with a view to learning lessons and identifying opportunities. Section 10 compares China's changing technology with India and other countries. Sections 11 and 12 explore two key comparative advantages of High-income countries (HICs), the demand for manufactured imports and their Foreign direct investment (FDI) in manufacturing & the Multinational Enterprises head quartered there. Section 13 analyses global demographic trends and its implications for dynamic comparative advantage. Section 14 suggests policies for creating competitive India-HIC supply chains in a cost-effective way to reduce the global concentration of MVA and manufactured exports.

Part I: Globalization of World Manufacturing

2. Literature Review & Framework

In this review we focus on the literature on, (1) Concentration of manufacturing production and exports, (2) The role of FDI in development of global supply chains. (3) The evolution in the

complexity of supply, and (4) The role of MNCs/MNEs in driving intra-firm trade and international trade.

2.1 Concentration of Supply

Traditional anti-monopoly laws and Competition policy, such as US Anti-trust, have focused on oligopolies/monopolies created by companies operating in a market democracy. Over the past two decades, economists have become familiar with country monopolies based on State capitalism or Party Capitalism. These concerns were heightened during the pandemic. New concerns have risen since then, about regional concentration of critical products and geographical risk of logistical disruption of key intermediate inputs into supply chains. These concerns have led to sporadic efforts at risk reduction through diversification of supply chains across countries, regions and geographies.

The Future of Industrialization Report by UNIDO (2024) projects that China will account for nearly 45 per cent of global manufacturing output by 2030, consolidating its position as the world's primary production hub. The report attributes this trajectory to China's continued large-scale investments in advanced industries, infrastructure, and technological integration, particularly in sectors such as electronics, automotive, and green technologies. UNIDO notes that China's manufacturing value added has grown consistently faster than the world average, and this trend is expected to persist, even as other major economies like the United States, the European Union, and Japan register relatively modest shares (UNIDO, 2024). The report cautions, however, that such concentration of production could intensify supply chain dependencies and vulnerabilities in the global economy.

Richard Baldwin (2023) similarly underscores China's manufacturing dominance in his recent work, observing that the country's share of global output, already about one-third today, is on course to rise to between 45 and 50 per cent by 2030. He attributes this expansion to the combined effects of scale economies, state-backed investment in infrastructure and innovation, and China's central position in global supply chains. Baldwin further highlights that China's technological upgrading into high-value segments, such as electronics and chemicals, is accelerating faster than its overall growth, reinforcing the prospect of its near-hegemonic role in world manufacturing by the early 2030s. While acknowledging potential risks such as rising labor costs and geopolitical frictions, Baldwin concludes that current dynamics point toward China producing almost half of the world's manufactured goods within the next decade (Baldwin, 2023).

There are reports of a surge of labor-intensive exports from China to Indonesia and other Middle-Income countries, which are competitors of China in these exports (FT April 2026). This contradicts conventional trade theory, that rising income and wages in China, would lead Chinese industry to shift out of Labor-intensive manufacturing. Excess production of Labor-intensive goods like shoes & textiles, seems to have kept pace with export surpluses in high tech goods like EVs, and batteries. Chatterjee and Subramanian (2026) show that the "China Squeeze" affects low- and middle-income countries through three channels; intense competition in global export markets, rising Chinese import competition in their own domestic

markets, and limited access to China's own consumer market for low skill-intensive exports from developing countries.

Michael Pettis argues that China's large external surpluses are fundamentally driven by structural imbalances within its domestic economy, particularly the suppression of household consumption relative to production.[2] According to Pettis, policies that channel a disproportionate share of national income toward investment, industry, and state-linked entities keep domestic demand weak, forcing excess savings and industrial output into global markets through exports. He contends that this export dependence creates persistent trade surpluses and contributes to global economic imbalances, while conventional discussions often underestimate the scale of the problem by focusing narrowly on current account figures rather than the broader manufacturing and goods trade surplus (FT, 2026).[3]

Brad Setser in his article '*China's Massive Surplus is Everywhere (Yet The IMF Still Has Trouble Seeing It Clearly)*[4] argues that the International Monetary Fund (IMF) substantially understates China's true external imbalance by relying primarily on current account estimates, which placed China's surplus at around 2.2 percent of GDP in 2024. In contrast, Chinese customs data show that the country's manufactured goods surplus alone exceeds US$2 trillion, equivalent to nearly 10.5 percent of GDP, while the overall goods surplus has risen to approximately US$1.2 trillion over recent years. These figures indicate that China's export-driven manufacturing surplus is far larger than reflected in conventional IMF assessments, raising concerns that existing measurement frameworks fail to fully capture the scale of China's external imbalance and its implications for global trade dynamics (Setser, 2025).

Dani Rodrik (2004) defines industrial policy as the process of discovering the activities in which a country has a comparative advantage, emphasising 'self-discovery' and 'strategic collaboration' between government and the private sector. Rather than 'picking winners', the state facilitates experimentation under uncertainty and corrects coordination failures in sectoral development (Rodrik 2008). This approach is operationalised through 'embedded autonomy' (Evans 1995), wherein policymakers maintain close engagement with firms while retaining sufficient independence to resist rent-seeking or capture. Rodrik (2004) explicitly differentiates strategic industrial policy from earlier protectionist models, arguing for 'selectivity, sunset clauses, and transparency' rather than permanent subsidies or blanket tariff protection. Amsden (2001) and Chang (2002) show that East Asian success was not due to laissez-faire policies but rather to reciprocal performance requirements—a central component echoed today in export-linked incentives under modern industrial schemes (e.g., PLI policies in India, IRA in the US).

From a national-security perspective, domestic production of weapons and certain dual-use items is justified when foreign dependence creates material risks to readiness, resilience, operational security, or sovereign control over critical technologies. Policy responses typically combine selective onshoring, allied diversification, stockpiles, supply-chain transparency, and

[2] https://carnegieendowment.org/projects/chinas-reform-imperative .
[3] https://www.ft.com/content/72ab51ed-8dcc-46c5-8457-6944d98bf280?utm_source=chatgpt.com&syn-25a6b1a6=1
[4] https://www.cfr.org/articles/chinas-massive-surplus-everywhere-yet-imf-still-has-trouble-seeing-it-clearly

procurement incentives to manage the trade-off between security and economic efficiency. Recent government reports of USA and specialist analyses show this is a high-priority issue across advanced militaries and policy communities (Government Accountability Office+1). These include (1) Vulnerability to tampering, counterfeit, and supply-chain sabotage and Hidden backdoors & intelligence compromise (CSIS+1), (2) Strategic leverage & coercive diplomacy) Risk of supply denial / coercive interdiction (Director of National Intelligence , Air University+1). One answer to these problems is to build competitive supply chains for dual use and defence items, with trusted partners and allies (Government Accountability Office).

2.2 FDI and Export Oriented Supply Chains

Multinational Company's (MNC) investment in developing nations is linked to increased exports, through direct export activity, productivity spillovers, and integration into global value chains, as confirmed by cross-country studies, sectoral analyses, and specific case studies across multiple regions. World bank (2022) shows that countries with higher shares of FDI and investment in GDP also have higher shares of exports and manufactured goods in GDP. Sectoral studies in the automotive and electronics industries, in Thailand, South Korea, and Vietnam document significant export growth following MNC investment. Similarly, evidence from Sub-Saharan Africa shows that FDI is associated with increased participation of local firms in export markets, especially when strong backward linkages are developed (International Growth Centre, 2022).

The World Bank (1993) highlighted that East Asian economies' export dynamism was driven by FDI-led manufacturing, within the overall increase in domestic capital formation. The intertwining of foreign direct investment (FDI), supply chains, and exports translated manufacturing into rapid growth. The phase of globalization between 1985 and 1997, was marked by evolution of global production with the rise of complex supply chains, where goods are produced in multiple cross-border stages rather than within a single country (Hymmels et al., 1999). During this period Southeast Asian countries integrated into global supply chains and experienced annual GDP growth of 6–8 percent, with exports of manufactured goods rising as a share of GDP from less than 20 percent in the early 1980s to over 50 percent in the 1990s (Athukorala, 2003).

FDI inflows provided not only capital and technology transfers but also access to international markets. Unlike most domestic investment, FDI by MNCs in East and S. E. Asia was largely export-oriented, designed to integrate host economies into global production and distribution networks (Lall, 2000). Empirical studies show a positive correlation between FDI and export growth in Southeast Asia, as foreign-invested firms accounted for the bulk of manufactured exports in Malaysia, Thailand, and Vietnam (Athukorala, 2003). The international fragmentation of production allowed MNCs to disperse labor-intensive segments of manufacturing (e.g., electronics assembly, textiles, automotive components) to lower-cost Southeast Asian economies (Kimura, 2006). This process was central to the emergence of 'Factory Asia', a dense web of regional production networks (Athukorala, 2014).

FDI thus served as the mechanism through which supply chains were internationalized, and exports became the outcome of these cross-border networks. Gereffi (1999) describes this as

the essence of global value chains (GVCs): capital and technology from MNCs, host-country labor and infrastructure, and exports as the final channel of growth. In Malaysia and Thailand, electronics exports surged as Japanese and later U.S. firms relocated production stages to local facilities. In Vietnam, over 70 percent of manufactured exports in the 2000s originated from foreign-invested enterprises (Athukorala et al., 2012).

2.3 Evolution of Global Supply Chains

The evolution of global production has been marked by the rise of complex supply chains, where goods are produced through multiple cross-border stages rather than within a single company or country. The evolution of global production from simple to complex chains has coincided with the uptrend in globalization of manufacturing.

Baldwin (2013) draws a distinction between simple and complex supply chains. In a linear supply chain, production proceeds in a sequential manner with limited interdependence across stages, and disruptions at one stage can be relatively contained. By contrast, complex supply chains involve dense webs of interconnections, cross-sourcing of components, and intricate coordination between multiple firms and locations. These networks exhibit strong complementarities and path dependencies, making them more efficient but also more vulnerable to coordination failures. The World Bank (2019) formalized this distinction, defining simple GVCs as those in which value-added crosses a border only once, and complex GVCs as those where value added crosses borders multiple times before reaching final consumers. Theoretical insights of several earlier authors are relevant to this discussion. Grossman and Rossi-Hansberg's (2008) developed a 'task trade' framework, in which offshoring reduces the cost of specific tasks, enabling finer fragmentation and thereby fostering more complex supply-chain structures. Hummels, Ishii, and Yi (2001) concept of 'vertical specialization', showed how countries increasingly use imported intermediate inputs that are embodied in exports, creating sequential production processes across borders.

Country approaches to timing and phasing domestic & foreign supply chains played a role in differences in industrialization trajectories. South Korea initially invited FDI, then built relatively self-contained supply chains, and then transitioned into becoming the hub of complex regional networks. In contrast, Malaysia's persisted with a national-car project based on linear supply-chain thinking. This left it poorly positioned when the regional automobile industry reorganized into more efficient and complex, supply networks dominated by Japanese multinationals (Baldwin, 2011).

Simple or linear supply chains are easier for late-industrializing nations to join, since integration may involve specializing in one stage such as assembly. In such cases, the main requirements are cost competitiveness and basic reliability. However, complex supply chains—such as those prevalent in electronics and automotive sectors in East Asia—require not only cost efficiency but also precise quality control, just-in-time logistics, and institutional arrangements to ensure credibility in long-term relationships (Baldwin, 2011). Joining a complex supply chain is very different from building it. Baldwin's analysis separates the first unbundling, before 1985 from the subsequent one with emergence of ICT and GVCs. This leads to comparison of the ease/difficulty of building a domestic supply chain under the first

unbundling and joining an international supply chain under the second unbundling. In the pre-1985 context, industrialization was modeled as a process requiring the establishment of a sufficiently wide range of upstream and downstream activities to support manufacturing. The presence of strong pecuniary externalities and the "O-ring" nature of complementary inputs created high thresholds of coordination, leading to the classical "big push" or "critical minimum effort" problems in development economics (Baldwin, 2011). In this regime, a nation aspiring to industrialize had to build most of the supply chain domestically in order to reap scale economies and sustain manufacturing competitiveness.

By contrast, the second unbundling altered this dynamic. The falling cost of coordinating geographically dispersed production allowed firms in advanced economies to offshore discrete stages of the production process. Developing nations could thus integrate into global production networks without replicating the entire upstream and downstream industrial ecosystem. In Baldwin's framework, the availability of foreign intermediate varieties raises the social marginal product of domestic labor in manufacturing, thereby lowering the critical threshold of industrialization. This makes "joining" a supply chain feasible with far smaller initial efforts than those required for "building" one.

Baldwin (2011) illustrates this through the experiences of Korea, Malaysia, and Thailand in the automobile sector. Korea's industrialization followed the traditional model: it *built* its domestic supply chain under protectionist policies and state-led coordination before becoming a headquarter economy. Malaysia attempted a similar approach into the 1990s, but struggled in the new era of supply-chain trade, failing to generate competitiveness once protection was lifted. Thailand, by contrast, pursued a strategy of *joining* international supply chains by attracting Japanese assemblers and component producers. This led to large-scale integration into "Factory Asia," significant export success, and employment creation despite the absence of a fully developed domestic supply base.

The modern global economy is shaped by the coupling of production and trade networks, where firms coordinate the production of goods across multiple countries through global value chains (GVCs). The phenomenon of intermediate goods accounting for a significant share in the world exports accelerated in the 1980s and 1990s, as advances in ICT allowed multinational firms to unbundle production stages and outsource manufacturing to low-cost countries (Baldwin, 2013). This "second unbundling" drove a new wave of industrialization in East Asia, most dramatically in China, which became central to global manufacturing. The G7's share of global manufacturing fell from two-thirds in 1990 to less than half by 2010, while China absorbed a significant portion of the gain (Baldwin & Freeman, 2021).

2.4 Role of MNEs in Trade

UNCTAD (2022) describes modern Multinational Enterprises (MNEs) as *fragmented firms*—organized as global equity networks of legally separate subsidiaries that trade with each other 'as if' they were independent companies. This shift from nationally integrated production systems to geographically dispersed supply chains has led to faster growth of intra-firm trade than of inter-firm trade, with a rising ratio of the former to the latter.

MNEs/MNCs are key drivers of trade with developing countries, particularly in manufactured goods (IMF, 2001). Case studies from China and Mexico demonstrate that the entry of MNCs has led to increased exports from local firms, due to spill-over effects on their productivity and innovation capacity. By embedding host countries into global supply chains, MNCs increase demand for local inputs and foster the development of export-oriented industries (World Bank, 2022). Moreover, the large manufacturing MNEs in automotive and electronics sectors rely heavily on intra-firm trade to move parts and goods within their networks (World Bank, 2017). With parts and components accounting for over 50 percent of gross exports in certain manufacturing sectors (as per OECD data), intermediate goods have started to dominate global trade (World Bank, 2020).

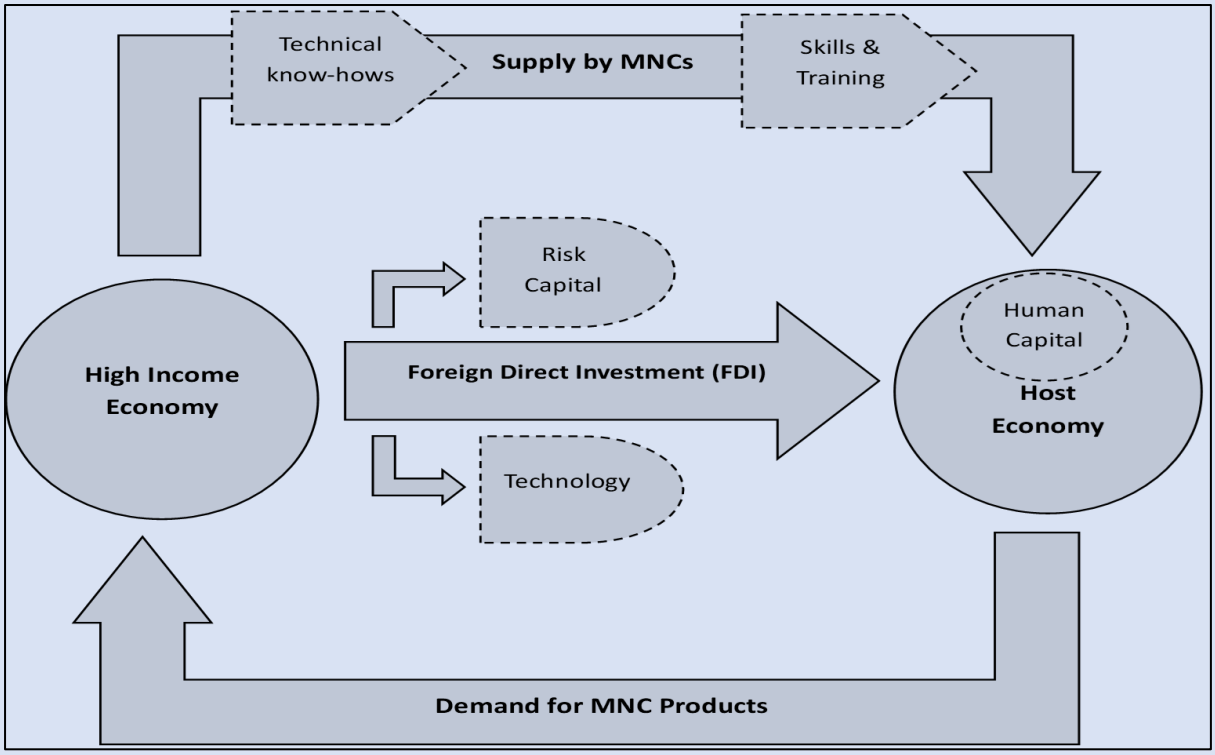
One of the defining features of trade globalization since the 1990s, has been the expansion of the intra-MNEs trade (Baldwin & Freeman, 2022). The fragmentation of manufacturing across national borders since 1980s has fundamentally transformed the architecture of world trade, with MNCs establishing complex global supply chains. As production has become more fragmented and specialized across borders, MNCs have structured their operations to move intermediate goods—such as parts, components, and semi-finished products—between their subsidiaries and affiliates. Intra-firm trade is particularly concentrated in manufacturing sectors like automotive, electronics, aerospace, and pharmaceuticals, where complex production networks are the norm (OECD, 2020).

In 2015 about 1/3rd of global merchandise exports were intra-firm transactions (World Bank, World Development Prospects, 2017)**.** Baldwin (2016) emphasized the role of trade in parts and components, relative to trade in final goods, as driver of this growth. Currently MNEs and their affiliates represent about 1/10th of world GDP; they generate about half of world sales. Intra-firm trade now accounts for 50-60per cent of total trade flows (Anderton et al., 2022).

2.5 Framework: FDI, Supply Chains and MNEs

A critical aspect of the development of East and Southeast Asian countries was the localization of the labor-intensive stages of manufacturing supply chains of Multinational Enterprises/Corporations (MNEs/MNCs). They acted as “anchor investors” to develop host country supply chains. A stylized representation of the process is shown in **Figure 1**. The left represents the source of FDI, the High income developed country (HIDC) like USA, Germany or Japan, and the right side depicts the recipients of FDI (LIC or LMIC), which provided the labor & human capital. The middle bar represents conventional FDI and the risk capital, disembodied technology, management and organizational skills associated with FDI.

Figure 1: Multi-National Enterprise's **FDI and Manufactured Imports**



Source: Authors depiction, based on literature review.

The top and bottom bars represent the supply and demand operations of the anchor MNC/MNEs which physically connect the home and host countries through its multinational supply chains and internal, cross-country trade networks. The top bar denotes the MNC/MNE importing technology embodied in capital goods and intermediate goods into the LIV/LMIC, as also the trainers for skilling the workers & management, to the standards & procedures required in production unit(s) located in the host country.[5] This is critical for the host country to become a node in the MNCs global supply chain or "quality chain". The bottom bar denotes the MNC/MNE importing manufactured goods from its production units or supply chains in the host country, into the home country and other HIDCs (**Figure 1**).

3. Trends in Global Manufactured Exports & MVA

Globalization of trade has generally been analyzed in terms of merchandise trade and the trade openness index (trade/GDP). This section therefore starts by looking at this aspect, but with a focus on exports (World merchandise exports/world GDP). As the main focus of the paper is on manufacturing, the section analyses the trends in manufactured exports both as a ratio to world GDP and manufacturing value added. World Manufacturing Value Added (MVA) trends are also analyzed as per cent of GDP. The period covered is a sub-set of the second wave of globalization, post the second World war, but includes the period after the Global financial crisis, referred to as "Slobalization" (1960 -2014).

[5] Or sending local engineers/managers for training to another unit, which is also service import.

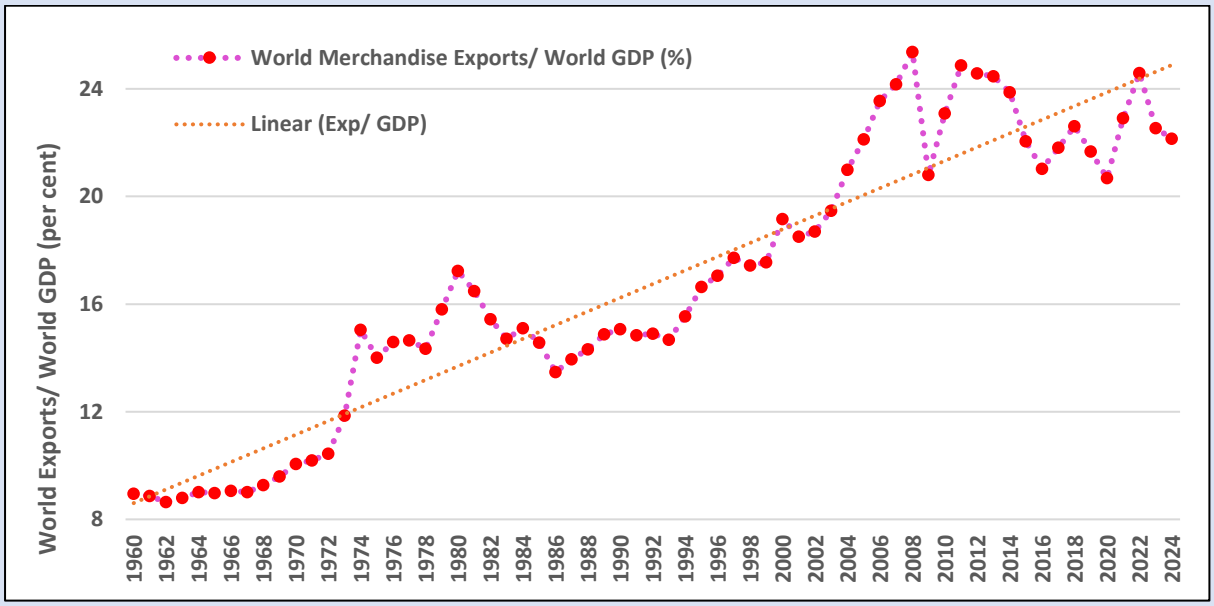
3.1 Merchandise Exports

The ratio of World exports to World GDP since 1960, is shown in ***Figure 2***. Though Haufbauer (1998), Oritz-Ospina (2014) and others, have linked the post WW2 increase in trade (1945-2008) to tariff reductions and trade liberalization under GATT and WTO, the actual picture is more nuanced. We find two distinct sub-periods of globalization, both marked by a gradual increase in the export/GDP followed by short, sharp, spurt. The first was in the 1960s and 1970s, and the second in the 1990s and 2000s. each followed by a setback (***Figure 2***). The 1980s de-globalization was followed by a slow recovery, while the plateauing out of globalization("slobalization") after the Global financial crisis (2008) could still evolve into a down-trend(de-globalization).

Merchandise exports were 9 per cent of world GDP in 1960. The ratio increased by about 0.1 per cent point per year till 1972, driven by post-war reconstruction in Europe & Japan and tariff reductions under the GATT Kennedy Round (1964–67). The latter cut average industrial tariffs by about one-third (WTO, 2007). Container shipping was introduced in late 1960s, significantly lowering transport costs (Baldwin, 2016), setting the stage for potential trade expansion, but the Nixon shock (1971) and the collapse of the gold standard, Bretton Woods, system, acted as an offsetting factor.

The first oil shock (1973–74) quadrupled oil prices, raising the dollar value of petroleum exports, and non-oil imports by oil exporters, leading to a 4.6per cent increase in exports as a per cent of GDP over two years. The sharp deterioration in Terms of Trade for net oil importers triggered stagflation and recessions across many developing economies (World Bank, 2001), Consequently, the export GDP ratio peaked at 17.2per cent in 1980 and fell by 4 per cent point in next six years (***Figure 2***). The external debt crisis in Latin America, marked by soaring debt levels, high inflation, and stagnant economic growth (IMF 1997) collapsed world trade,. The ripple effects of this crisis extended beyond Latin America, affecting global trade more broadly. The dramatic collapse in commodity prices during the early 1980s (Maizels, 1987), reducing the export earnings of commodity-dependent economies. This contributed to the overall decline in the ratio of merchandise exports to global GDP. The decline happened despite the substantial tariff cuts resulting from the GATT Tokyo Round [1973–79; WTO (2007)].

Figure 2: **Global Merchandise Exports as percent of World GDP**



Source: Authors Calculations based on World Development Indices

Merchandise export's share of world GDP began rising again in 1987, bolstered by the launch of the GATT Uruguay Round in 1986, a comprehensive effort to reduce trade barriers and liberalize international trade (World Bank, 1993)[6]. In response, many countries embraced market-oriented reforms, popularly referred as the "silent revolution" of the 1980s by the International Monetary Fund Report (IMF, 1997). The opening up of the Peoples republic of China during the 1980s & early 1990s, East-Bloc countries during the late 1980s & 1990s, and the formation of the WTO's in 1995, liberalized markets (WTO, 2013). Offshoring and global supply chain expansion, especially in Asia, accelerated merchandise export growth (OECD, 1997). All these factors resulted in an increase in the export-GDP ratio by 0.25 per cent per year from 1986 to 2004 (***Figure 2***). This was about 2.5 times the annual change in the 1960s.

China's 2001 WTO accession catalyzed a global *"export shock"* (World Bank, 2008). Low manufacturing costs and booming commodity demand (especially from China) pushed merchandise exports up to 24–25per cent of world GDP by 2008 (WTO, 2011). The 2008–09 global financial crisis, can be partly attributed to the resultant financial euphoria. The collapse of export financing resulting from the GFC led exports to crash by about one-quarter (WTO, 2011). Trade recovered sharply in 2010 but growth has been highly volatile and on a declining trend thereafter. IMF (2016) attributes the slowdown to the "subdued investment and weakening global demand". According to WTO (2019), global trade volumes have grown more slowly than global GDP since 2012. As per latest available data (***Figure 2***). As the pre-GFC growth has some characteristics of a bubble, it is unclear so far, whether the ratio has plateaued or is returning to its long-term trend (***Figure 2***).

[6] The 1993 *East Asian Miracle* report, prepared by a team led by John Page and comprising Nancy Birdsall, Ed Campos, W. Max Corden, Chang-Shik Kim, Howard Pack, Richard Sabot, Joseph E. Stiglitz, and Marilou Uy, and Lawrence MacDonal as principal editors.

3.2 Manufactured Exports

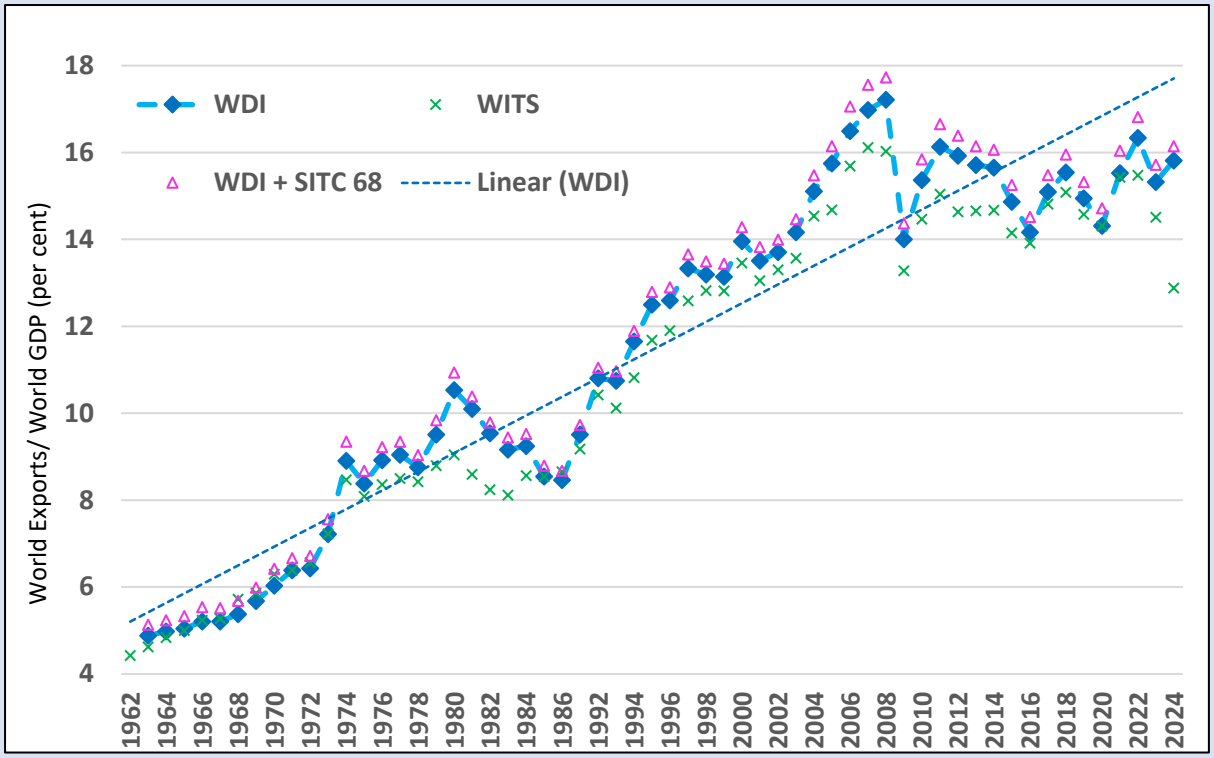
As this paper's focus is on manufacturing, we examine manufactured exports from both World Development Indicators and UN COMTRADE, by calculating their ratios to World GDP.[7] The evolution of World manufactured exports presents a similar but sharper picture, to that seen in merchandise exports. The two periods of globalization in 1960s & 1970s, and during 1990s & 2000s, are clear. There is perhaps a clearer plateauing in the export/GDP ratio from mid 2000s, adjusting for a possible bubble element during the year or two preceding the GFC (***Figure 3***).

The 1960s saw rapid recovery in growth of industrial output and global trade, driven by post-war reconstruction, falling tariffs, and technological advances (Colago,1980). Manufacturing export/GDP ratio rose slowly till the oil price shock, after which it accelerated from 7.2 per cent in 1973 to 8.9 per cent in 1974 (***Figure 3***). Following the oil price shock, higher energy prices resulted in stagflation and led to the Latin American Debt crisis. The ratio of manufactured exports to GDP declined from 10.5 per cent in 1980 to 8.5 per cent in 1986 (***Figure 3***).

Trade liberalization (GATT Tokyo Round, 1979) and emerging Asian exporters revived manufacturing trade after 1986. The period from 1987 to 2000 coincided with the structural shift in global production patterns and emergence of Global Value Chains (WEF, 2014). Trade liberalization contributed to an increase in the fragmentation of manufacturing production across countries, by making it easier to locate incremental production in new geographies. Developing countries in East and Southeast Asia increased their share in global manufactured exports, and reshaping World manufacturing trade (Singh, 1990). These economies increased their industrial output and exports of electronics and consumer goods. Developing economies' trade share rose from around 25 per cent in early 1970s to over 30 per cent in late 1990s. Institutional reforms (WTO creation 1995, NAFTA, EU Single Market, etc.) and falling tariffs encouraged this trend (IMF; World bank; WTO, 2018). With *global manufacturing exports* growing much faster than World GDP, the ratio of manufactured exports to World GDP rose from 8.7per cent in 1986 to 14per cent in 2000 (***Figure 3***).

[7] The WDI data base excludes SITC-68 which are non-ferrous metals from their calculations of the manufactured exports. In the manufacturing exports using UN COMTRADE database, we include SITC 5, SITC6, SITC7 and SITC 8. This also includes the SITC 68. However, the share of the manufactured goods exports calculated as percent of the GDP is found to be less than that of the WDI. This means that the UN COMTRADE database might be missing some countries data. Therefore, we consider the WDI database for subsequent analysis.

Figure 3: **Global Manufacturing Exports as percent of World GDP**



Source: Authors Calculations based on World Development Indices, UN Comtrade (accessed through WITS)

With China's entry into WTO (2001), the rising trend continued. From 2000–2007, global trade grew faster than output – though slower than in the 1990s – reflecting late effects of past reforms (IMF, 2018). Manufactured exports rose from 14per cent in 2000 to a peak of 17.2per cent in 2008 (***Figure 3***). The Global Financial Crisis (GFC) ended this period of Globalization in 2008–09. GFC; ratio down. Manufactured exports declined by 19 per cent, while global GDP fell only a few percent, due to synchronized demand and supply-chain breakdowns (Baldwin, 2009). Supply chain saturation, protectionism, and policy uncertainty kept manufacturing exports' share of world GDP flat. COVID-19 caused a sharp dip and rebound, but the long-term trend remained muted (UNCTAD. 2022).

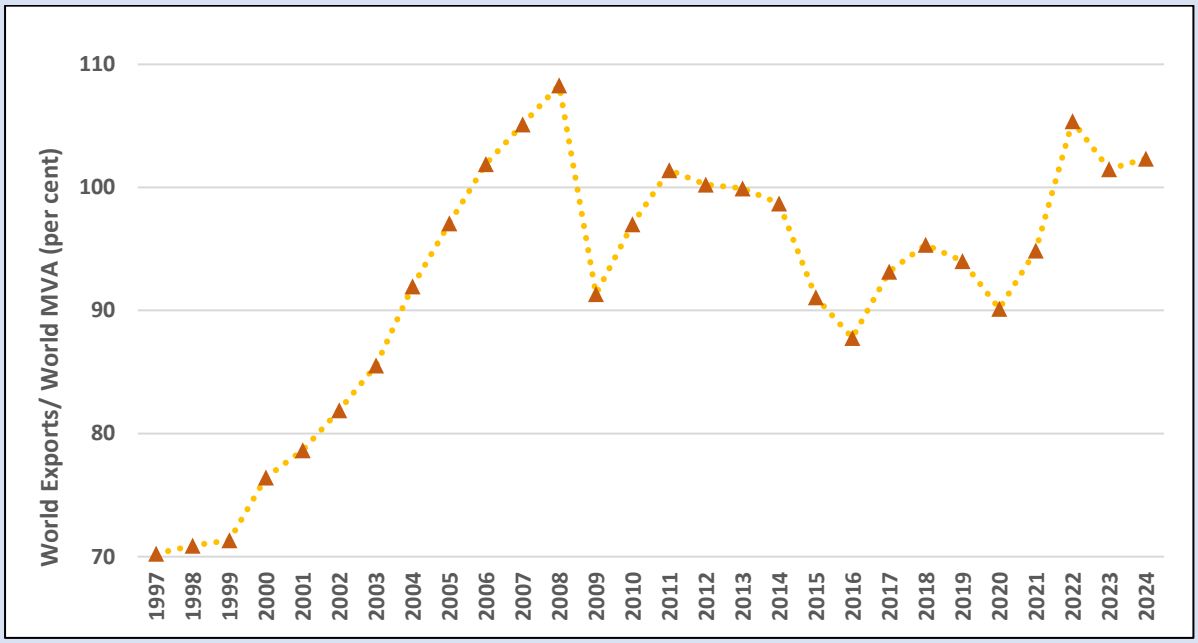
3.2.1 Manufactured Export and MVA

The trends in the Manufacturing exports can also be seen as the per cent of manufacturing value added (MVA). The MVA data is, however, available only from 1997. This period overlaps with the second period of globalization analyzed in section 3.1 and earlier in this section (***Figure 2 & Figure 3)***. The pattern for the Manufactured/MVA ratio (**Figure 4**) is very similar to that in figures 1 & 2, from 1997, though the rise in the former ratio from 1999 to 2007 is smoother than in the latter.

China's accession to the WTO in 2001 significantly boosted global manufacturing trade, as its share in world manufacturing exports surged from around 5 per cent in early 2000 to over 15 per cent by 2010 (Bown & Irwin, 2015). However, the 2008–09 financial crisis reversed this trend. Global manufacturing exports dropped by around 20 per cent in 2009 (Bems et al., 2010). Post crisis (2009-10), there was a recovery. While manufactured output expanded steadily,

exports grew more slowly due to maturing global value chains, domestic rebalancing in China, and increased protectionism (OECD, 2016; IMF, 2016).

Figure 4: **Global Manufactured Exports as percent of World MVA**



Source: Authors Calculations based on World Development Indices

COVID-19 led to a fall in global manufactured exports, and a similar contraction in industrial output (UNIDO, 2021). However, despite the shock, trade in manufactured goods proved resilient due to demand for electronics and medical goods (UNCTAD, 2021). This led to a recovery in the export-to-MVA ratio, though some softening occurred in 2023 with slowing trade momentum.

3.2.2 Manufactured exports relative to Merchandise exports

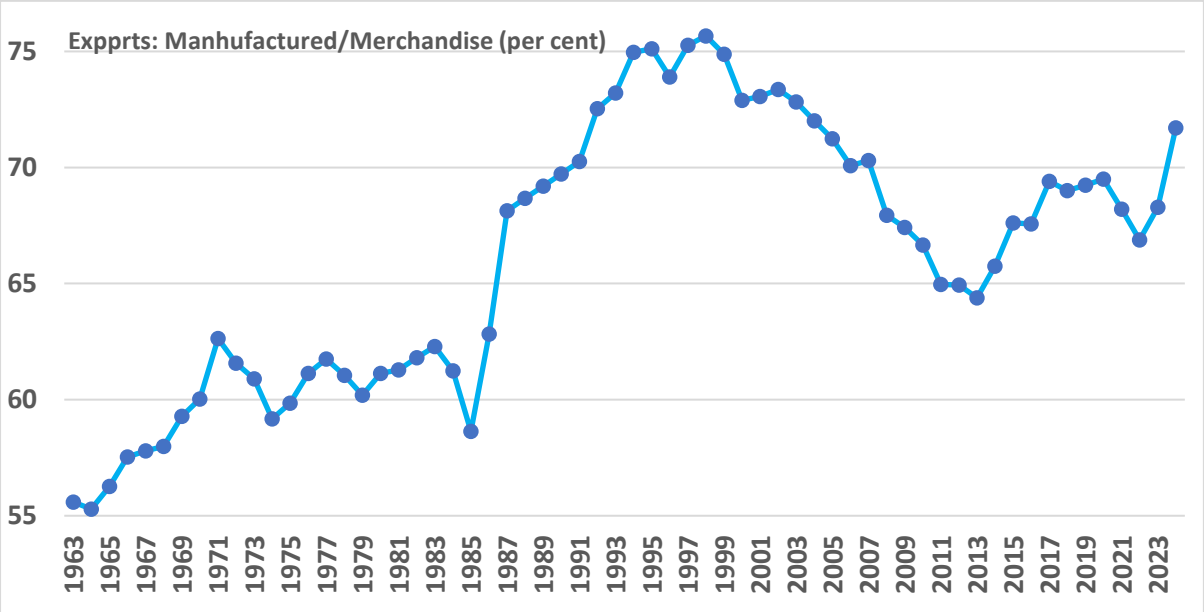
The ratio "world manufactured exports / world merchandise exports" measures the importance of trade in manufactured goods (machinery, vehicles, electronics, textiles, chemicals, etc.), relative to primary commodities (food, fuels, and raw materials)[8]. It can be used as an indicator/proxy for degree of global industrialization and depth of manufacturing-led global value chains, important for growth, technology transfer, and vulnerability to external shocks (UNCTAD, 2016).

The share of manufactured exports in merchandise exports increased by 7 per centage points between 1963 and 1971 and then fluctuated between a narrow band of 58.5per cent and 63 per cent, for the next fifteen. In the 8 years (1986-1994) it rose by 12per cent. The rise in share from 1964-71 and 1986-1994 reflects the long post-war shift of world trade toward manufactures and the rise of East Asian export-oriented industrialization **(Figure 5)**.

[8] https://databank.worldbank.org/metadataglossary/world-development-indicators/series/TX.VAL.MANF.ZS.UN

We would hypothesize, that backward integration of supply chain within China increased from 2000, and halted or reduced cross-border fragmentation, while increasing the import of primary commodities by China. This reduced the share of World Manufactured exports in merchandise exports. The process accelerated a few years after China joined WTO (2001), with the share of manufactured exports declining by almost 1per cent per year (2002-2011). The global financial crisis of 2008-9 had little or no impact on the share of manufactured exports in merchandise exports.

Figure 5: **World Manufactured Exports as Share of Merchandise Exports**

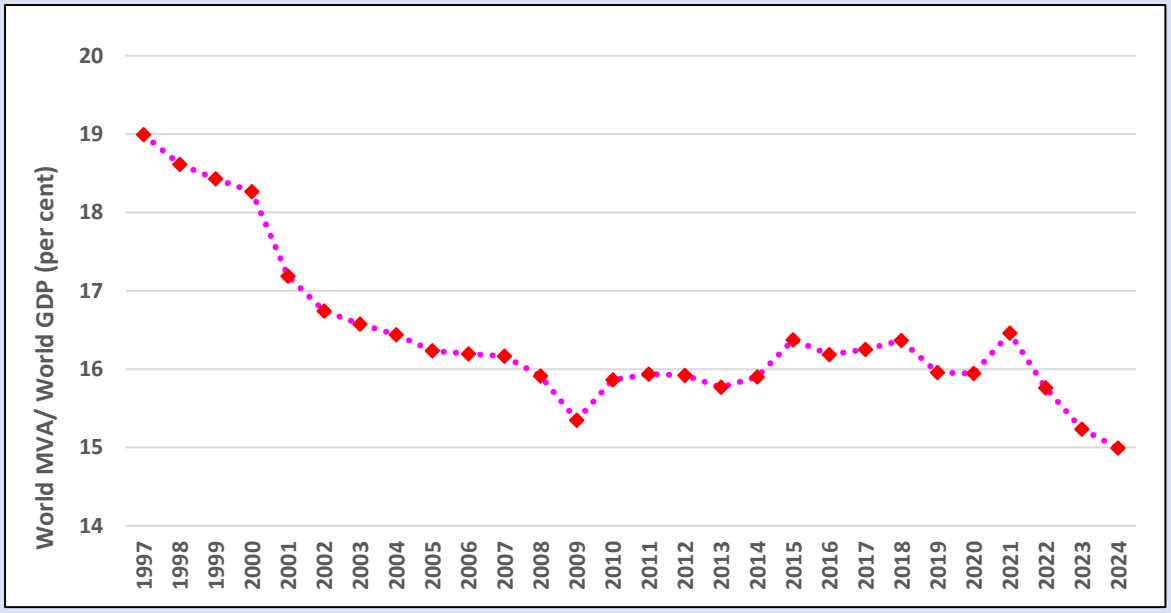


Source: Autors Calculations based on World Development Indices

3.3 Manufacturing Value Added (MVA)

The share of global GDP accounted for by MVA fell from about 19 per cent in 1997 to roughly 15 per cent in 2024 (***Figure 6***). In advanced countries, high productivity gains and rising incomes shifted demand toward services. In developing countries share of services rose to 55 per cent of GDP, with manufacturing declining to 40per cent, by 2019 (World Bank blog, 2021) . Globalization and trade liberalization relocated manufacturing to lower-wage countries: China and East Asia expanded output, while Western factories closed or outsourced. The result was a falling share of manufacturing in world GDP (Gowder, 2023). The 1997 Asian crisis and the global financial crisis (2008-09) also affected demand patterns.

Figure 6: **Global Manufacturing Value Added as percent of World GDP**



Source: Authors Calculations based on World Development Indices

3.4 Implication of Paused Globalization

The aggregate picture with respect to the manufacturing sector is that that globalization is not going to be the driver of international trade or manufacturing, as it was in the past. This is evident from figure 5, where we see the declining share of Global MVA in the World GDP. It is also evident from figure2,Error! Reference source not found. which showed the world e xports of manufactured products as per cent of the world GDP has not been able to recover to the same levels as it was pre global financial crisis of 2008-09. China and the countries of S.E Aia, used the globalization of manufacturing to capture incremental demand to develop their supply chains. This scenario casts a shadow over the growth of manufacturing sector in the HICs as well as the emerging economies. The only way for the high-income countries (like USA, EU, Japan, South Korea amongst others) and the MICs like India can grow their manufacturing is by diversifying away from China and building a competitive supply chains to reduce the concentration of China-linked supply chain.

From the perspective of the HICs, China has been absorbing the factors (technology, risk capital) that constitutes the comparative advantage of the developed economies. From the perspective of developing economies like India, this shift of the supply chain holds significance as the MNCs that set-up their production units in the host countries, provide access to the international markets in the high-income nations, but help enhance the quality of the products of the domestic markets of the host economies.

Part II: Challenge – Rise of Manufacturing Monopoly

4. Fall and Rise of Manufacturing Countries

Given the aggregate trends in manufacturing Value Added (MVA) and manufactured exports, this section drills down to the country level and the evolution of the largest producers and exporters of manufactured goods. The section examines both the medium-long term trends and more recent trends in country share of world MVA and World manufactured exports. The rise of China's manufacturing sector and its displacement of USA and other counties in global MVA and export rankings is stark.

4.1 Large Producers

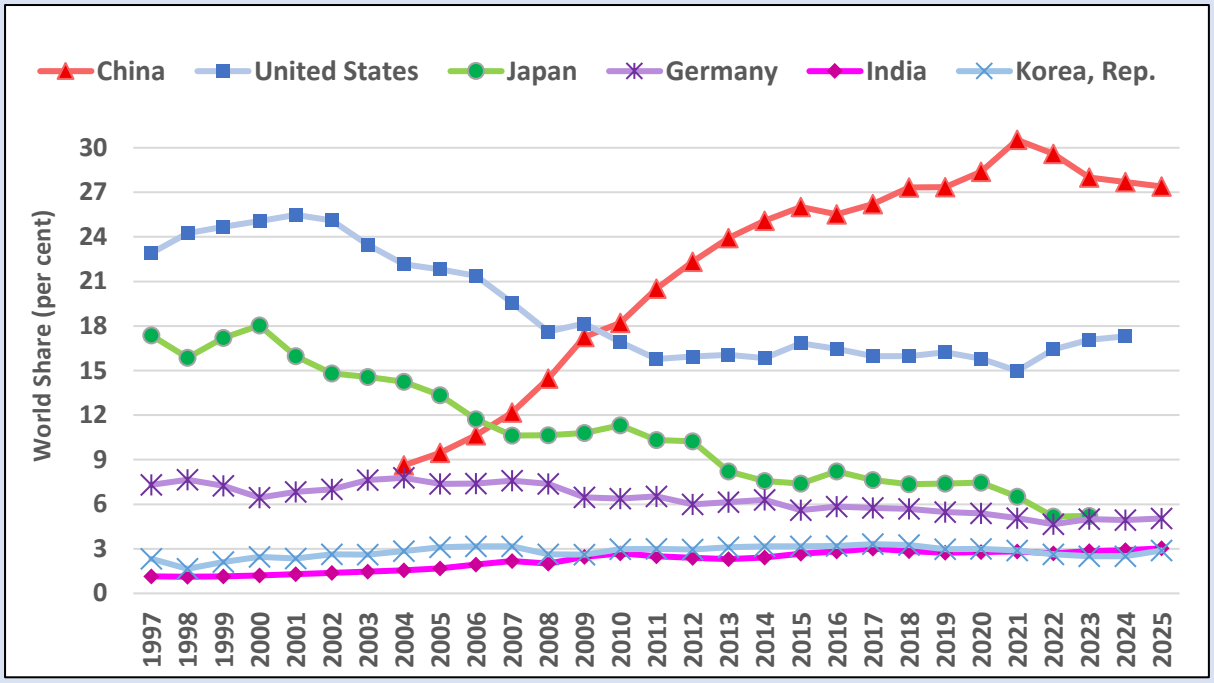
The evolution of the World MVA shares of the six largest producers (China, USA, Japan, Germany, India & S Korea) in 2024, is depicted in **Figure 7**. At the turnoff the century (1997), the top ranked countries in terms of share of World MVA were USA with 22.9 per cent, Japan with 17.4 per cent and Germany with 7.3 percent, while the data for China was not even available. These three countries were ranked in the same order in 1991, but Italy, France and UK were in the top six in MVA.[9]

After China joined WTO in 2001 the share of China in World MVA has grown rapidly, while that of USA, Japan and Germany has declined. China's MVA overtook Japan in 2004, Germany in 2007 and USA in 2010. The World share of China in MVA increased by 21.9per cent from 2004 to its peak in 2021. This is more than the sum of the declines in the MVA share of USA (-7.6per cent), Japan (-7.7per cent) and Germany (-2.7per cent). China's peak share of 35.5per cent was 10per cent higher than the USA's 21st century peak of 25.5per cent in 2001 and 2 times its current share of 17.3per cent. Japan's share of World MVA has declined from 1.8 times China's in 2004, to 1/6th of China's share in 2021. China's manufacturing value added is now more than the MVA of the next four countries combined (**Figure 7** & table 1). India has gradually increased its share in the global MVA from 2.6 per cent in 2009 to almost 2.9 per cent in 2024 and is currently running neck and neck with S Korea. India's MVA was larger than South Korea in 2023, but lower in 2024.

After 2021, there seems to be a modest change in trend in China's and USA's MVA shares, with the former declining, and the latter rising modestly. China's rising share shows little or no deceleration after the Global Financial crisis in 2008, as did the declining share of Japan, Germany & S Korea's MVA share. In contrast USA's MVA share stabilized after GFC and was almost the same in 2024 as it was in 2008 (**Figure 7**).

[9] China's data is only available from 2004. Given the share of the curve, World aggregate MVA data is not available in WDI before 1997. In 1991, S Korea was at 7th rank, and India was at 13th rank.

Figure 7: Top producers of manufactured goods by share of world



Source: Authors Calculations based on World Development Indices

Table 1 shows the 11 largest producers in terms of share of world MVA in 2024. World MVA has increased more than 2.5 times in the last two decades from $US 6.6 trillion in 2004 to $US 17.6 trillion in 2024. The share of each of these countries in the total increase in World manufacturing value added in the last 20 years is also shown (clmns 4 & 5). This is a useful indicator of likely evolution of MVA shares in the next decade or so.

Table 1: Manufactured VA shares and Incremental Contribution: 2004 to 2024

Country	Share in World MVA (2024)		Share in World MVA increase	
	Share (%)	Rank	Share (%)	Rank
China	27.7	1	42.2	1
United States	17.3	2	13.6	2
Japan	5.2	3	-1.8	
Germany	4.9	4	2.8	4
India	2.9	5	4.0	3
Korea, Rep.	2.5	6	2.2	5
Mexico	2.2	7	2.2	6
Italy	2.1	8	0.6	19
France	1.8	9	0.3	32
United Kingdom	1.7	10	0.3	33
Russia	1.7	11	2.1	9

Note: Korea and Japan shares calculated taking values of MVA for 2023 (latest available).
Source: Authors calculations based on WDI.

The incremental contribution of China (39.2per cent) is higher than its 2024 share (28.0per cent). These two numbers bring out the complete domination of Chinese manufacturing over World manufacturing. The former is greater than the share of the next four countries combined, and the latter is more than the increase in MVA of the next 12 countries combined. If the global

environment had not changed, the share of China in World MVA could easily have risen from over 35per cent in 2021 to 40per cent in 2030 and 50per cent by mid-century.

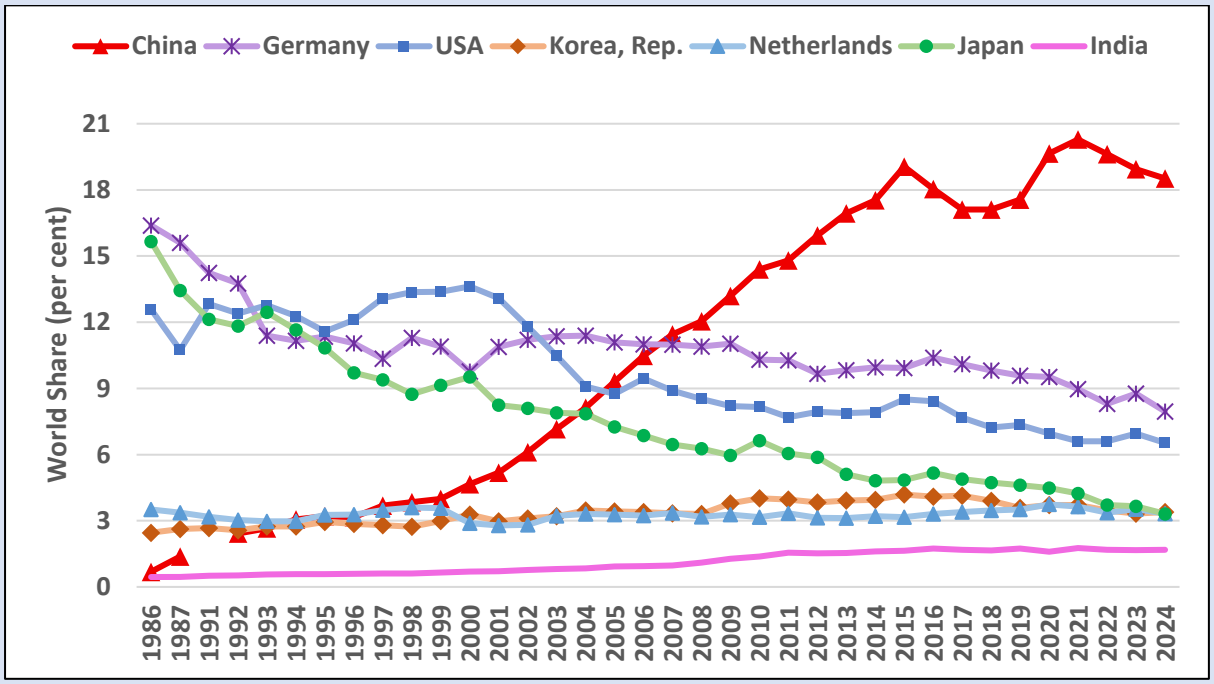
The USA's contribution to increase in World MVA was only 13.6per cent almost 4per cent lower than its 2024 share of 17.3per cent. Japan, a major manufacturing nation a few decades ago, with the third largest Global MVA share in 2024, made a negative contribution to the increase in World MVA, while Germany, the 4th ranked producer in 2024 also made the 4th highest incremental contribution to MVA during past 20 years.

The biggest surprise is that India, whose world MVA share of 3.0per cent in 2024, placed it at sixth rank, made the third highest contribution (4.7per cent) to the increase in world MVA during last 20 years **(Table 1).**

4.2 Leading Exporters

The evolution of the export shares of the World's six largest manufactured goods exporters in 2024 (China, Germany, USA, Japan, S Korea and Netherlands) is depicted in ***Figure 8***. The meteoric rise in China's share of World manufactured exports, parallels that of the rise in its World MVA share since 1997 (***Figure*** *7*). There is some data to show that the latter grew faster than the former before the Global financial crisis (2008), but the relative growth rates clearly reversed during 2008-2009, leading to a sharp fall in the manufactured exports/MVA ratio (***Figure 9***).[10]

Figure 8: Top Exporters of Manufactured Goods by share of world



Source: Authors Calculations based on World Development Indices

In 1986, Germany was the leading manufactured goods exporter with 16.4 per cent share in global manufactured exports followed closely by Japan (15.7 per cent) and USA (12.6 per).

[10] Relatively complete data on MVA is only available in WDI from 1997. Before that several years are completely missing, while there are glaring gaps for many countries before that.

Netherlands, which is currently amongst the top 5 manufactured goods exporters with a 3.3per cent share, had a marginally higher 3.5 per cent share in 1986. Its share was higher than that of South Korea, with 2.5 per cent of the global manufactured export market. China's share at 0.7 per cent was marginally greater than India's share of 0.5 per cent (**Figure 8**).

As Japan and Germany's export shares were on a declining trend, USA overtook Japan in 1991 and Germany in 1993 to become the largest exporter of manufactured goods. Germany's share of World manufactured exports stabilized thereafter, was the same in 2004 as it was a decade earlier (1994). Japan's share of world manufactured has, in contrast, remained on a declining trend (***Figure 8***). USA's manufactured export share rose to a peak of 13.6per cent in 2000, declined for a few years.

China's manufactured exports accelerated at the turn of the century as USA agreed to the entry of China into the WTO, terms were agreed and it formally became a member of the World Trade Organization (WTO) in 2001. China's share of world manufactured exports has increased by almost 1per cent a year from 4per cent in 1999 to over 19per cent in 2015. The rise of China's share was corelated with the decline of USA's share in the first half of the 2000s, likely due to outsourcing of USA manufacturing from USA companies and shift of supply chains from Japan and other Asian countries to China. China overtook Japan in 2004, USA in 2005 and Germany in 2007 to become the largest exporter of manufactured goods. The global financial Crisis seem to have affected China more than the other leading exporters (***Figure 8***).

Figure 9: Manufactured Exports/MVA (per cent)

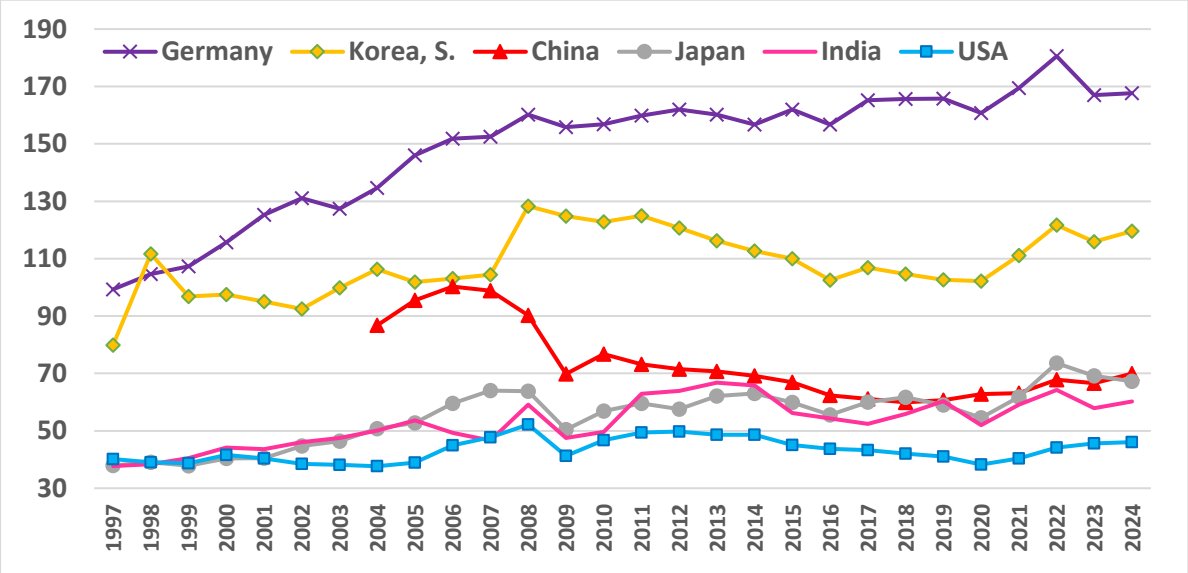


Figure 9 depicts the ratio of Manufactured exports to MVA of the leading manufacturer-exporters. It provides an insight into their export orientation from the late 1990s. Germany appears as the most "export led" manufacturing economy according to this indicator, followed by Korea. This index suggests that Germany's export orientation has risen progressively over the period, while that of S Korea jumped after GFC (2008) and then followed a shallow U curve. China's average manufactured export/MVA ratio of 98per cent, was only 5per cent less than Korea's 103per cent, during 2005 to 2007, but fell after GFC.

USA appears to be the least manufactured export driven. This is consistent with our image of USA as a service economy. Japan has a ratio, which is between that of S Korea on the upper side and USA on the lower, suggesting an export-oriented manufacturing sector, but not an export led one. Somewhat surprisingly, the Manufactured export/MVA ratio of India mirrors Japan's but is significantly less during 2006-2008 and 2022-2024. Since 2011 the ratio of exports/MVA has averaged 45per cent for USA, 59per cent for India, 62per cent for Japan and 66per cent for China, 112per cent for S Korea and 164per cent for Germany (***Figure 9***).

Table 2 shows the manufactured export shares and incremental shares of the top 15 exporters. Countries ranked in top 5 are the same as countries ranked in top five in incremental shares. China is however unique among them. Its share in 2024 (18.5per cent) is less than its share of the increase in exports from 2014 to 2024 (24.9per cent). For the next four largest exporters this is reversed, with the latest share in 2024, lower than the incremental share in the past 10 years; Germany (8per cent & 5.9per cent), USA (6.5per cent & 5.0per cent), S Korea (3.4per cent & 3.3 per cent) and the Netherlands (3.3per cent & 3.3). Their incremental contribution is in line with their 2024 rank. The specialization of S Korea and Netherlands in high-technology and logistics-intensive sectors have likely helped them hold their own against China.

Table 2: **Manufactured Exports shares and Incremental Contribution: 2004 to 2024**

Country	Share in World Exports (2024)		Share in World Export Increase	
	Share (per cent)	Rank	Share (per cent)	Rank
China*	18.5	1	24.9	1
Germany	8.0	2	5.9	2
United States	6.5	3	5.0	3
Korea, Rep.	3.4	4	3.3	4
Netherlands	3.3	5	3.3	5
Japan	3.3	6	0.5	21
Italy	3.0	7	2.1	9
France	2.8	8	1.3	19
Mexico	2.8	9	3.1	6
Singapore	2.0	10	1.9	12
United Kingdom	1.8	12	0.4	24
Viet Nam	1.7	13	3.0	8
India	1.7	15	2.2	7

Note: Shares for France, Singapore and Vietnam calculated by taking Exports for 2023 (Latest available). *If Hong Kong is included in China export share is 21.8per cent. Source: Authors calculations based on WDI

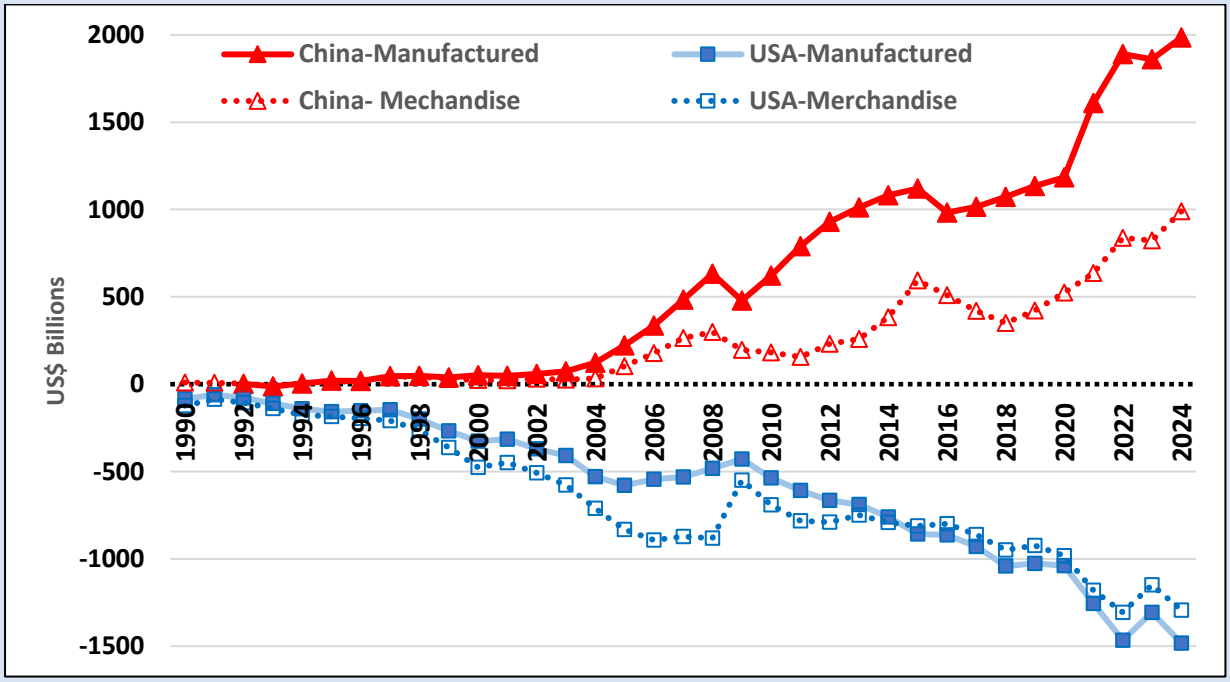
There is a lot of difference between the next five countries in 2024 and the top five in incremental shares. Japan the 6th ranked in 2024 had a declining share in manufactured export growth. Italy (3.0per cent & 2.1per cent) and Mexico (2.8per cent, 3.1per cent) are the two other countries in the top five, both in 2024 and incrementally. Mexico, India and Vietnam rank 6, 7 & 8 in terms of the decadal increase in manufactured exports. Mexico (2.8per cent & 3.1per cent) has gained from integration into North American production networks, particularly in

automobiles and electronics. Vietnam (1.8per cent & 3.0per cent) has become an outsourcing hub in S.E. Asia, for US firms diversifying production out of China. India's manufactured export share has increased substantially (1.7per cent & 2.2per cent) due to diversification into engineering, chemicals, and petroleum-based products, but the gap between its MVA rank and the manufactured export rank remains large **(Table 2).**

4.3 Net Manufactured Exports

The trends in net manufactured exports (manufactured exports net of manufactured imports) of USA and China, highlight not just a major shift in global manufacturing power, but the increasing concentration of manufacturing. Over the last thirty years, China's net manufactured exports have grown from almost zero to nearly US$2 trillion. When China opened to the World in 1980s, its manufactured imports were larger than manufactured exports, resulting in an average deficit of –$11.6 bi during 1984-88. As Taiwan started shifting its labor-intensive manufacturing to China, the situation reversed, and by 1995 it had net export surplus of $21 billion (**Figure *10***).[11]

Figure 10: Net Manufactured and Merchandise Exports of USA and China



Source: Authors Calculations based on World Development Indicators

With export oriented FDI entering China during the 1990s, net manufacturing exports almost doubled (1.9x) every five years, reaching $73 billion by 2003. The acceleration in manufacturing surplus increased noticeably after China joined the WTO in 2001, with China's net manufactured export surplus passing US$600 billion in 2008, 5.2x that in 2003. Interestingly though manufactured exports jumped 2.5x between 2003 and 2008, compared to 2.3x in previous five years, manufactured Imports increased only 1.7x compared to 2.4x in previous five years. Import substitution became an increasing part of China's development policy as manufactured export markets were saturated. The Global financial crisis proved to be

[11] China's manufactured import data is not available 1988 to 1991.

a temporary setback, with quick recovery to over US$1 trillion by 2017, and almost US$2 trillion in 2024. The 3x increase in net exports from 2008 to 2024 was based on a strong 2.4x change in manufactured exports fueled by credit subsidies and a modest 1.8x increase in manufactured imports supported by a range of import-substitution policies (**Figure *10***).

The United States' net manufactured exports have been negative since the early 1980s. Since then it's been on trend of increasing deficits on manufactured goods trade, except for a short trend reversal in late 2000s (**Figure *10***). The deficits in net manufactured exports of USA almost mirror the net export manufactured export surplus of China (**Figure 10**).

These trends of the net exports contradict the Keynesian assumptions that external imbalances would be cyclical. The postwar international economic architecture was built on the assumption that adjustment would distributed across deficit and surplus economies (Keynes 1942; Eichengreen 2008). However, the actual trajectory of the merchandise as well as the manufactured trade balances of China contradicts this assumption, from the time that China entered the international trading system. China's surplus on net merchandise trade has exhibited a persistent and accelerating upward trend, rising from close to balance (USD 9 Billion) in 1990 to well above USD 1 trillion by 2024, with only brief reversals during the 2008 Global Financial Crisis and the 2015 slowdown (**Figure 10**). These long-duration and directionally consistent imbalances point to structural concentration of manufacturing capacity in China, reinforced by scale, integrated supply chains, and cost advantages (Baldwin 2016).

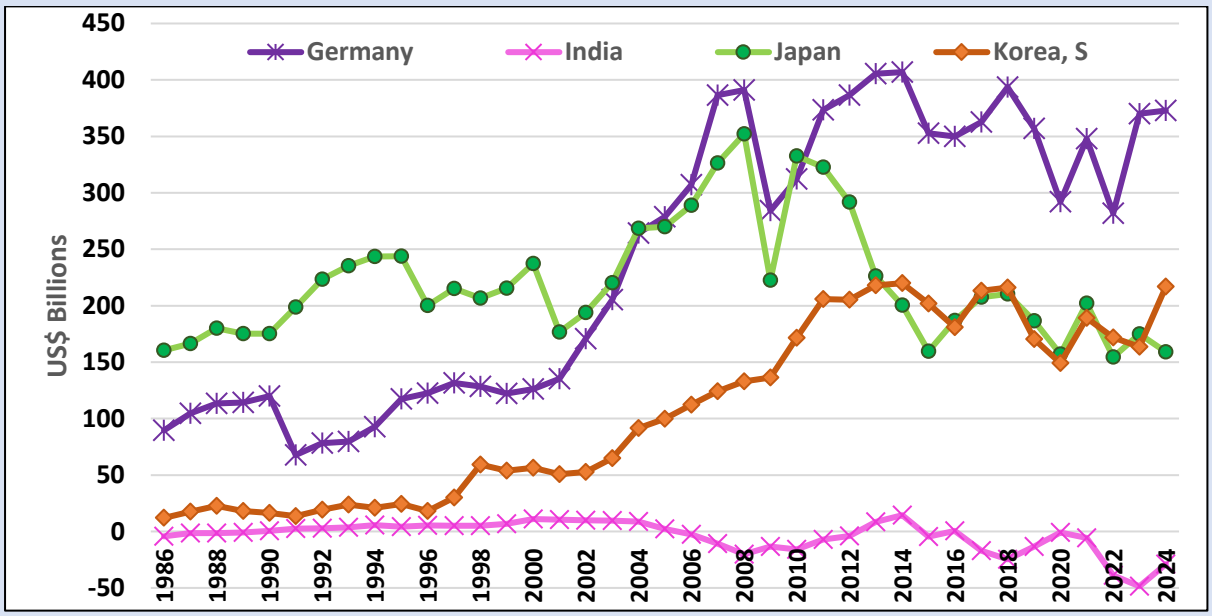
The gap between the surplus of the manfactured and merchandise exports of China has widened since China entered the WTO, suggestive of a structural shift. China's export competitiveness has become overwhelmingly concentrated in manufacturing rather than in broader merchandise categories. This concern is consistent with Baldwin's (2016) argument that modern global value chains have concentrated manufacturing capacity into a few dominant hubs, producing systemic vulnerabilities. Similar conclusions also appear in Gereffi's global value chain analyses (2018) and in Baqaee and Farhi (2020), which link production concentration to macroeconomic fragility.

Another aspect of China's growing surplus is the "under-reporting" of China's surplus by the International Monetary Fund (IMF). Setser(2025, 2026) identifies two specific accounting maneuvers that artificially deflate the reported number. First, a 2022 revision to China's balance of payments methodology reduced the recorded goods surplus by over one percentage point of GDP. Second, a persistent income account deficit. China owns nearly $4 trillion more in foreign assets than foreigners own in China. That means China should be collecting more in returns — interest, dividends, profits — than it pays out. But China's official data shows the opposite: iSetser argues it is not credible. This unexplained deficit artificially reduces China's reported surplus by roughly one percentage point of GDP. Setser (2026, 2025), estimates China's overall goods surplus $1.2 trillion (6per cent of GDP) from customs data. This repesents an $800 billion increase over the past five years. The real trade surplus is 3x the $420 bil reported by

the IMF for 2024,[12] over 1per cent of the GDP of China's trading partners and more than the peak surpluses of Germany and Japan combined.

The net-export trajectories of Germany, Japan, South Korea are similar to those of China, while that of India is similar to that of USA, but at a much smaller absolute levels(**Figure 11**). Germany's surplus increased sporadically till 2001 and tripled from 135bi to $390bi by 2008. It's surplus has hovered between US$350 billion and US$400 billion since, underscoring its role as Europe's manufacturing powerhouse. Japans net manufactured exports were much larger than germany's before 2001-2, increased less dramatically till 2008. And declined sharply after the GFC South Koreas's net manufactured export sutplus has shown a much steadier growth from $30 bi in 1997 to $220 bi in 2014, plateauing out thereafter. (**Figure 11**).

Figure 11: Net manufactured exports of major producers of manufactured goods



Source: Authors Calculations based on World Development Indices

The corelation coefficients of the net exports of countries with China reflect their manufactured trade connections with China's. For the period for which China's manufactured export and import data is available, there is -0.96 correlation between its net exports and that of USA. This is marginally more negative than that of France (-0.95) and UK (-0.94). and much more negative than India (-0.7), the only other country in Table 2 with a significant negative correlation with China's net manufactured exports. Japan (-0.15) and Mexico (0.1) are not significantly uncorrelated with China, while Germany (0.78), South Korea's (0.86), Netherlands (0.89) and Italy (0.83) net manufactured exports are positively corelated. If we restrict the correlations to the last two decades, Japan's correlation has become significantly more negative (-0.71) and Germany (0.29), South Korea (0.61), Netherlands (0.73) and Italy

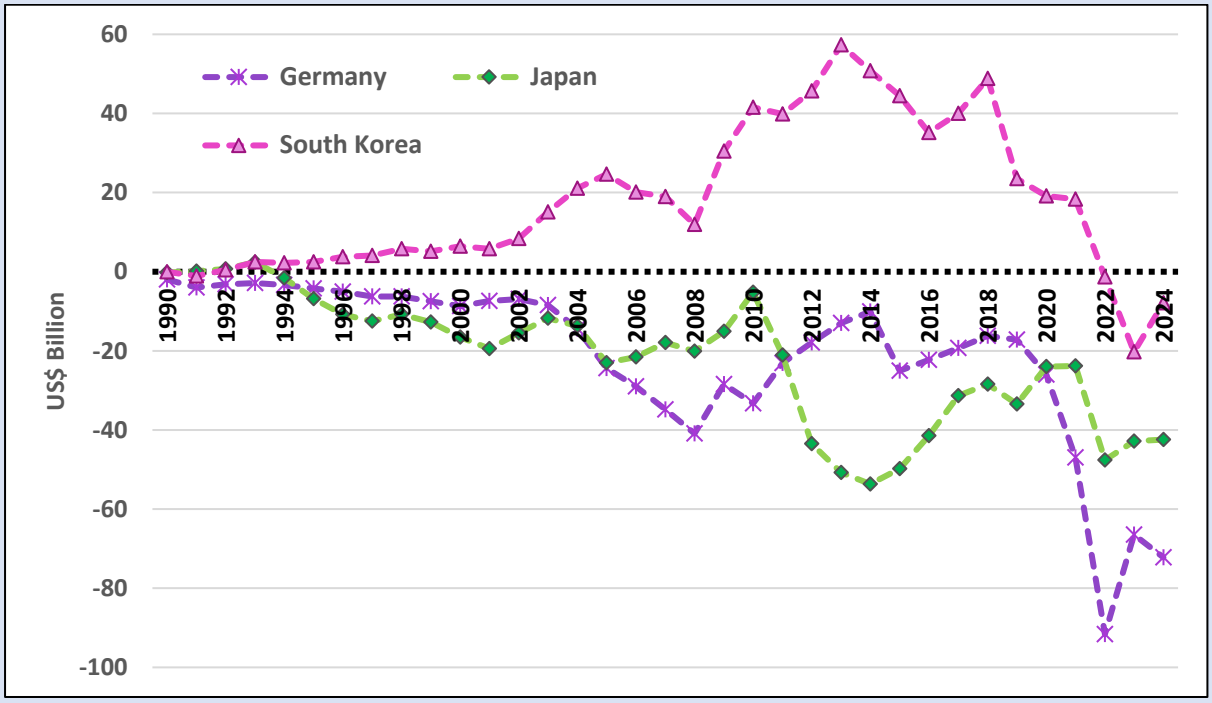
[12] Brad Setser, "*China's Massive Surplus is Everywhere (Yet) The IMF Still Has Trouble Seeing It Clearly*
"https://www.cfr.org/articles/chinas-massive-surplus-everywhere-yet-imf-still-has-trouble-seeing-it-clearly

(0.69) have become significantly less positive. While India's correlation has become less negative (-0.58), those of USA, UK and France remain almost the same.[13]

We hypothesize that countries whose net manufactured exports are significantly positively corelated with China's have benefited from China's mercantilist policies, while those with significant negative correlation, have suffered from it. The fact that the latter set of countries have used tariffs and/or anti-dumping policies against China, is suggestive. Further, the reduction in the absolute value of these countries' net export correlation with China, suggests that China is delinking itself from these countries since the GFC (2008).

Many of the Worlds largest manufacturers and manufatured goods exporters are net importers of manufactured goods from China. Germany and Japan have been the net importer of manufactrued goods from China since the 1990s. Germany witnessed a five-fold spike in the net imports from -$17.1bi in 2019 to -$91.6bi in 2022 (**Figure 12)**.

Figure 12: **Net Manufactured Exports to China**



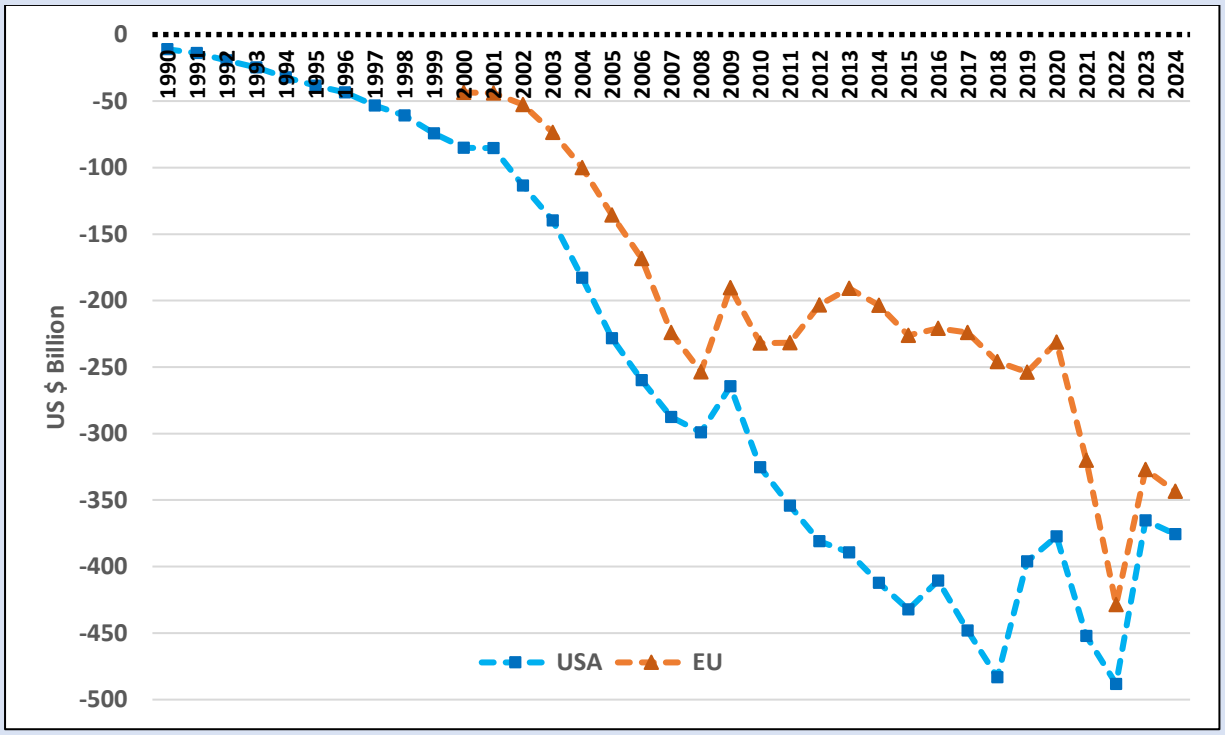
Source: Authors Calculations based on UN-COMTRADE database (accessed using WITS)

Even though it recovered slighly from its deficit -$66.5 billion, by 2024 it has again fallen to -$ 72 billion taking forward the deficit trend. Japan too had an almost quadrupling (3.6x) of net manufactured imports from China, with net exports going from -$15.1bil in 2009 to -$53.7bi in 2014. South Korea was the only significant exporter with positive net exports to China till 2021, and a peak of US$57.3bi in 2013. It too has become a net importer of manufactured goods from China since 2022, with a determined effort at import substitution by China from 2019 to 2023 (**Figure 12**).

[13] Net manufactured exports of Mexico (0.59) and Vietnam (0.78=>0.87) have become more highly correlated with those of China, suggesting latter is using the former a a conduit for exports to USA. EU as a whole declines from 0.83 to 0.58,

The USA and EU both witnessed steep net import rise from China after its accession in WTO in 2001. US net manufactures imports after recovering from the global financial crisis (2009) and the European Union (EU) after the the pandemic-2020 (**Figure 13**).

***Figure 13*: Net Manufactured Exports to China from EU & USA**



Source: Authors calculations based on UN-COMTRADE database (accessed using WITS)

The European Central Bank attributes the trade imbalance to a structural shortfall in domestic demand, with a weak domestic economy producing rate cuts, low yields, and a relatively weak renminbi, the net effect of which has been to displace European producers across a range of manufacturing sectors and generate significant geopolitical tension[14].

4.4 Asymmetric Manufacturing Trade Policy

Table 3 summarizes the manufacturing trade details of the top eleven Manufactured Value-Added (MVA) countries in the World. Among the top eleven in MVA are eight High Income countries (HICs) and three Middle income countries (MIC)-China, India and Mexico. China, a MIC is ranked first in World share of MVA (27.7per cent), in World share in manufactured exports (18.5per cent), but number 2 in World share of manufactured imports (7.7per cent). China's share of World manufactured exports is 2.4 times its share of world imports, with a 10.8per cent difference between the two shares. Consequently it has the largest Net export value ($1985 bil), more than five times that of next highest Germany ($373 bil). Germany's export share is only 1.8per cent (or 30per cent) higher than its import share. Even 4th ranked exporter, South Korea, has an export share which is 50per cent higher than its import share compared to

[14] https://www.cfr.org/articles/chinas-massive-surplus-everywhere-yet-imf-still-has-trouble-seeing-it-clearly

2.4 times for China. This is proof of China's Export led, Import substituting industrial (manufacturing) policy.

Table 3: **Global Manufacturing (2024)**

Economies	Value Added		Exports		Imports		Export/ Import	Exports-Net ($
	Share	Rank	Share	Rank	Share	Rank		
China	27.7	1	18.5	1	7.6	2	2.4	1985.3
USA	17.3	2	6.5	3	15.8	1	0.4	-1483.3
Japan	5.2	3	3.3	6	2.5	9	1.3	159.1
Germany	4.9	4	8.0	2	6.2	3	1.3	372.8
India	2.9	5	1.7	15	2.0	13	0.9	-28.9
South Korea	2.5	6	3.4	4	2.3	11	1.5	217.0
Mexico	2.2	7	2.8	9	3.0	7	0.9	-7.9
Italy	2.1	8	3.0	7	2.5	10	1.2	125.8
France	1.8	9	2.8	8	3.5	4	0.8	-70.8
UK	1.7	10	1.8	12	3.0	6	0.6	-187.4
Russia	1.7	11	0.7		1.5	18	0.5	-130.8

Notes: *(1) Data is for 2024, except Exports & imports for France (2023), & Russia is not available for 2022-24.*
(2) Net Exports= Manufactures Exports – Manufactures Imports; Data for 2024, Values in US $ Billions.
(3) Netherlands MVA is not in top 11, but is ranked 5th in World Export and Import shares.

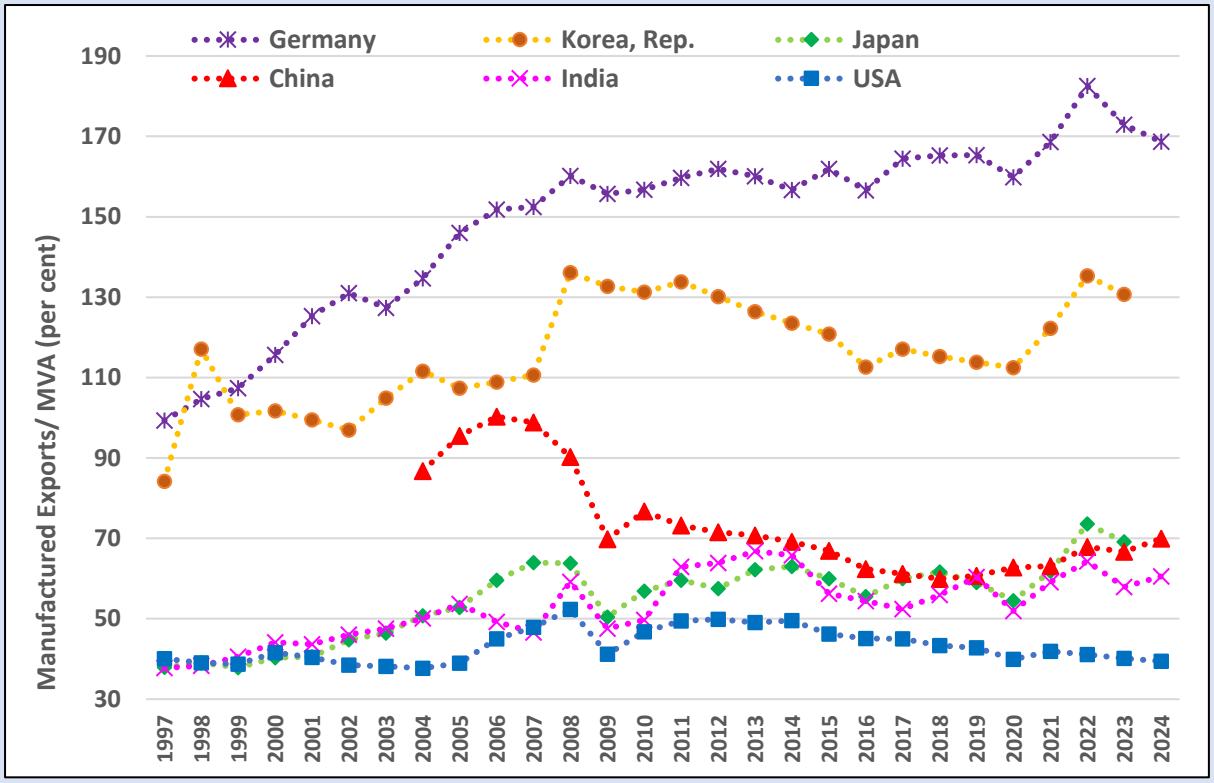
India (2.9per cent) and Mexico (2.5per cent) are ranked 5th and 7th in World MVA share, both have a 0.9 ratio of export/import shares, and a negative balance on manufactured trade of -$28.9 bi and -$7.9 bi respectively in 2024. Of the HICs, South Korea has the highest ratio of exprt share to import share (1.5) followed by Japan and Germany at 1.3, and Italy with half of China's rati0(1.2). As per this indicator, these countries seem to follow an export led strategy of manufacturing growth, and have a net positive balance of trade in manufactured goods (2024). USA, UK and France have Export share/import share ratios of 0.4, 0,5 and 0.8 respectively and a negative balance on manufactured trade, consistent with the fact that they do not have an export led manufacturing growth strategy (**Table 3***)*.

4.4.1 Net Manufactured Exports and MVA

Other indicators of global imbalances are the ratio of Manufactured Exports and net manufactured exports (or export surplus) to Manufacturing Value Added (MVA). The former measures the share of a country's manufacturing GDP (MVA) which is sold abroad, and the latter measures the extent to which foreign trade subtracts from the availability of manufacture goods available to domestic consumers. These two indicators are shown in **Figure** 14 and **Figure 15** respectively, for the five exporters ad India (drawn from table 5).

From the manufactured export/MVA trends in **Figure** 14 there appear to be three categories of manufacturer-exporters (2024 ratios in brackets), during the post Global Financial Crisis period. Manufacturing Export led Germany (169per cent) & S Korea (131per cent), Export oriented Japan (67per cent), and neutral USA (40per cent). China seems to have moved from being Export driven before the GFC (100per cent) to Export oriented after GFC (70per cent). India export/MVA ratio seems to track that of Japan surprisingly well, except during the pre-GFC boom, and is at 61per cent in 2024.

Figure 14: **Manufactured Exports as per cent of Country's MVA**

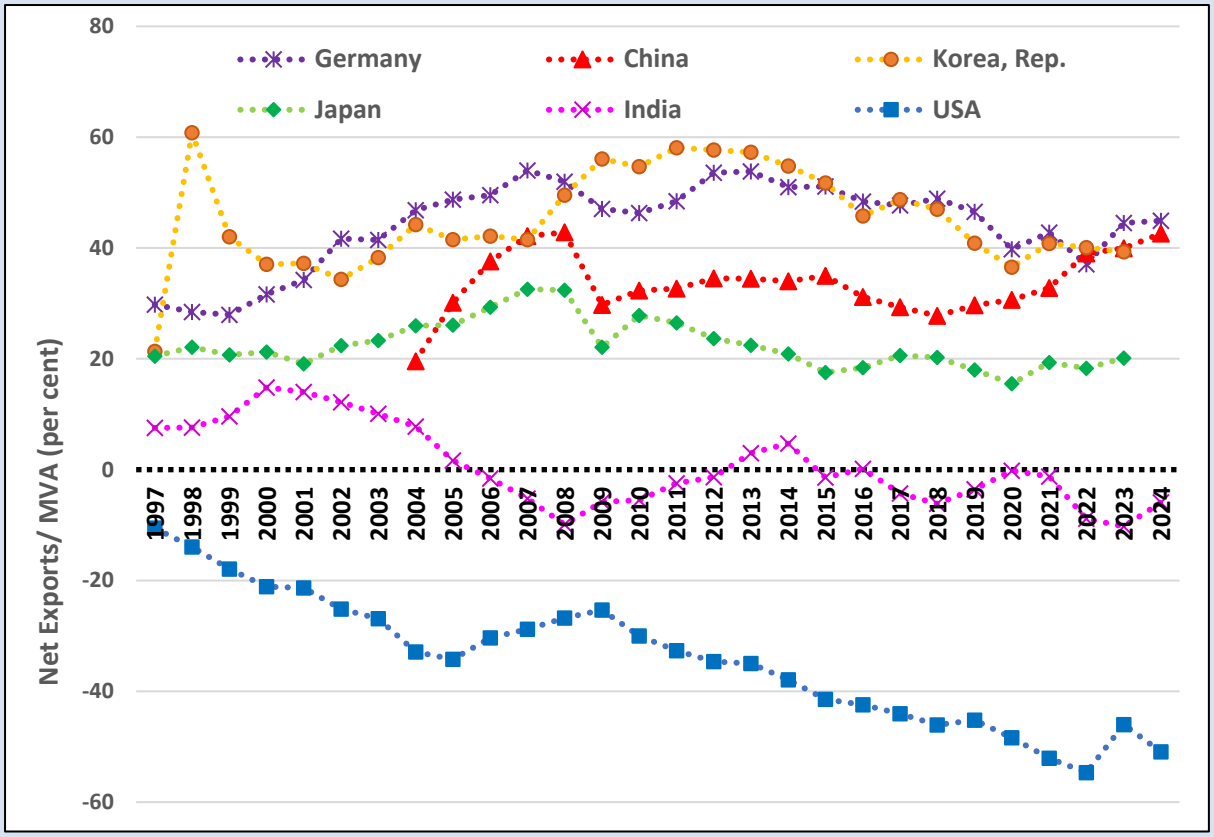


Note: MVA data available from 1997. China data available from 2004.
Source: Authors calculations based on World Development Indices, World Bank

Germany's exports share has been on a rising trend since 1997 when it was around 100 per cent. It peaked in 2022 at 182 per cent. South Korea had a stable ratio till the GFC, but jumped sharply during GFC to 136, Since then it declined slowly till the pandemic and then returned to a peak of 135 in 2022. China's exports as per cent of its MVA rose briefly up till 2006, after which it declined until 2020. Post covid it has been on a rising trend. USA's manufactured export/MVA ratio a little above 40per cent in 1997, rose to a peak of 52per cent during the pre-GFC bubble and has gradually declined to below 40per cent. Indias manufactured exports/MVA ratio was identical to that of USA & Japan in late nineties but has risen to become 50per cent larger than that of the USA by 2024 **(Figure 14)**. This is consistent with a shift, from inward orientation during 1950-80, to a more neutral orientation through trade liberalization in 1980s, and to outward orientation during the 1990s economic reforms.

Net exports as per cent of MVA clarify the above classification for all countries, but China is in a different classification. Germany (45per cent) and South Korea have the highest net export/MVA (39-40per cent) and are therefore clearly "*manufactured export led economies*". China's net manufactured export/MVA has fluctuated, attained a peak of 42.8per cent in 2008, similar to that of S Korea in 2007, and is now at 42.6per cent in 2024; This now exceeds that of S Korea and is marginally less than that of Germany and therefore in the category of *manufactured export led economy* (**Figure 15**).

Figure 15: **Net Exports as per cent of MVA**



Note: MVA data available from 1997. China data available from 2004.
Source: Authors calculations based on World Development Indices, World Bank

Japan is now much more distinct and clearly a manufactured export-oriented economy distinct from the manufactured export led economy, even though it had periods in which the ratio went as high as 32per cent. It has a net export/MVA ratio of 20per cent, half of that for export led economies. Similarly India is clearly a manufacturing neutral country with its net exports/MVA ratio fluctuating around zero, between a peak of 14per cent and trough of 10.3per cent. USA has been on a negative trajectory for the last two and half decades, with its manufacturing sector declining over the period. This is largely due to its status of Global reserve currency and related openness to manufacturing trade.

5. East & S.E. Asian Supply Chains

As the challenge to USA & Europe's pre-WW2 dominance in manufactured exports, including the latest one from China, has come from East and S.E. Asia, this section summarizes its industry-based growth strategy. The Flying Geese model is the classic explanation for the manufactured export driven, export led or export oriented economic development of East and S. E. Asia. Akamatsu (1962), conceptualized industrial development as a hierarchical and sequential process in which technological capabilities, production structures, and export specializations diffuse across countries in a pattern resembling a formation of "flying geese." Akamatsu posited a three-step sequence in which imports precede domestic production which eventually give way to exports, as latecomer economies acquire capabilities in specific product categories. While Akamatsu provided the foundational narrative, Ozawa (2001) systematized

and elaborated the 'catch-up' framework, recasting the Flying Geese (FG) model as a dynamic, multi-layered theory of industrial deepening, FDI-driven restructuring, and regional hierarchy in East Asia. He introduced a four-stage "industry ladder", which anchors the analytical core of the modern FG paradigm:

Stage I — Learning via labor-intensive consumer goods
Stage II — Capital-deepening via scale-intensive, medium-technology industries
Stage III — Innovation-driven, high-technology industries
Stage IV — Post-industrial upgrading into services and knowledge industries

The flying geese model identifies Japan as the lead goose, with the newly industrializing economies (NIEs) of Singapore, South Korea (ROK), Taiwan and Hong Kong as the tier 1 of the flying geese formation behind Japan. The newly Industrializing countries (NICs) of Malaysia, Thailand, Philippines and Indonesia are defined as falling in the second tier. In this paper, South Korea is taken as representative of tier 1, Malysia and Thailand as representatives of tier 2. The third tier potentially includes China and Vietnam, though China moved rapidly to the front, by displacing, first the tier 2 countries, then the tier 1 countries and eventually Japan itself. India has been less embedded in the East and Southeast Asian supply chains despite FTAs with Japan, South Korea and ASEAN. The reasons are explored in ***section* 9.6**

Japan the lead goose in this model, had a manufacturing capability comparable to Germany and USA during the first half of the 20th century. After its defeat in WW 2, Japan's low-tech manufacturing, especially cotton textiles, had largely rebounded, driven by a revival of export demand and strong private-sector coordination. Building on American support, the cotton sector had regained competitiveness to become the world's largest exporter of cotton goods by 1951 (Fletcher 1996). Japanese economy entered a period of high growth following its political independence from USA in 1951, membership of World Bank in 1952, membership of World Trade Organization (erstwhile GATT) in 1955, and various policy reforms during the post-war period. For Japan, the textile and clothing (SITC 65 and SITC 85) segment which forms the sub-set of the low-tech manufacturing, had already peaked before 1960s.[15]

According to Ohno (2004), the trade liberalization in 1960s, was an important factor in raising Japan's share of world exports of low-tech manufacturing in the 1960s to a peak of 13 per cent in 1971. Japan's GNP also overtook West Germany, around 1970, to become the second largest economy in the world, after the United States. These two events defined the conclusion of Japan's catching-up process with the West (Ohno, 2004).

The stages of development aspects of the flying geese model can be related to the tech level of the country's exports, detailed comparative data for which is available. The paper uses the three levels of manufacturing defined by Lal (1999), Low, Medium and High-tech

[15] Data is available only from 1962 when Japan's share was around 12 per cent

manufacturing, for empirical analysis.[16] This section starts with a snapshot of peak export shares by tech level, and the current position (2024) of the selected flying geese countries (sec **5.1**). This is followed by an analysis of the flying geese countries' trends in low-tech (sec **5.2**), medium-tech (sec **5.3**) and high-tech exports (section **5.4**). The final sub-section shows the overlap between the alternative concept of network products and products defined by tech level.

5.1 Manufactured Exports by Technology Level

As USA, Germany and Japan are the traditional manufacturing export powers, this sub-section starts by comparing their disaggregated export shares with respect to the three levels of technology. The USA's share of low-tech exports peaked before 1962, followed by Germany (15.6per cent) in 1967 and Japan (13per cent) in 1971 (**Table 4**). It's noteworthy that despite peaking earlier, Germany's share of world low-tech exports was larger than Japan's throughout the 1970s. Germany's medium-tech export share peaked at 22.7per cent in 1977, higher and earlier, than USA's peak share of 15.6per cent in 1981. Japan's share of medium tech exports equaled that of USA in 1976 and exceeded it thereafter (**Table 4**). Despite peaking well below Germany, at 19.1per cent in 1984, Japan's mid-tech export performance contributed to the Japan scare in the USA during 1980s leading to the Plaza accord in 1985.

The high-tech exports of USA and Germany peaked almost simultaneously, but the USA's peak of 30.2per cent (1976), was almost double that of Germany's 18.1per cent (1977). Japan peaked a decade later marginally higher than Germany (19per cent). The USA remained dominant in High-tech exports till China's share (13per cent) overtook that of USA (12.8per cent) in 2004. China has had the highest share of high-tech exports for 23 years. Unlike the "*Japan scare*" during the 1980s, there was no "C*hina scare*" in the 2000s and 2010s, despite China's rising manufacturing export surplus, and the rising US export deficit, since 2004 (**Figure 10**).[17]

The stages of development aspects of the flying geese model can be related to the tech level of the country's exports. We hypothesize that, (A) The date of attaining the peak global share in each level of technology will be later the further it is from the technology leader (down the column), and (B) The date on which a country reaches its peak global share of exports, will be later the higher the technology level (across row).

[16] Refer appendix for details on classification of the manufactured products as low, medium and high-tech as per Lall (1999).

[17] China is the only other country whose export shares are comparable to those of USA Germany & Japan. The followers of Japan in the flying geese (including South Korea) had peak shares much smaller than Japan. USA took 15 years to recognize the threat and impose protective tariffs on China in 2018 (under President Trump).

Table 4: Peak Share of World exports by Technology level (per cent) & Per Capita GDP ratios

		Peak share of exports by level & peak year						PcGdp ratio with benchmark as:		
Technology level=>		I. Low Tech		II.Medium Tech		III. High Tech		Korea(1988)	Germany(1977)	USA(1976)
Sr.No.	Country	Peak	Date	Peak	Date	Peak	Date	Low Tech	MediumTech	High Tech
-1	USA	10.7	1962	15.6	1981	**30.2**	1976	2.46	1.44	**1.00**
0	Germany	15.6	1967	**22.7**	1977	18.1	1977	1.88	1.00	0.77
1	Japan	13.0	1971	19.1	1984	19.0	1989	1.78	**1.00**	0.70
2	Korea	5.7	1988	4.4	2015	6.3	2021	**1.00**	1.31	0.84
3	Malaysia	1.5	1996	1.02	1995	4.7	2002	0.77	0.27	0.17
4	Thailand	1.4	2000^	1.75	2022	2.0	2024	0.63	0.26	#
5	China	**28.9**	2015	14.4	2022	26.1	2017	0.99	0.53	0.23
6	India	3.3	2022	1.49	2022	1.4	2024	0.26	0.10	
7	Vietnam	5.3	2024	0.9	2024	4.4	2024			

Note: PCGDP ratios are based on PCGDP at constant 2015 prices. Benchmark is Korea (1988) for low tech, Germany (1977) for medium tech and USA (1976) for high tech. ^ Thailand had a second low tech peak in 2011 at 1.3per cent, so we use PcGDP for 2011. Peak date 2022 could be due to negative shock in 2023-24. Highest value in 2024 just implies an uptrend (not peak), so we do not compare PGDP. # = 0.17.

Table 4 is broadly consistent with this hypothesis, but there are a few anomalies. In the case of proposition A, Malaysia peaks too early in both medium and high-tech export shares, while China peaks too early in High-Tech (cells colored red). The anomalies of the two countries also create anomalies in proposition B. In the case of Malaysia the early peaks could be due to MNEs expanding the supply chains for new medium & high tech products in China, by routing incremental FDI to it, since the mid-1990s.

Shares of Labor-intensive manufacturing are inversely related to wage rates in a market economy. Similarly average wages are positively related to per capita GDP. Given the overlap between low-tech exports and labor-intensive production, we can correlate peak shares with per capita GDP. South Korea's Per capita GDP (US$ in constant 2015 prices) in 1988, the low-tech export share peak, is used as benchmark. When Japan's low-tech exports peaked in 1971, its PCGDP was 1.78 that of Korea's in 1988, while Malaysia's PCGDP (1996) was 0.77 of Korea's in 1988 (peak share year). Using Thailand's second peak in 2011, the corresponding ratio was 0.63 (**Table 4**). When China's low-tech exports peaked in 2015, its per Capita GDP was almost identical to that of South Korea's in 1988. This pattern suggests that subsidized competition from China at the turn of the century (1995-2005) was partly responsible for the plateauing of Malaysia & Thailand's low-tech export share. These subsidies allowed learning by doing, backward integration and buildup supply chains, which raised competitiveness, by the early 2010s. Malaysia and Thailand, were then unable to expand their exports beyond traditional products and/or buyers, despite lower wage costs.

Medium-tech export share of Germany, which peaked in 1977, is used as the benchmark in this case(table 4). When Japan's share of medium-tech exports peaked in 1984, its per capita GDP was the same as Germany's in 1977 (**Table 4,** 2nd last column). USA whose share peaked in 1981, had a per capita GDP 1.4 times Germany's (1977). South Korea, which peaked in 2015 with 1.3 times the per capita GDP of Germany in 1977 was very similar. This is consistent with the view that USA and Korea had medium technology sub-sectors with higher productivity & long-term competitiveness. In contrast, Malaysia, Thailand and China's medium-tech export shares peaked simultaneously in 2022 (**Table 4**). Malaysia and Thailand's Per capita GDP were both about 1/4th that of Germany in 1977, while that of

China's was a little over half that of Germany (1977). This suggests that in contrast with South Korea, China had not created many competitive medium-tech industries, despite subsidies, which allowed it to outcompete Malaysia after 1995 and Thailand since Global Financial crisis (2008).[18]

For high tech products, the USA was the most competitive exporter of high-tech products as indicated by the Per capita GDP ratios of Germany, Japan and Korea at 0.77, 0.7 and 0.84 respectively (**Table 4,** last column). South Korea has therefore become a more competitive producer of high-tech goods than Japan. China's relative PCGDP (0.23) at its high-tech peak is less than half that at medium tech peak (0.53), suggesting that the former was even more dependent on subsidies (as of 2024). Further, though the latter was more than twice that of Malaysia (0.27), the former is only 1/3rd more than the former, indicating a far smaller gap in competitiveness and a greater use of subsidies by China in high tech, than in medium tech manufacturing, vis-à-vis Malaysia.

This rest of this section compares the latest available export shares of the countries considered in the Stages of Production, Flying Geese model. **Table 5** presents the export shares in 2024 and the change in these shares over ten years. China now has the highest share of total manufactured exports (18.5per cent), as well as for low tech (25.3per cent), medium tech (14per cent) and high-tech exports (22per cent). In Low tech its share is equal to the total of all the other countries in the table, while in medium-tech and high-tech exports China's share is marginally lower than the total of all other countries in the table (-1.4per cent & -1per cent respectively).

Another noteworthy feature is that USA, Germany, and Japan have lost export share at every level of technology, while Korea has lost at every level except High tech exports (+0.5per cent). China has gained 1per cent share overall, because of its 3per cent increase in share of medium tech exports, while its low tech and high-tech shares have declined, by -2.6per cent and -3.2per cent respectively. Vietnam in contrast has gained export shares in total and in all categories, but with greatest gains of almost 3per cent in low-tech and high-tech exports (**Table 5**).

Table 5: Country Share of World Exports by Technology Level

	Country	Shares in 2024				Change in share: 2024-2014			
Sr.No.	Tech=>	All	Low	Medium	High	All	Low	Medium	High
-1	USA	6.5	4.7	10.2	7.8	-1.4	-0.7	-0.6	-2.0
0	Germany	8.0	5.9	11.7	5.8	-2.0	-1.0	-2.2	-1.5
1	Japan	3.3	2.5	6.6	3.8	-1.5	-1.1	-1.9	-1.1
2	Korea	3.4	1.9	4.1	5.8	-0.6	-0.7	-0.2	0.5
3	Malaysia	1.3	1.0	0.9	3.6	0.2	0.0	0.1	-0.1
4	Thailand	1.2	1.2	1.6	2.0	-0.1	0.0	0.0	0.3
5	China	18.5	25.3	14.0	22.0	1.0	-2.6	3.0	-3.2
6	India	1.7	2.7	1.3	1.4	0.1	0.1	0.2	0.7
7	Vietnam	1.2	5.3	0.9	4.4	0.8	2.9	0.6	2.9
	ST(1-4,5-6)	26.6	14.6	15.4	21.0	-1.1	1.3	-1.1	3.2
	US,Ger	14.5	10.6	22.0	13.6	-3.4	-1.8	-2.8	-3.4

This suggests that both labor-intensive, low-tech products but also labor-intensive assembly and other process used in High tech and medium tech production have been outsourced to

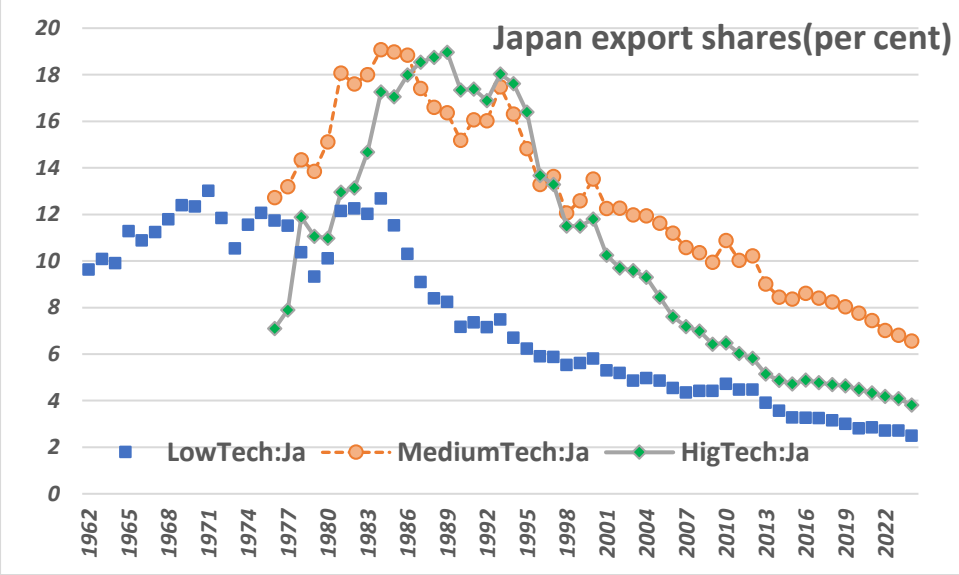
[18] Figure 17 in subsequent section.

Vietnam by USA, Germany, Japan and Korea, but also by China. India's gains in shares are positive but small so far, with the main competitor for high tech, labor/skill intensive processes being Thailand and Malaysia.

5.2 Low-Tech Manufactured Exports

Japan's low-tech exports follow a pattern over time, which can be described as a hump (with peaks & valleys). The share rises, up the slope, plateaus out, and then declines on the other slope (**Figure 16**). The pattern of Japan's medium tech and high-tech export shares is similar but the plateau is a lot bumpier, with a downward slope and a double peak. The duration of plateau gets shorter as we move from low tech (16 years) to medium tech (13 years) to high-tech exports (5 years), suggestive of greater competition in high-tech exports. Medium/ high-tech export shares plateaued about 50per cent higher and have a steeper rise than low-tech, indicating Japan's competitiveness in production of medium tech goods. Medium-tech export shares rise before high-tech export shares as suggested by the growth model but fall more slowly than high-tech exports, due to less competition (**Figure 16**). These results complement the analysis linking peak shares to per capita GDP benchmarks which showed that Japan was competitive with Germany in medium tech, but less competitive in high tech, than USA, Germany and South Korea. The shorter plateau and quicker decline of high-tech exports are likely due to China displacing Japan in high-tech sectors, given its Export led, import substituting, Infrastructure driven (ELISID) policy before, and sREAD policy after, joining WTO (**section 6.1**).

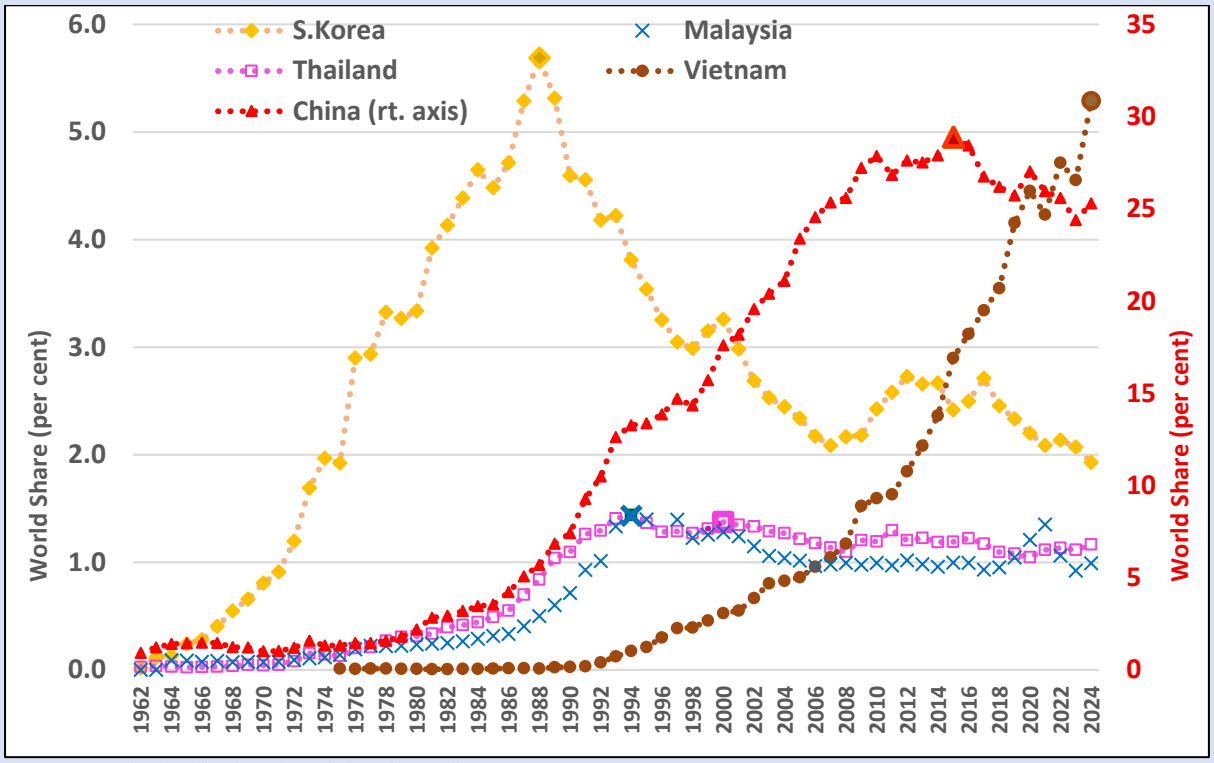
Figure 16: Japanese export shares of low, medium & high-tech exports (per cent)



There is a considerable overlap between low-Tech manufacturing exports and labor-intensive manufactured goods, Clothing and Textiles constitute about 27per cent of low-tech exports, Miscellaneous Manufactured goods (21per cent) and Manufactures of Metal (18per cent). Iron and Steel, constituting less than 18per cent of low-tech exports are, however, relatively capital intensive. Leather goods, Footwear, Furniture, Travel goods, Pottery, Glassware, and Artiles of paper account for the rest of flow-tech exports.

As its wages rose, Japan gradually vacated low-tech manufacturing for the Newly industrializing economies (NIEs) of South Korea, Taiwan, Singapore and Hong Kong, the first tier of flying geese behind Japan. The four NIEs expanded their textile and apparel exports at extraordinary rates during mid-1960s. South Korea illustrates the rise of the NIEs. Its share of low-tech exports grew rapidly during the 1970s and 1980s, when Japan's share plateaued and declined. Korea's share exceeded 1per cent in 1972, and more than tripled (3.5x) in next 10 years, peaking at 5.7 per cent in 1988 (**Figure 17**). The driving force behind this industrial progression in South Korea, was the establishment of what Radelet and Sachs (1997) termed "capitalist enclaves"—export processing zones (EPZs), special economic zones (SEZs), and bonded warehouses that offered tax incentives, reduced regulations, and provided direct access to global markets. These institutional innovations were instrumental in attracting foreign direct investment and enabling rapid industrialization based on low-wage labor. Japan played a crucial role in this process, with Japanese firms investing in textile production across the NIEs, effectively transferring entire supply chains to lower-cost locations (Yoshioka, 2007).

Figure 17: **Low Tech Manufactured Exports - World Share by country (per cent)**



Note: Low Tech classification of goods based on Lall (1999).
Source: Author's estimation using UN-COMTRADE database (WITS), mirror statistics for all countries that have reported (import) data for every year during 1962-2024 (SITC Rev. 1 classification).

From the different trajectories presented in (**Figure 17**), we can discern three patterns in the growth and decline of low-tech export shares. South Korea exemplifies the mountain peak pattern - a clear rise, a single peak and a clear decline, Thailand and Malaysia exemplify the S curve pattern of very gradual rise, an inflection point followed by rapid growth, and finally a broad plateau and/or very slow decline. Vietnam appears to be following the S-curve, and may have just plateaued.

China exhibits the hump shape with a downward sloping hump (**Figure 17,** right scale), which resembles the Japanese pattern without the subsequent declining portion (**Figure 16)**. China is an upper middle-income country on the verge of becoming a high-income country, with its per capita income higher than that of Malaysia and Thailand. Its unprecedent-ally high share of low-tech exports in 2024 (2 times Japan's peak), supports the argument that it has used fiscal and credit subsidies and wage controls to sustain these exports.

As incomes and wages rose in the NIEs, comparative advantages in labor intensive manufacturing shifted away from NIEs to the new NICs, during the 1980s. Korea's share of low- tech manufactured exports declined rapidly from 1989, while those of Thailand, Malaysia grew. The two countries' trajectory of low-tech exports was similar, The increase in Thailand's global share of low-Tech exports started earlier than Malaysia's and was more sustained: Thailand's share grew 3.1 times during the ten years to 1988 (Korea's peak) and 1.5 times during the 10 subsequent years when Korea's share was declining. Malaysia's low tech export share however increased by 2.3-2.5 times both periods. (**Figure 17**). Japanese companies like Toyota transferred some of their low-tech manufacturing process to Thailand, while their exports from Japan stabilized during 1970-1984 (**Figure 16**). Malaysia on the other hand was one of the earliest recipients of investment by US electronic companies and was likely less affected by rise in Japanese or Korean wages.

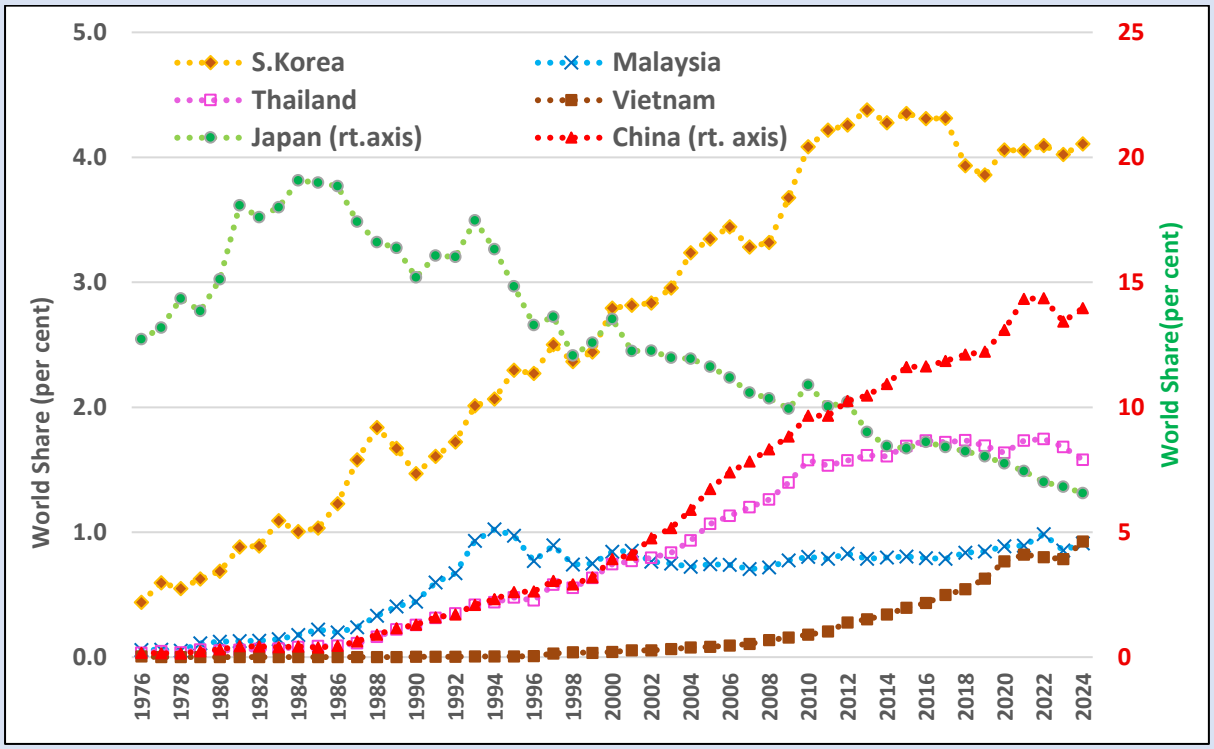
Thailand's industrial development followed the sequence predicted by Akamatsu's model with its clothing industry developing first, then achieving positive net exports, followed by growth of the textile yarn and thread industry, with light industries consistently outperforming heavier capital-intensive sectors. Thailand's expansion in textile and apparel production during the 1980s and 1990s occurred as precisely this window of opportunity opened, following the NIEs' migration toward medium-tech manufacturing. Malaysia similarly entered apparel and textile production during this period, leveraging government incentives, foreign investment, and its position within expanding ASEAN trade networks. Indonesia and the Philippines likewise diversified into textile and garment manufacturing, though with somewhat less dramatic success than Thailand and Malaysia.

China is sometimes thought of as the third tier of the flying gees model, but it's world share of low-tech exports was close to 1 per cent in the early 1960s, when South Korea, Malaysia and Thailand's share was negligible. Following the 1978 opening and reform, China's share rose to equal Korea's share of 5.7per cent in 1988. Thereafter it continued to gain share in low tech, from both Korea and Japan (**Figure 17,** right axis). Vietnam is however, a better representative of the third tier of the flying geese model, led till 2000 by Japan. Vietnam's liberalization and reform (1990s) and export led development took place ten years after China. Its share of global low-tech exports rose slowly from 1992 to 2008, jumped 40per cent in 2009 (following Global financial crisis), and increased threefold from 1.6per cent in 2011 to 5.2per cent in 2024 (**Figure 17**).

5.3 Medium-Tech Manufactured Exports

Medium Tech exports can be broadly categorized into four types: (1) Engineering Goods (35per cent), of which the highest in value are machinery & equipment, but also include household goods, (2) Automotive products (28per cent), (3) Process goods like chemicals, fibers & metals (24per cent) and Electronics & Semiconductors (13per cent). Medium-Tech exports in **Figure 18** cover a shorter period (1976-2024) and show that the hump pattern with downward sloping hump is the most common pattern.[19] This is visible for Japan (1976-2024), as part of the rising portion, the downward sloping hump, and the gradually declining share. South Korea displays a steady, long, rise, followed by a flatter hump/plateau. Thailand follows an S curve pattern as it did in the case of low-tech exports. Malaysia, in contrast, follows a mixed S curve cum hump pattern, with downward sloping hump. Both China and Vietnam appear to be on an S curve trajectory, whose pattern is incomplete (**Figure 18**).

Figure 18**: Medium-Tech Manufactured Exports**



Note: Medium Tech classification of goods based on Lall (1999).
Source: Author's estimation using UN-COMTRADE database (WITS), mirror statistics for all countries that have reported (import) data for every year during 1976-2024 (SITC Rev. 2 classification).

Japan's share of world mid-tech exports increased during the years when its low-tech share fluctuated below the peak but was virtually the same in 1984 (12.7per cent) as in 1971 (13per cent). It declined slowly during the next seven years from 19per cent in 1984 to 18per cent in 1993 (**Figure 16**, & **Figure 18)**. The Ford paradigm of mass production through assembly lines and standardized components led by automobiles sector, emerged as the organizing principle of Japanese medium-tech manufacturing. Backward integration into intermediate inputs like steel and basic chemicals and capital goods (heavy machinery), accompanied or followed the

[19] Low tech export growth showed three patterns in the countries considered (**section 5.2**, **Figure 17**).

initial thrust on automobiles. The iron and steel industry developed as a crucial intermediate-stage sector, providing the material foundation for subsequent advancement into higher-value-added manufacturing. By the 1970s and 1980s, Japanese automobiles had achieved global competitiveness, representing successful navigation of the intermediate stages of industrial development (Ozawa, 2010).

Korea and Taiwan, moved into electronics and assembly-based manufacturing, benefiting from US demand and diversification of supply chains of US MNEs. Korea's share of mid-tech export rose in the 1970s when Japan's share rose was also rising. South Korea's medium tech export share more than doubled during 1980-90 as Japan's share flattened in the 1980s. It increased four times, by the early 2000s, as Japan's share fell during the 1990s (**Figure 18)**. Korea's transition to the mid-tech sector, required substantially greater capital investment, technological sophistication, and skilled labor. Korean firms began producing consumer electronics, initially through assembly operations, then progressively moved into more technologically sophisticated semiconductor manufacturing. By the 1980s, Korean electronics firms had achieved significant global market presence, competing with Japan and capturing substantial market share in consumer electronics categories (Tung, 2003).

Thailand and Malaysia's share of medium-tech exports started to rise in the mid-1980s, and rose along with those of Korea, though at a much lower scale. The two countries' trajectory was very different for medium-tech exports vis-à-vis low-tech exports. Malaysia's world share of medium-tech exports rose almost simultaneously with low tech exports, from the mid-eighties to mid-1990s, with the former preceding the latter by a few years and flattening a few years earlier. Thailand's share of mid-tech exports in contrast, exceeded those of Malaysia around 2000 and continued to rise for a decade, to reach twice those of Malaysia (**Figure 18**).

Thailand emerged as the bigger success story in medium tech, by developing automotive assembly, electrical machinery manufacturing, amongst others. The establishment of Thailand's Eastern Seaboard Development Scheme created a transportation and logistics corridor facilitating linkages between foreign automotive assemblers (primarily Japanese) and local parts suppliers, effectively embedding Thailand within global automotive production networks (Wanwiwat, 2019).

Kojima's extension of the flying geese theory, emphasizing FDI as the transmission mechanism for technology and industrial organization, proved particularly relevant for the ASEAN-4. Foreign direct investment by Japanese firms drove the relocation of medium-tech manufacturing capacity to Thailand, Malaysia, and Indonesia, effectively recreating in Southeast Asia the production networks that had been established in the NIEs a decade earlier (Ozawa, 2007).

Large, multinational Corporations (MNCs), which acted as *"Anchor investors"*, were the primary drivers in shifting Thailand to a global export powerhouse in the mid-tech category of manufactured goods, earning it the title *'The Detroit of Asia'*[20]. By leveraging a strategy of

[20] https://eosglobalexpansion.com/thailand-automotive-industry-southeast-asia/

agglomeration, these investors did not just build factories, but transplanted entire supply chain ecosystems (Kuroiwa, 2017). This allowed Thailand to achieve a top 10 global ranking in vehicle production and become the world's second-largest manufacturer of pickup trucks, holding approximately 50 per cent of the global market share in the 1-ton pickup segment. An example is Toyota's Innovative International Multi-Purpose Vehicle (IMV) Project, launched in 2004. which designated Thailand as the sole global production and export base for the Hilux Vigo (pickup) and Fortuner (SUV), shifting production capacity from Japan to Thailand.

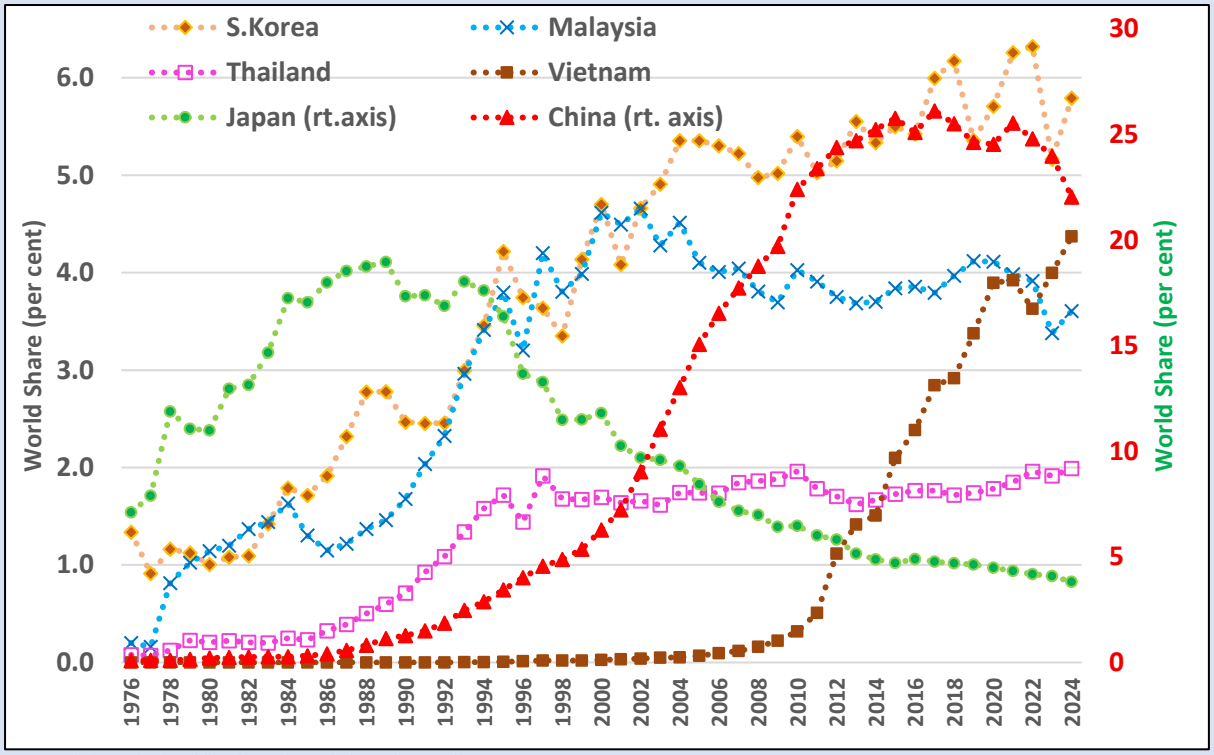
China's growth accelerated after 1980s reforms, and its mid-tech export share rose to almost 15per cent per cent at the beginning of the millennium, when China entered the WTO. The rise paralleled that of South Korea, with a lag, but at a much higher level, comparable to Japan (**Figure 18**, right axis). Vietnam, the latest entrant, has begun to see a significant rise in its mid-tech export share, post global financial crisis, with Thailand's share still rising slowly.

5.4 High-Tech Manufactured Exports

High-tech exports in 2024, consisted of (1) Telecommunication equipment (33.5per cent), (2) Medicinal & Pharmaceutical products (18.2per cent), (3) Office machines and Automatic Data Processing equipment (17.5per cent), (4) Electrical Machinery and equipment (8.8per cent), (5) Measuring, checking, analyzing instruments, (6) Cathode ray & other tubes & valves (4.5per cent), and (7) Aircrafts and parts (4.1per cent).

High-tech export shares show a greater variety of patterns than medium- tech or low-tech exports. Japan is the most consistent with a hump pattern in high tech exports. Japan's high-tech export share nearly tripled from 7.1per cent in 1976 to 19per cent in 1989, flattened and started its decent from 1994 (**Figure 16** & **Figure 19,** right axis). The rise of corporate research laboratories exemplified by IBM's Watson Labs and AT&T's Bell Labs in United States and replicated in Japan, ushered in what Ozawa terms the *'age of corporate laboratories.*' Japanese firms achieved leadership in semiconductors, consumer electronics (televisions, audio equipment), computers, and telecommunications equipment by the beginning of 1990, when Japan's occupied one-fifth of the world's share in this segment. After 1990, Japan's share of world high-tech products declined continuously, as NIEs narrowed the technological gaps to compete in high-tech sectors.

Figure 19: **High Tech Manufactured Exports**



Note: High Tech classification of goods based on Lall (1999).
Source: Author's estimation using UN-COMTRADE database (WITS), mirror statistics for all countries that have reported (import) data for every year during 1976-2024 (SITC Rev. 2 classification).

Taiwan and Korea represent the most successful examples of rapid transition into high-tech manufacturing. Taiwan demonstrates the importance of deliberate state coordination, foreign technology transfer, and domestic champion development. Korea pursued a somewhat parallel but operationally distinct path, which is reflected in its high-tech export pattern of multiple peaks over a 45 to 50-year period. Each peak is followed by a setback or consolidation, a new spurt and another higher peak than the previous one. Korea's rise overlaps with Japan's rise, consolidation and decline, though at lower shares (**Figure 19**).

Korean firms like Samsung and other chaebol (large conglomerate) structures integrated semiconductor design and manufacturing, rather than emphasizing foundry services. Korean firms achieved prominence in both memory chips and consumer electronics, competing directly with Japanese manufacturers in both price and technological sophistication. Both Taiwan and Korea accomplished this high-tech transition through combinations of state-directed industrial policy, selective foreign technology acquisition, creation of domestic champions, and careful human capital development through polytechnics and universities. Ozawa (2001) identifies these enabling mechanisms as essential to successful FDI-led industrialization and knowledge-intensive stage entry.

Singapore's high-tech trajectory differed from Taiwan and Korea insofar as it explicitly embraced foreign direct investment from multinational corporations rather than emphasizing domestic champion development.

Malaysian High-tech exports display a peaking pattern like South Korea, suggestive of spurts of export growth following introduction of new products. The pattern diverges after 2002 with

a decline in Malaysia's export share till 2008, coinciding with an explosion in China's share. Malaysia's high-tech exports picked up almost a decade before mid-tech exports (1987). Thailand's high-tech exports began their rise in 1980s and accelerated in mid-late 1980s, almost coinciding with Malaysia's. Thailand's share however stabilized at 1.5per cent to 2per cent in late 1990s while Malaysia's share continued to rise. Malaysia's share of high-tech exports has always been more than that of Thailand since late 1970s when they started increasing (**Figure 19**).

The growth of Malaysia's high-tech segment, particularly in Electrical and Electronics (E&E), was driven by a different mechanism than Thailand's automotive sector. While Thailand relied on Anchor Investors (like Toyota) to build deep, integrated local supply chains (agglomeration), Malaysia's high-tech rise in the late 1980s was led by Independent FDI investors, specifically Export-Oriented, foreign companies, operating in Free Trade Zones (FTZs) with 100per cent foreign equity, largely independent of local supply chains during their initial growth phase. Foreign direct investment (FDI) figured prominently in the New Economic Policy (NEP), which was launched through the Second Malaysia Plan in 1971 (Rasiah, 2017). Athukorala (2006) has noted that Malaysia's rise in the high-tech segment was fueled by "fragmentation trade," where foreign firms located specific production blocks (assembly/testing) in Malaysia. These blocks were integrated into the global network but remained relatively "independent" of the host country's broader industrial base. To attract high-tech firms like Intel and National Semiconductor to Penang in the 1970s and 80s, Malaysia waived equity restrictions, allowing 100 per cent foreign ownership for export-oriented firms. These firms operated "independently" of the domestic economy, importing duty-free input and exporting finished chips, effectively bypassing the local supply chain to achieve rapid speed-to-market (Rasiah, 2017). It can also be seen from **Figure 19** that while the rise of Thailand's share in the high-tech category between 1979-95 is relatively smooth, Malaysia has gone through multiple peaks and troughs during this period. Anchor Investors may have played a role in keeping the rise smooth in Thailand.

China's global share of high-tech manufactured exports rose after 1986, surpassed South Korea by 1993, and accelerated further after its entry into the WTO in 2001. The uptrend continued until its peak of 26per cent in 2017. (**Figure 19**, right axis). Vietnam's high tech export share stands out by the steepness of its rise during the 2010s; It grew 13x in a decade from 0.3per cent in 2010 to 3.9per cent in 2020. This is consistent with foreign MNEs like Samsung, with supply chains located in China, transferring the labor-intensive assembly lines for high tech products, to Vietnam. This contrasts with the rise in Vietnam's medium-tech exports, which were much more gradual, and possibly related to backward integration into production of intermediate inputs for low tech exports.

5.5 Network Products

The '*flying-geese model'* was based on traditional trade model with trade in 'final/finished consumer goods' where countries specialize and develop comparative advantage, based on their factor endowments (Ozawa, 1992). Krugman's New Trade Theory changed this view by

showing that trade in manufactured goods can also arise due to economies of scale and product differentiation, even between similar countries (Krugman, 1980).

This framework helped explain the growing role of 'intermediate goods,' as firms began to split production across borders with falling trade and coordination costs (Baldwin, 2006). Building on this shift, Athukorala (2012) showed that in modern manufacturing trade, there is a significant share of the network products, where parts, components, and final assembly are produced across multiple countries through global production networks. Considering the growing significance of the intermediate goods in modern manufacturing trade, this section explores the trends in export of network products and assembled end products.

Athukorala's definition of Network Products overlaps with Lall's Medium and High-Tech products. Athukorala (2012) identified six "network product" (NP) categories under the Standard International Trade Classification (SITC): Office machines and automatic data-processing equipment (SITC 75), Telecommunications and sound-recording apparatus (SITC 76), Electrical machinery (SITC 77), Road vehicles (SITC 78), Professional and scientific instruments (SITC 87) and Photographic apparatus (SITC 88). While SITC 75, 76,77 and 87 fall under the high-tech category, products under SITC 78 (Automotive) and certain selected products under SITC 87 like Medical Instruments n.e.s. (SITC 872) & Meters & Counters (SITC 873) and products under SITC 88 like optical goods (SITC 884), & Watches and clocks (SITC 885) fall under the medium-tech category[21]. "Network products" can split into NP (Parts & Accessories) and AEP (Assembled-end Products). As a share of manufactured goods trade, AEP's share has shrunk sharply from more than 21per cent in 2000 to less than 9per cent in 2024. It reached a trough of 3.3per cent in 2016. NP in contrast has increased very slowly from less than 59per cent in 2000 to more than 61per cent of manufactured goods trade in 2024.

The share of network products trade in the total manufactured exports have increased significantly since the turn of the century (Athukorala, 2012). Veeramani (2024) provides a comprehensive analysis of network products to quantify the magnitude of fragmentation trade across countries, products, and over time. It focuses on product categories in which fragmentation is most pronounced.

Network products emerged from global production sharing systems coordinated by MNCs, where firms fragment production into components, subassemblies, and final assembly to exploit cross-country cost and capability differences. When the products cross the borders multiple times, value addition gets distributed amongst various countries. This fragmentation is operationalized primarily through Foreign Direct Investments (FDI), as lead firms establish or contract overseas affiliates to perform specific tasks within integrated supply chains (Baldwin, 2016).

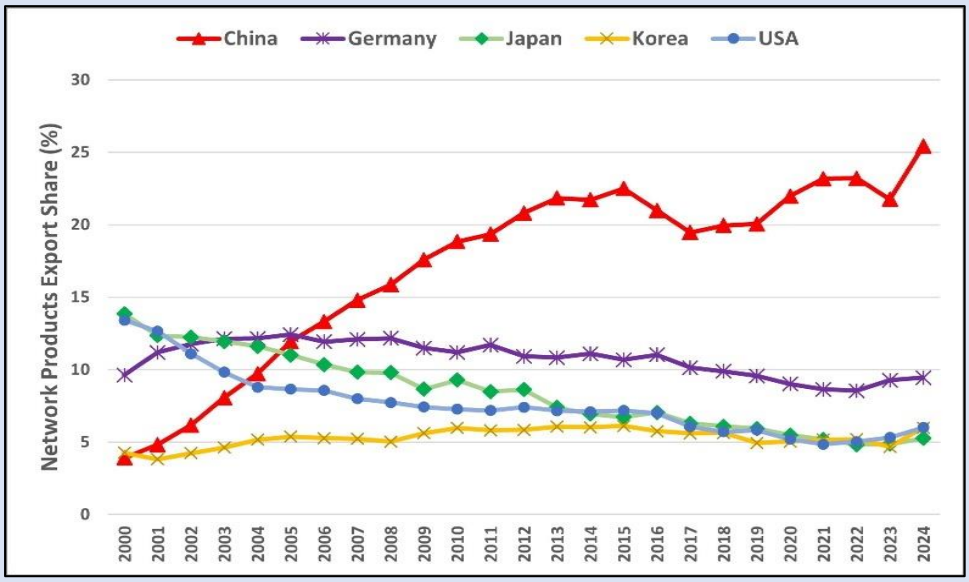
Gereffiti (2018) further explains that such network trade is organized through global value chains in which MNCs govern supplier networks by setting product standards, controlling key

[21] Lall (1999) has defined the medium and high-tech products at SITC 3-digit levels, while Athukorala (2012) definition of Network Products is at SITC 2-digit level. The overlap pointed out between the two definitions is a rough estimation because of this reason.

technologies, and coordinating logistics across borders. Veeramani (2024) provides a comprehensive analysis of network products to quantify the magnitude of fragmentation trade across countries, products, and over time. It focuses on product categories in which fragmentation is most pronounced.

The comparative growth trends in country shares of Network product exports since 2000, are very similar to the total manufactured export trends for the leading exporters (**Figure *8***, section 4.2). China's ascent is however, steeper in network-product exports than in total manufactured exports: Network products increased from ~4–5per cent in 2000 to over 20per cent by the mid-2010s and over 25per cent in 2024, while total-manufactured-exports series peaks around 19per cent and remains lower throughout (**Figure 20**).

Figure 20:: Country Shares of World Network Product exports



6. China: Export Led Manufacturing

The East and the Southeast Asian countries broadly followed the flying-geese pattern in the development of their manufacturing sector. China on the other hand has a different pattern.[22] China leapfrogged over mid-tech, to become a dominant player in the high-tech products, while low-tech export shares continued to grow and remain above both medium tech and high-tech export shares. This section analyzes the path undertaken by China by analyzing exports of different categories of exports like level of technology, electronics and semiconductors, labor-capital/scale intensive, and their disaggregated details. ***Section 7*** analysis the concentration of Global manufacturing and explores China's near monopoly in a range of manufactured goods.

6.1 China: From Flying Geese to Lead Goose

While China's manufacturing evolution followed the flying geese model in its early stages, its trajectory differed completely after it acquired significant share in the low-tech manufacturing

[22] India's export pattern is also quite different from the flying geese, and in contrast to China, missed the opportunity and even lost its relatively dominant position in low-tech manufactured exports (***section 9***).

by 1990s. Unlike Japan, NIEs (South Korea, Singapore, Taiwan and Hong Kong) and ASEAN-4 (Malaysia, Thailand, Indonesia and Philippines), it moved from low-tech to both medium-tech high-tech products, simultaneously. The pronounced acceleration observed in exports and in manufacturing output reflects the success of its Socialist Market Economy (Lange-Lerner SME), powered by the Export-Led, Import-Substituting, Infrastructure-Driven (ELISID) growth strategy, and coupled with its Reverse Engineer and Develop (READ) technology policy.[23]

During the 1990s, China actively attracted multinational enterprises (MNEs) and multinational corporations (MNCs) as anchor investors by offering rapidly deployable, high-quality industrial infrastructure and connectivity, particularly in its eastern provinces. This facilitated the swift establishment of low tech, labor intensive, manufacturing in the 1980s, followed by a scaling up of export-oriented production networks in the 1990s, leading to a surge in exports in the late 1990s and early 2000s. As export opportunity declined due to the Global Financial crisis (2008), policy emphasis shifted towards import substitution and real estate-driven investment, thereby sustaining industrial growth and domestic economic expansion.

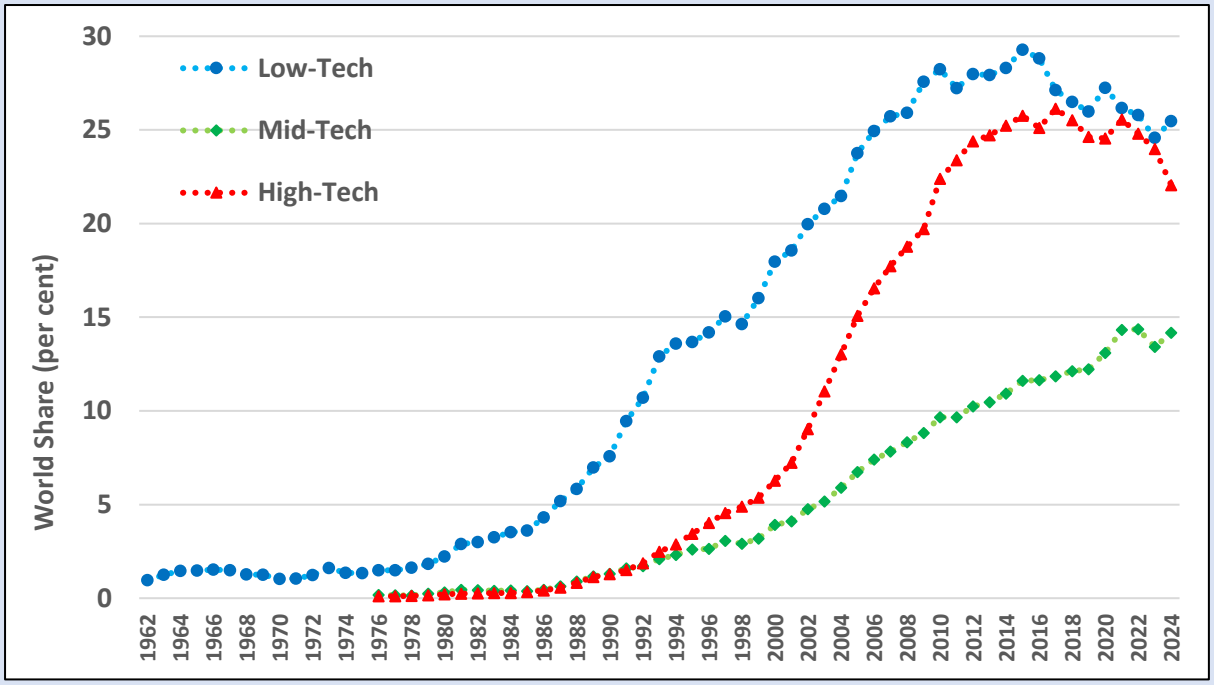
From 1985 onwards there was a significant acceleration in the growth of China's share of World, low-tech exports. The share more than doubled in five years, and then doubled again in the decade 1990-2000, from 7.5 per cent to 15 per cent. This period also saw a significant rise in the high-tech products share of China in the world, where it grew from close to 1 per cent in 1990 to around 10 per cent at the beginning of the millennium. China's share low tech exports peaked in 2015 at 4.5 times German share, 5 times that of USA, 9 times that of Japan, 12 times that of Korea and almost 30 times that of Thailand.

China's rise in the exports of medium-tech manufactured goods has been lower than the Low-Tech and High-tech segments. Medium tech export share barely rose after 1978 economic liberalization & opened to FDI, increasing from 0.1 per cent in 1978 to 0.4 per cent in 1985. There was a more rapid rise thereafter to 4 per cent in 2000. The growth momentum further accelerated post China's WTO accession in 2001, rising to a peak of 14.4 per cent in 2022.

China's exports of low tech and high-tech products seem to follow an S-shaped trajectory (**Figure 21). In** Medium Tech exports the acceleration is unclear. China's share in high-tech exports was same as that of the medium-tech exports at 1.3 per cent in 1990. The gap between high tech and medium tech exports opened in 1993 and increased to 2,3per cent by 2000 (6.3per cent and 4per cent). This excess of high-tech export share (22.4per cent) over medium tech export share (9.7per cent) increased to almost 13per cent by 2010. China's path is unique in that all three shares continued to rise until 2014-15 (**Figure 21)**. Low-tech shares remain higher than both high-tech and medium-tech export shares, unlike in other export- oriented economies (**Table 5**).

[23] From Lenin's Control of "The Commanding Heights of the Economy," to Mao's decentralized party system, to Lange-Lerner SME: https://link.springer.com/content/pdf/10.1007/978-1-349-20863-0_21?utm_source=copilot.com , https://link.springer.com/content/pdf/10.1007/978-1-349-20863-0_21.pdf?utm_source=copilot.com , to Deng Xiaping's Growth Maximizing ELISID strategy: https://egrowfoundation.org/research/chinas-socialist-market-economy-lessons-for-democratic-developing-countries/ followed by sREAD (s for spy/steal).

Figure 21: **China's Manufactured Export shares by Technology levels**



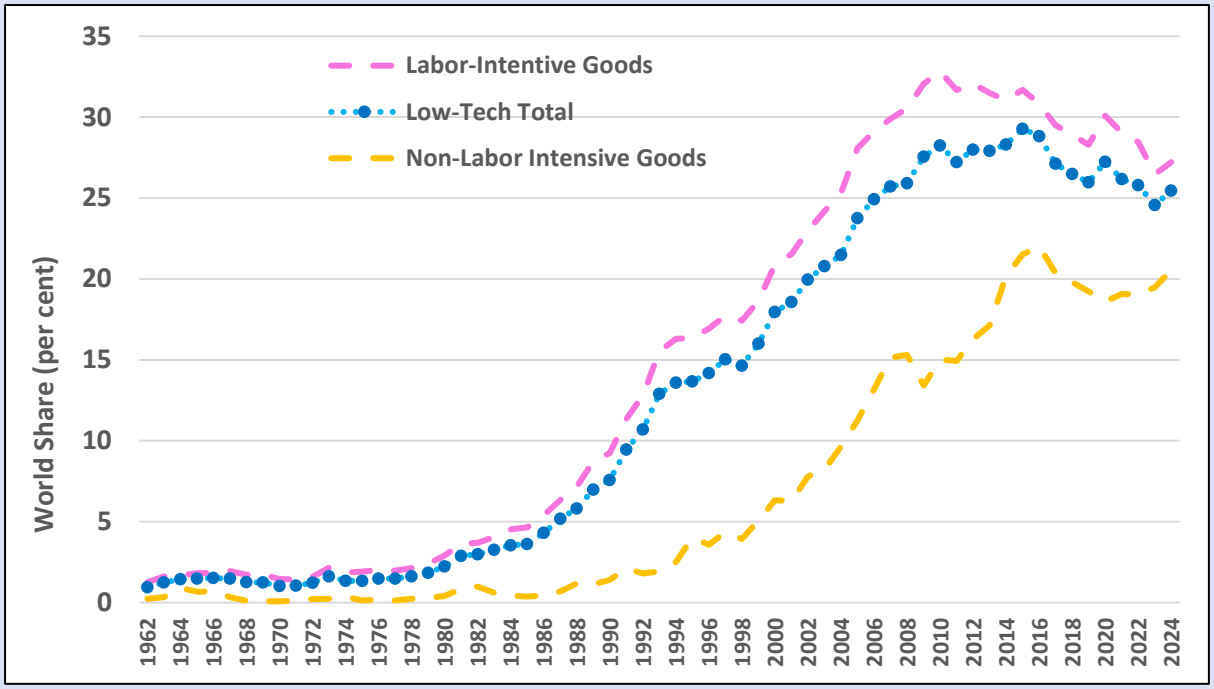
Source: Author's estimation using UN-COMTRADE database ; Estimates are based on mirror statistics for all countries that have reported (import) data from China. Labor Intensive goods are based on *Trade and Development Report, UNCTAD, 1996*.

China's share in high-tech exports was same as that of the medium-tech exports at 1.3 per cent in 1990. The gap between high tech and medium tech exports opened in 1993 and increased to 2,3per cent by 2000 (6.3per cent and 4per cent). This excess of high-tech export share (22.4per cent) over medium tech export share (9.7per cent) increased to almost 13per cent by 2010. China's path is unique in that all three shares continued to rise until 2014-15 (**Figure 21)**. Low-tech shares remain higher than both high-tech and medium-tech export shares (as of 2024), unlike in other export- oriented economies (**Table 5**).

6.1.1 China's Low-Tech, Labor-Intensive Exports

In 1960s, China's low-tech exports were 1 per cent of world exports. The subsequent increase (1962-78) was led-by Textiles yarns (SITC 65) and Clothing (SITC 84) – both the labor-intensive segments- which contributed close to two-thirds (45 per cent & 21 per cent respectively) of the total increase. The year 1978 marked a significant milestone when Chinese economy with the launch of *'The Open Door Policy'* that started the liberalization & reform process and allowed foreign direct investments into the country. **Figure 22** shows the trends in China's low tech export shares, along with its labor-intensive and non-labor-intensive parts. Labor intensive exports led the acceleration in growth of low-tech exports from 1980 to its peak in 2010, followed by a spurt of growth in non-labor-intensive (NLI) exports from end-1990s to a peak world share in 2016 (**Figure 22**). Labor-intensive exports contributed 97per cent of the USD value of low-tech exports during 1978-1993. This declined to 84.5 during 1993-2010.

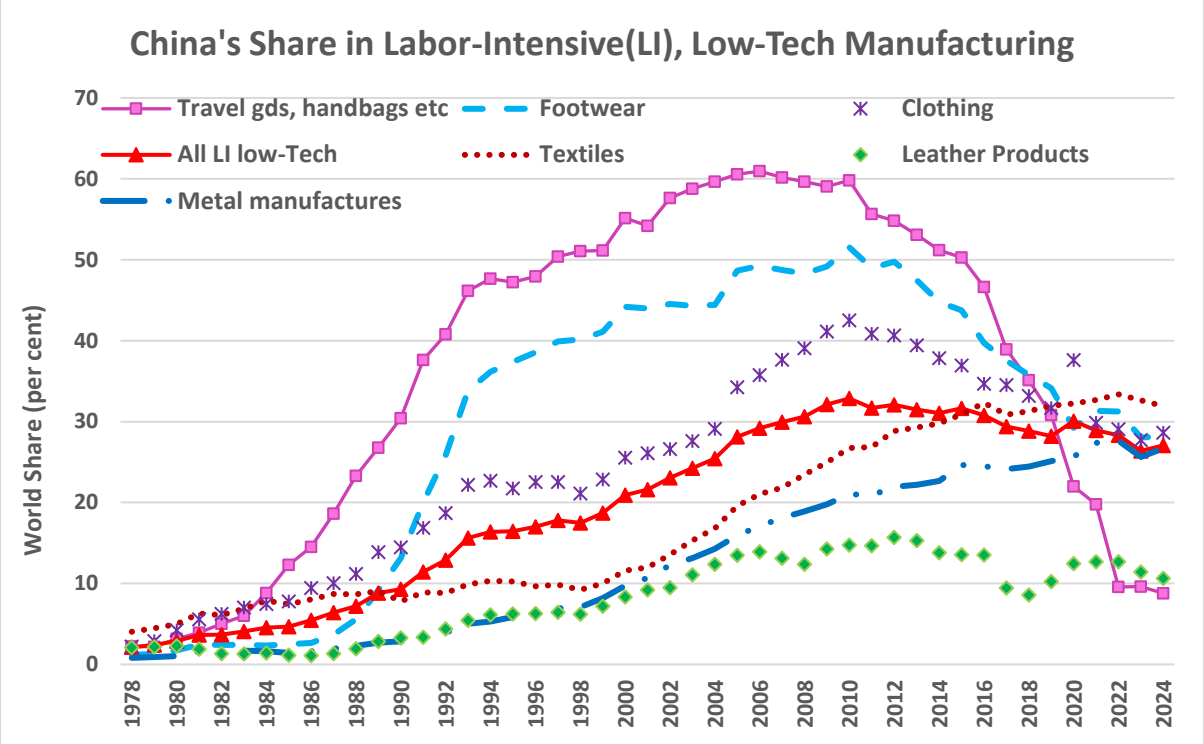
Figure 22: **China's Low-Tech Exports by World Share**



Source: Author's estimation using UN-COMTRADE database (accessed using WITS); Estimates are based on mirror statistics for all countries that have reported (import) data from China. Labor Intensive goods are based on *Trade and Development Report, UNCTAD, 1996*.

The rise in China's share of labor-intensive exports was accompanied by a rise in its export share in (a) Travel goods, handbags etc. (1980 to 1993), (b) footwear (1988 to 1994) and (c) Clothing, which rose faster than Non-Labor Intensive (L-T) exports for three decades (***Figure 23***). China consolidated its position in clothing its share of world clothing exports rising from 2 per cent in 1978 to 25.6per cent in 2000 (***Figure* 23**). Given the larger (in USD) world market for Clothing and Misc goods (SITC 89; plastic, toys, stationaries, jewelry) their contribution to rise in China's Low-tech exports, was 33per cent and 28per cent respectively, during 1978 to 2000 (WTO entry). Travel goods et al contributed only 5.5per cent and Footwear 10.4per cent. Non-LI export contribution came mostly from Textiles (8.1per cent) and 6.1per cent by manufactures of metals.

Figure 23: **China's Labor-intensive (LI), Low Tech (LT) Exports: World Shares**



Source: Author's estimation using UN-COMTRADE database (accessed using WITS); Estimates are based on mirror statistics for all countries that have reported (import) data from China. Labor Intensive goods are based on *Trade and Development Report, UNCTAD, 1996*.

China's reforms started with the agriculture sector and spread to the export sector in the 1980s. Taiwan began transferring its low-tech, labor intensive, export-oriented manufacturing units to China in the late 1980s, with the transfer of export-oriented supply chains accelerating through the 1990s, after the lifting of martial law in 1987 and the relaxation of restrictions on investment in China. Investments from Taiwan to China rose by 25 times from an average of US$220 million during 1959 to 1986 (**Table 6**) to close to US$ 5.5 billion in 1993. The initial investments were concentrated in labor-intensive and traditional manufacturing industries, with the Pearl River Delta in southern China being a primary destination. The shift was fundamentally driven by rising labor and production costs in Taiwan, stricter domestic regulations, and attractive incentives and lower costs in China (Chen, 1996).

Table 6: **Taiwanese Direct Investment in China (US $ Million)**

1959-86	**1987-90**	**1991-94**	**1995-98**
220	754	4551	7594

Source: Chen (1996) and Hou et. al. (2001).

During the late 1990s and early 2000s, many other countries, including the USA, shifted their low-tech, labor-intensive manufacturing units to China, including from third countries, in which they had set up export supply chains in the i970s and 1980s. Consequently, China's share of world exports in 7 of the 9 categories of labor-intensive exports was more than 1/4th in 2024. The only exceptions were leather goods and "Travel goods, handbags etc.". The diversification to non-labor-intensive sectors within the low-tech sector became significant

after China entered WTO in 2000. Between 2000-24, the contribution of non- labor-intensive to overall low-tech exports was 27per cent compared to 7per cent during previous period.

6.2 Structure of China's Medium-Tech Exports

This section examines medium-tech exports at a more disaggregated level, a sthese have a bearing on issues of economic and domestic security. Lall (2000) has divided the medium-tech products into three broad categories: *Engineering goods, Manufactures processing and Automotives*[24]. This classification for the SITC Rev. 3 products by technological categories is also followed by UNCTAD. Besides the three categories within the medium-tech products, we have created a separate category of products under *Electronics & Semi-Conductors (E&SC or 3C)* to capture the sophisticated group of medium-tech engineering products that hold critical significance in the modern complex supply chains. [25]

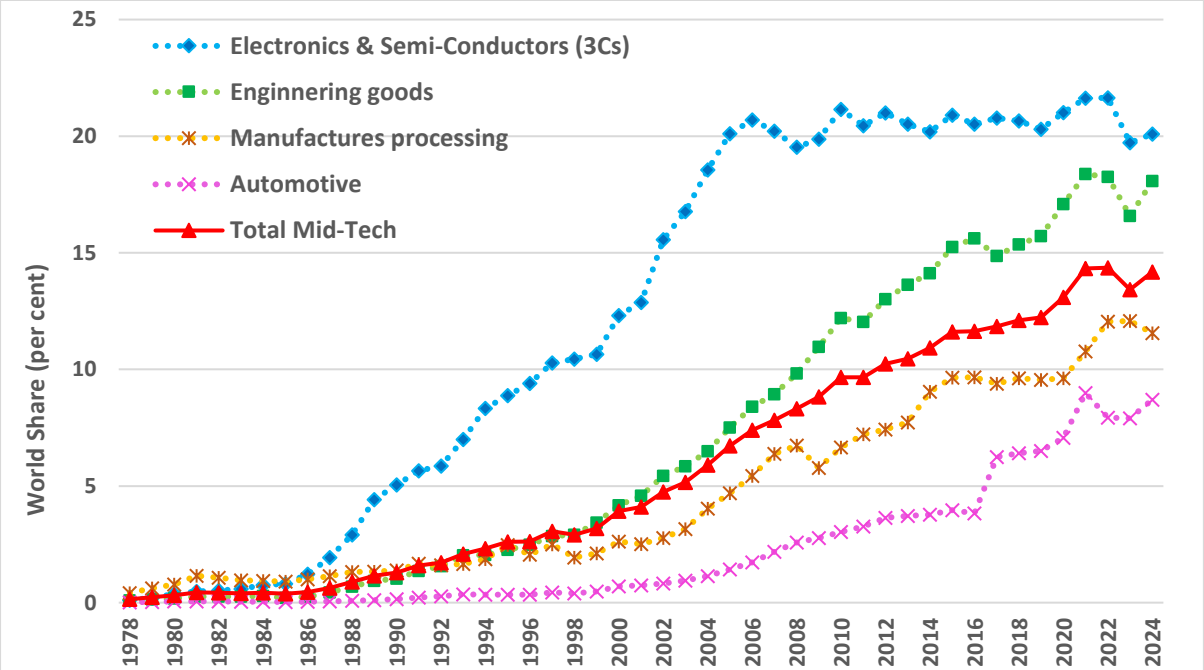
Figure 24 shows that the rise in share of medium tech exports has been driven by the fast growth of the China's share of World Electronics exports (E&SC or #C), which increased from 1.2per cent of world exports in 1986 to 20.7per cent in 2006. China's share of Engineering exports also rose faster than total medium-tech share from 1.9per cent in 1998 to 18.4per cent in 2021. World imports and China's exports of manufactured processed goods was higher than electronics in US dollar terms in 1980s. So their contribution to the increase in China's medium tech exports during 1978-1985 was the highest (54.3per cent), followed by electronics (26.3per cent). From 1985 to 2000 (the *FDI-phase*), China's share of World engineering goods exports rose from 0.2 per cent (1985) to 4.2 per cent (2000), and the share of Electronics (E&SC/C3) rose by almost fifteen-fold from 0.8 per cent to 12.3 per cent (**Figure 24**). The contribution of E&SC (43.6per cent) and Engineering goods (37per cent) to medium-tech export value (USD), mirrored the rise in their world shares.

Post-WTO accession, the share of the Electronics (E&SC/C3) doubled in six years (2000-06) from around 10 per cent to more than 20 per cent of the world share. Post-2006 the share of Electronics has stabilized between 20-22 per cent, yet with more than one-fifths of the world share it continues to occupy a dominant position in the global market. China's world share in engineering goods increased faster after 2000 than before, with its contribution increasing to 45.5per cent during 2000-2024, from 37per cent (in 1985-2000). The contribution of process manufactured goods and Automotive exports increased to about one-fifths to the increase in USD value of medium-tech exports rise. Post-2016, the exports of the automotive segment have seen a very significant rise in the world share of China where it has more than doubled to peak briefly in 2021 at 9 per cent. In fact, in the period from 2015-24, the automotive sector contributed one-third to the rise of the medium-tech category products exports. Led by the EVs, this is the emerging sector poised to lead this segment for China.

[24] Refer appendix for the detailed list of products considered under each of the sub-categories of the medium - tech products.

[25] This group includes radio-broad receivers (SITC 762), sound recorders (SITC 763), apparatus of electrical circuits; boards, panels (SITC 772), equipment of distributing electricity, n.e.s. (SITC 773), instruments & appliances, n.e.s., for medical, etc. (SITC 872), meters and counters, n.e.s. (SITC 873), optical goods n.e.s. (SITC 884), watches & clocks (SITC 885).

Figure 24: **China's Total Medium-Tech Exports & Constituents by World Share**



The contribution of Electronics declined to 16.5 per cent to USD value of China's mid-tech sector. It however remains the sub-category with the highest share of World exports **(Figure 24)**. The importance of different Electronics goods exported by China has changed since the liberalization in the 1980s. China's electronics exports and corresponding production have gone through three phases since 1978. The first phase, from 1980s to early 1990s, was driven by the FDI liberalization of 1985, with watches and clocks, radio broadcaster receivers and sound recorders as important exports. The second phase was from mid-1990s to 2000s with two sub-phases, one lasting till early 2000s with electricity distribution Optical goods as major exports, and the second till late 2000s, with Electric switches, relays, fuses etc. and Meters & counters as major exports. Some of these involved "backward integration" of successful exports and product diversification The third phase from late 2000s to today, has medical instruments & appliances as major export products **(Table 7)**.

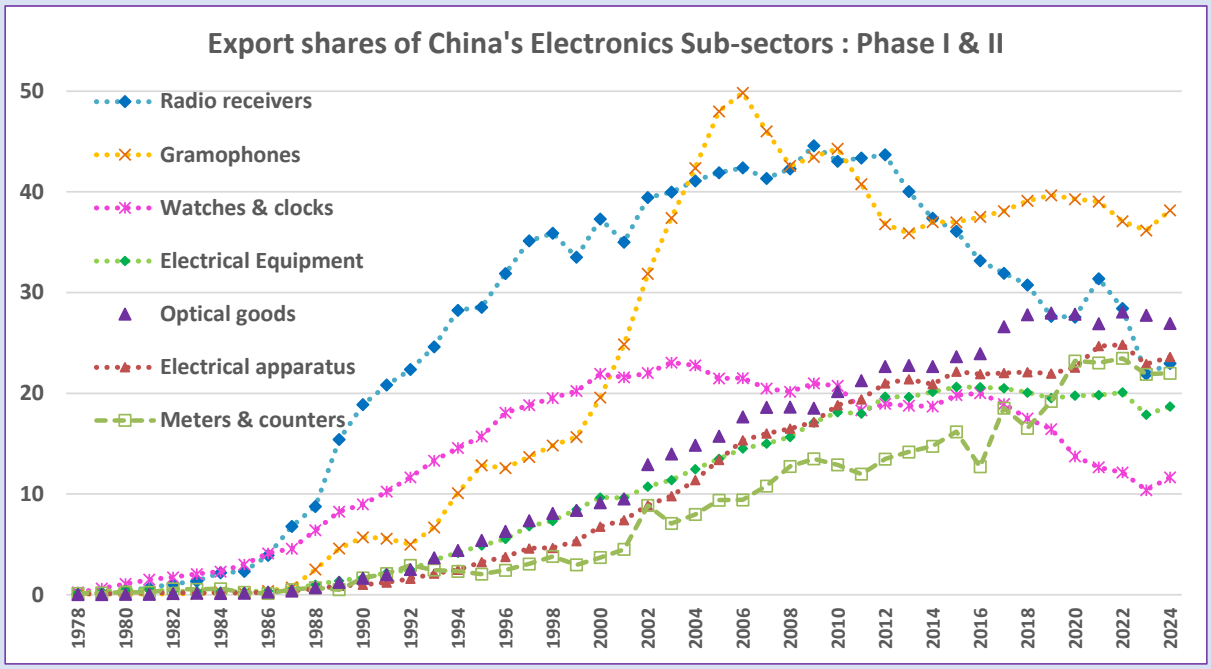
In Phase I Sound recorders and reproducers constituted almost half (49.8per cent) of world exports at their peak in 2005. The share has declined since its peak in 2009 but is still almost two-fifths (38.2per cent) of the world exports in 2024 China's Radio-broadcast receivers had a marginally lower share of global exports market at 44.6per cent at its peak in 2009 but is still at 23per cent in 2024. Watches and clocks are another consumer good with $1/5^{th}$ – $1/4^{th}$ share of world exports in 2003 but has about $1/10^{th}$ of world export market **(*Table 7 & Figure 25*)**.

Table 7: Progress of China in Export of Electronics products

Electronics & Semiconductors (SITC Rev. 3)	Attainment Date (Year)			World Share (%)	
	1%	10%	Peak	at Peak	In 2024
Watches and clocks	1980	1991	2003	23.1	11.6
Radio-broadcast receivers	1982	1989	2009	44.6	23.0
Gramophones,dictating,sound recorder	1988	1994	2005	49.8	38.2
Equipment for distributing electricity	1988	2002	2016	20.6	18.7
Optical goods,n.e.s.	1989	2002	2022	28.1	27.0
Elect.app.such as switches,relays,fuses	1990	2004	2022	24.8	23.6
Meters and counters,n.e.s.	1990	2007	2022	23.5	22.0
Medical instruments and appliances	1993	2020	2020	12.8	8.2
Total Electronic (ES&EC/3C)	**1989**	**2012**	**2022**	**14.4**	**14.2**

Source: Same as figure 17

Figure 25: Electronics sub-sector export shares



Phase II of China's electronics growth was led by new set of products that include Equipment for electricity distribution, optical goods, electrical apparatus such as switches, relays & fuses, & parts, meters & counters. These products come under capital and scale intensive manufacturing. While the share of optical instruments is over a quarter of world exports, electrical circuits and meters & counters are between 1/5th and 1/4th of World exports. and electrical distribution equipment is still less than 1/5th of world exports (***Table 7 & Figure 25***).

Phase III focused on more technology and skill intensive products like medical equipment and instruments. Publicly, it has been driven by technology development plans such as, "China 2005" and "China 2015." Under the surface they were the post-WTO (2001) version of a

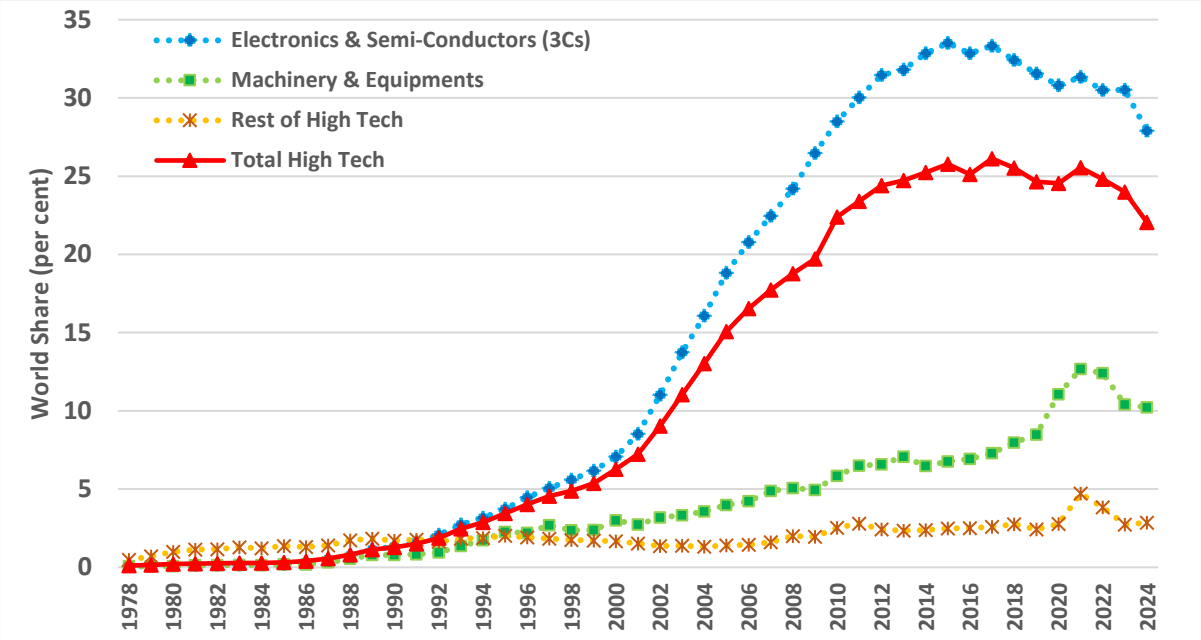
decade old approach of "Reverse Engineering and Development (READ)".[26] This involved a carrot and stick policy, which offered 'foreign invested enterprises', new opportunities for expansion if they transferred technology to CCP approved Chinese partners, while threatening their existing business, if they didn't comply. In many cases the technologies were obtained through a network of communist party members embedded in USA & other developed countries.[27] These technologies were then transferred to a string of Govt labs and research institutes (including military run) to reverse-engineer and develop further. Once developed, these were available free of charge to all State enterprises and Provincial Party sector companies to use for production.

The same approach (sREAD) was applied high tech electronics and aero-space products, considered in the next section.

6.3 Role of Electronics & Electrical Products in High-Tech Exports

China's world share at its peak in 2017 was more than thrice Germany's, four times USA's and RoK's and 6 times that of Japan. China's high-tech segment grew by more than 16 percentage points between 2000-10. Growth of High-Tech exports accelerated after the FDI liberalization in 1985, with China's share rising by 6 per cent points in 15 years to 6.3 per cent in 2000. It accelerated further in next decade to 21.5per cent in 2010 (**Figure 26**).

Figure 26: **China's Total High-Tech Exports & Constituents by World Share**



Source: Authors' calculation based on UNIDO & UNCTAD data

[26] The early version of this policy in late 1980s-early 1990s, was to set up duplicate factories for low tech exportable and sell unbranded or fake branded versions of products like silk ties and Rolex watches in domestic market, including to tourists.

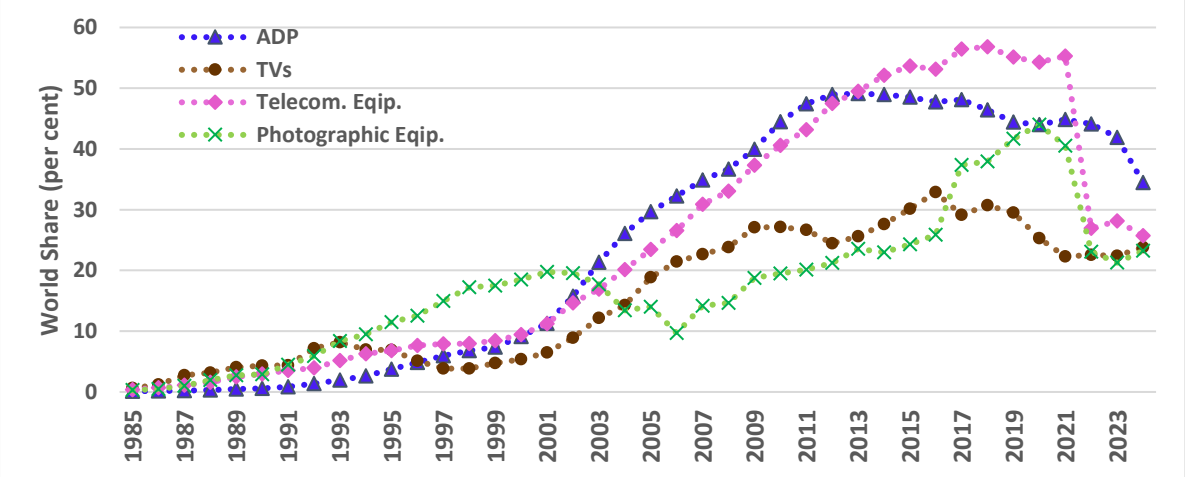
[27] The s in sREAD stands for steal or spy, given the two methods outlined.

High-tech products can be divided into three subgroups; Electronics and Semiconductors (E&SC/3C) [28], Machinery and Equipment and Rest of High Tech. The share of Machinery exports was 12.7per cent of world exports at its peak in 2017, about half of the 25.2per cent share of total high tech in World exports. *Electronics exports* played a critical role in the remarkable rise in China's high-tech exports. This is apparent from the S curve of China's share of World electronics exports; A smart rise starting around 1985, with an inflection point of 7.1per cent in 2000, an accelerated increase of over 10 pr cent in next decade to 28.5per cent in 2010 and a further rise of five pr cent in five years to 33.5per cent in 2015. The 1/3rd global share of electronics exports was significantly higher than the 1/4th share of total high-tech exports (**Figure 26**).

Electronics contributed 94 per cent to the total increase in USD value of China's high-tech exports between 1985-2000. This contribution is like the contribution of the electronics sub-category to medium-tech exports**.** It can be inferred that China has focused on gaining supremacy in the Electronics and semiconductor segment of products whether it be of the medium-tech or high-tech category, right from the time it first liberalized FDI. Following China's accession to WTO, the contribution of electronics to China's high-tech exports in USD, increased further to 96per cent during 2000-2017, when China's high-tech exports peaked at 26.1per cent of world high tech exports.

Electronics and semiconductors can be divided into two sub-categories of electrical products and electronics. The products included in the latter, TVs, Automatic data processing, telecommunication equipment and photographic equipment are plotted in **Figure 27**. The initial rise in the shares during 1980s, was led by the TVs and photographic equipment, though TV shares faced a setback during the late 1990s.

Figure 27: **Chinese World Share in Electronics & Data Processing Machines Exports**



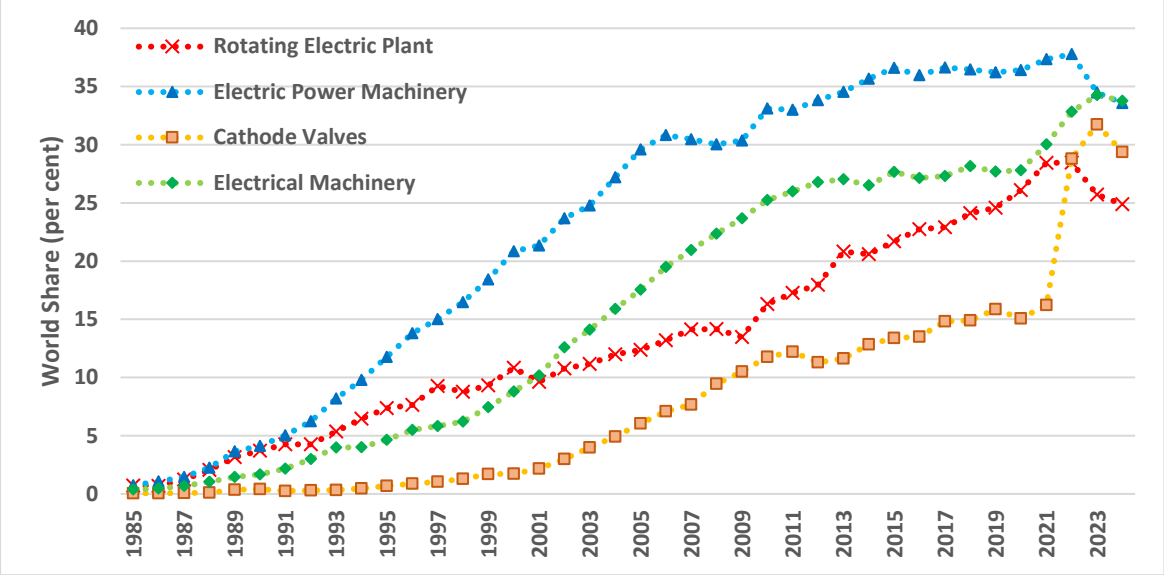
Source: Authors' calculation based on UNIDO & UNCTAD data

[28] The High-Tech Electronics and Electrical products have been defined by Lall (2000) SITC Rev. 3 and followed by UNCTAD. Products with following SITC codes are grouped in this category: SITC 716,718,751,752,759,761,764,771,774,776 & 778.

Telecommunication and automatic data processing (ADP) machines exports accelerated after China's accession into the WTO. China's share of world telecommunication exports continued to rise until it peaked at 56.8 per cent of the total world exports in 2018. Similarly, for ADP products, China went on to capture half the market for world exports. *This represents the post-WTO success of China's sREAD approach outlined at the end of the previous section*. This massive concentration, along with recognition of the risks to National security, led many countries to restrict or ban the import of sensitive telecom products from China in 2021, leading to a halving of China's global telecom export share in 2022 **(*Figure 27*)**.

A similar concentration can be seen in the products of the Electrical Products sub-category, consisting of Electric machinery, electric power machinery, rotating plants and Cathode valves (***Figure 28***). For Electrical machinery and Electrical power machinery China's export share was above 35per cent, for cathode valves & rotating electric plants it was around 30per cent, with the peak share being reached during 2021-2023. Electrical machinery poses a security risk because of the electrical/electronic control unit installed in these machines, which can be programed to stop or act erratically. If it is part of IOT system with telecom linkage to producer/seller, the risk in increased manifold.

Figure 28: **Chinese Share in World Electrical Machinery Exports**



Source: Authors' calculation based on UNIDO & UNCTAD data

6.4 The Scale Factor in China's SME

From the early reform period of 1980s, China's development strategy placed manufacturing exports at the core of its growth-story (Lardy, 1992). Unlike democratic market economies, whose production and exports are based on relative factor endowments (labor, capital and skills) and go through stages, the Peoples Republic of China (PRC) has operated almost simultaneously on all categories of manufacturing: Labor intensive and capital intensive, low and high skilled, low tech and high tech. This section analyses the products classified as *'scale*

intensive' or 'capital intensive', leaving aside the electronics products already discussed in sections on medium and high-tech exports.

China's success in scale-intensive manufacturing and exports was not accidental or market-driven. It was the outcome of a state-engineered system in which the effective cost of capital was deliberately kept low for investors in industries favored by the Communist party of China (CPC or CCP). These included both export industries which it wanted to dominate globally and import substituting industries in which it wanted to reduce its dependence on imports, industries in which scale and capital intensity are decisive. According to the OECD's classification, paper (SITC 64), chemicals excluding pharmaceuticals (SITC 5 less 54), and ships and transport equipment (SITC 79 less 792) are highly sensitive to fixed costs and capital availability (OECD, 1994).

Table 8 shows that **t**he three major product categories on which China focused since 1978 reforms, as part of its scale-intensive expansion, were Chemicals & chemical products (green), Automobiles (pink) & Transport Equipment(grey) and Metals & products (grey). Metals is one of the oldest industries in China, with China's global export share exceeding 1per cent (and 10per cent), for Iron & Steel by 1964 (2007), Pig Iron, sponge Iron etc by 1976 (1995), Ingots & other primary Iron by 1981 (2007) and Tubes pipes & fitting by 1990 (2006). Thus a major expansion of China's metal products export shares has occurred after it joined the WTO. Part of this expansion of the exports of engineering industries such as Ships and Railway equipment. It should also be noted that all four metals industry exports peaked at between 15per cent to over 20per cent and remained in that range till 2024 (**Table 8)**.

Chemicals and chemical products sector have largest number (ten) of scale intensive products with two crossing the 1per cent export share level around 1980, five during 1991-1995 and two in 2000-01. Two of the products whose exports have grown very fast are traditional; Explosives & pyrotechnic products in which China had a peak share of World exports of 31.4per cent in 1999, and Fertilizers, but exports of the latter was quite new for China, increasing very rapidly from around 1per cent in 2000 to a peak of 16.1per cent in 2015. In the other eight products, China has used repressed capital markets, and WTO membership to dominate export markets by building scale ahead of demand. For instance in Carboxylic acid it attained a world export share of 28.2per cent in 2023 and in Disinfectants, insecticides and fungicides it attained a share of 26per cent in 2022 **(Table 8)**. In other chemical groups like Miscellaneous chemicals, Pigments, paints & varnishes, and Artificial resins, plastic material & cellulose, the motive was a mix of import substitution through backward integration and exports, to attain minimum efficient scale.

The dual motive for import substitution and exports can also be seen in transport equipment (Rails, ships and aircraft) and the Automobile sector. The drive to build transport equipment started in the 1990s and export shares for both ships and railway took two decades to reach around 20per cent global export share. In the Automobile sector growth started after accession to WTO**.** Within the automobile category of products, while products under the Parts and Accessories of Vehicles (SITC 784) had crossed the first threshold of 1 per cent of the global share by 2002, the other products like Passenger Motor cars, Goods transport vehicles and

motor vehicles were still less than 10 per cent of the global exports market share in 2024 **(Table 8)**.

Table 8: Scale (Capital) -Intensive Manufacturing Exports by World Share

Group	Scale Intensive Manufacturing	Attainment Date (Year)			World Share (%)		Years	dHiShr
	Product Description	**1%**	**10%**	**Peak**	**Highest**	**2024**	**1=>10**	**/dYrs**
LowTech	Iron and steel	1964	2007	2016	16.7	15.2	43	0.30
LowTech	Articles of paper, pulp, paperboard	1966	2005	2024	24.4	24.4	39	0.40
MTprocess	Pig iron,spiegeleisen,sponge iron	1976	1995	1995	14.9	2.8	19	0.73
MTprocess	Ingots & other primary forms of iron	1981	2007	2023	16.1	15.4	26	0.36
MTprocess	Tubes,pipes and fittings,of iron ore	1990	2006	2014	21.3	19.0	16	0.85
MTprocess	Explosives & pyrotechnic products	1966	1976	1999	31.4	21.7	10	0.92
MTprocess	Alcohols,phenols,phenol-alcohols	1979		2020	4.6	4.3		0.09
MTprocess	Carboxylic acids & their anhydrides	1980	2010	2023	28.2	27.4	30	0.63
MTprocess	Disinfectants,insecticides,fungicide	1993	2013	2022	26.0	22.8	20	0.86
MTprocess	Misc chemical products,n.e	1991	2020	2022	14.9	10.7	29	0.45
MTprocess	Pigments,paints,varnishes etc	1993	2021	2022	10.3	10.1	28	0.32
MTprocess	Perfumery,cosmetics & toilet prep	1993		2024	6.0	6.0		0.16
MTprocess	Soap,cleansing & polishing prepar	1995		2020	7.6	7.4		0.27
MTprocess	Fertilizers,manufactured	2000	2013	2015	16.1	9.5	13	1.01
MTprocess	Artif.resins,plastic mat.,cellulose	2001	2023	2024	10.2	10.2	22	0.40
Mteng	Ships,boats and floating structures	1991	2009	2010	21.0	17.6	18	1.05
MTeng	Railway vehicles & associated equip	1997	2012	2015	19.3	12.6	15	1.02
Auto	Parts & accessories of Auto(722-,78	2002	2024	2024	10.8	10.8	22	0.44
Auto	Motor vehicles for transport of goo	2006		2024	6.0	6.0		0.28
Auto	Road motor vehicles,n.e.s.	2006		2024	9.5	9.5		0.47
Auto	Passenger motor cars,for transport	2019		2024	6.8	6.8		1.16

Note: Scale-intensive manufactures classification is based on OECD, 1994, *Industrial Policies in OECD Countries, Annual Review 1994. Mtpro: Medium-Tech Manufactures Processing; LT: Low-Tech; Auto: Automobile.* Source: Same as figure 17

With the expansion of EV production in last two years, the picture has changed rapidly, because of the technological change brough by the climate change pressure, leading to evolution of Electric Vehicles (EVs) amongst other developments.

6.5 Socialist Market Economy: Zero Risk Premium Credit

China's domination of Global exports of many scale-intensive, medium tech and high-tech products must be viewed in the context of its Growth maximizing, *Socialist Market Economy (SME).* The Banking system and finance is a critical node in the "commanding heights of the economy." China mobilized capital to support its industries under the scale/ capital intensive manufacturing. In China, the entire capital assets were owned and controlled by the State/ CCP in 1980 (Virmani, 2005, 2006). This showed that capital allocation during the reform period was not governed by the market forces but remained under the authority of the party (CCP). These assets were (are) managed at different levels of the government, which in turn are controlled by the party. While some are controlled at the national level, others are managed at the provincial, City or Village level *(*see Appendix for details).

China's cheap credit and subsidies flowed mainly to two types of firms: large SOEs and provincial party sector companies, the successors of the TVEs. SOEs ran the big state factories in steel, chemicals, machinery, etc. They had privileged access to bank loans and official support. They could borrow at the low policy rates and often did not face hard budget constraints. As a result, SOEs invested in every area or industry in which the party wanted growth and development, even if expected profits were thin. In export markets, SOEs dominated many capital-intensive sectors. Jefferson and Rawski (1994) report that SOE exports (including urban collectives) grew about 16per cent per year during 1985–1990. Even as China phased out direct export subsidies in the late 1980s, banks continued to give "low-interest loans to favored exporters" (Lardy, 1993). In reality, this meant many state and party sector firms could expand production for export without paying for the costs of bankruptcy in a market economy.

The most critical enabling condition for China's expansion in scale-intensive manufacturing was its exceptionally low effective cost of capital for State and Provincial Companies. China's financial repression, under which household savings were mobilized at artificially low deposit rates and redirected to industry through state-owned banks. Real deposit rates were frequently negative, implicitly taxing households and transferring resources to producers (Prasad, 2007). Since alternative financial instruments were limited, household savings were effectively locked into the banking system. State banks then allocated this pool of cheap capital according to government priorities rather than commercial risk, leading to an abundance of low-cost finance for industrial expansion (Lardy, 2008).

China's growth maximization goal, was communicated to every domestic enterprise in the country, ensuring that profits were re-invested by the Party Sector, and all provincial & local party-linked companies (appendix). Retained earnings became the dominant source of investment finance (Prasad, 2009). National savings and investment rates have therefore sustained at 40-45per cent rates for over three decades. This is the highest level ever observed internationally (Prasad, 2009). When national plan required high risk investments could be financed by a combination of retained earnings and directed bank credit, whose interest ignored the high risk premium when lending to SOEs and provincial party companies.

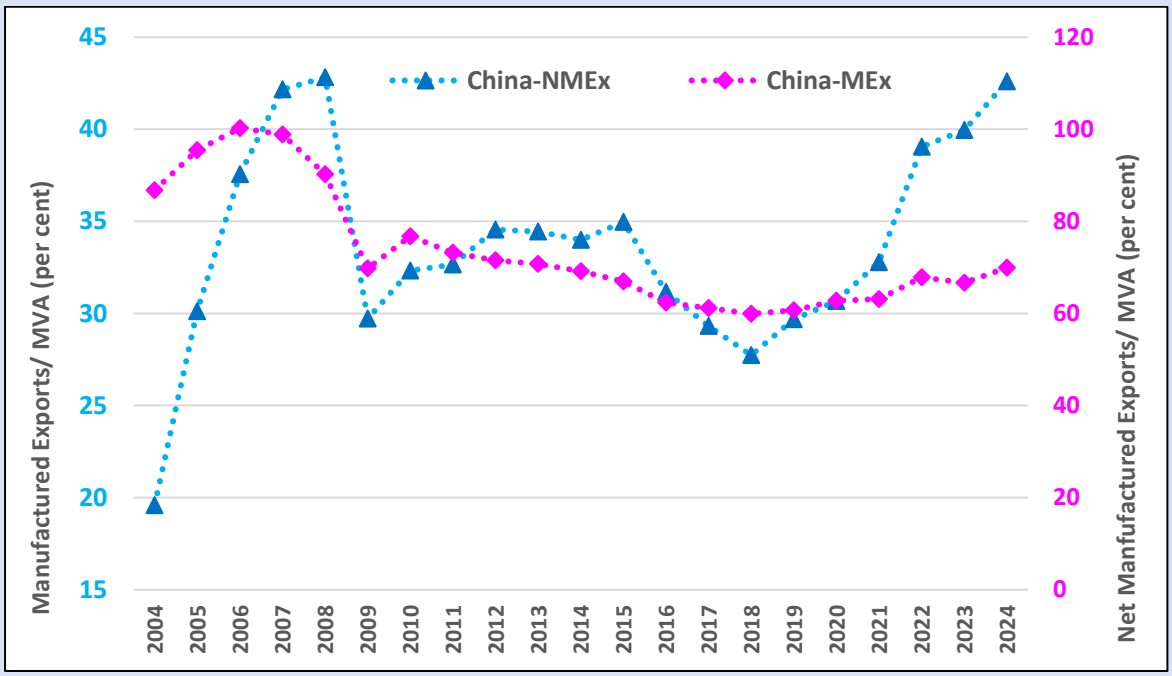
6.6 Import Substitution: Manufactured Exports/MVA

The trends in the manufactured exports (Mex) as the share of the country's MVA for China, presents a relatively stable picture falling within the brackets of 60 to 80 per cent post the global financial crisis in 2008-09. Initially, there was a rise till 2006 in the exports segment at close to 100 per cent, after which it declined to around 70 per cent by the global financial crisis. On the other hand, the Net Manufacturing Exports (NMEx) as the percentage of their MVA tells a different story. After China's entry into the WTO, the NMEx saw a sharp rise and it more than doubled from less than 20 per cent to more than 43 per cent to peak in 2008 (**Figure 29**). This indicates the fruition of a big import substitution of manufactured imports after WTO entry in 2001. Foreign invested enterprises, who had an established export base were coerced to extend their supply chains into intermediate goods needed for export production. New FDI investors

were induced by the World export boom and threats of exclusion from domestic market to shift intermediate goods supply chins along with final goods.

As a result of the Global financial crisis (2008) manufactured exports/MVA declined along with manufactured input into these exports. Post GFC the export/MVA ratio was on a declining trend, with Net-exports/MVA moving around this downtrend. With Global export growth slowing, China's sREAD policy went into high gear to generate technology for import substitution and creation of new products. This translated into huge import substitution thrust after Covid, with Net-export /MVA ratio rising by more than 10 per centage points from 32per cent in 2021 to 43per cent in 2024. This is also the phase in which China weaponized trade in pharmaceutical products & medical supplies, rare earth metals & magnets, and Automobiles & Electric Vehicles (EVs).

Figure 29: **China's Manufactures & Net Exports as per cent of its MVA**



Note: China's MVA data available from 2004.
Source: Authors calculations based on World Development Indices, World Bank

7. Manufacturing Concentration to Near Monopoly

The discussions on trends in manufacturing trade, exports and value added, highlighted the unprecedented rise in share of China in the world. This section quantifies the concern expressed in the previous section about the increasing concentration of market power in China. The section starts by applying the Hirschman–Herfindahl Index (HHI) to MVA and manufactured exports, and then explores China's export concentration at different levels of disaggregation.[29]

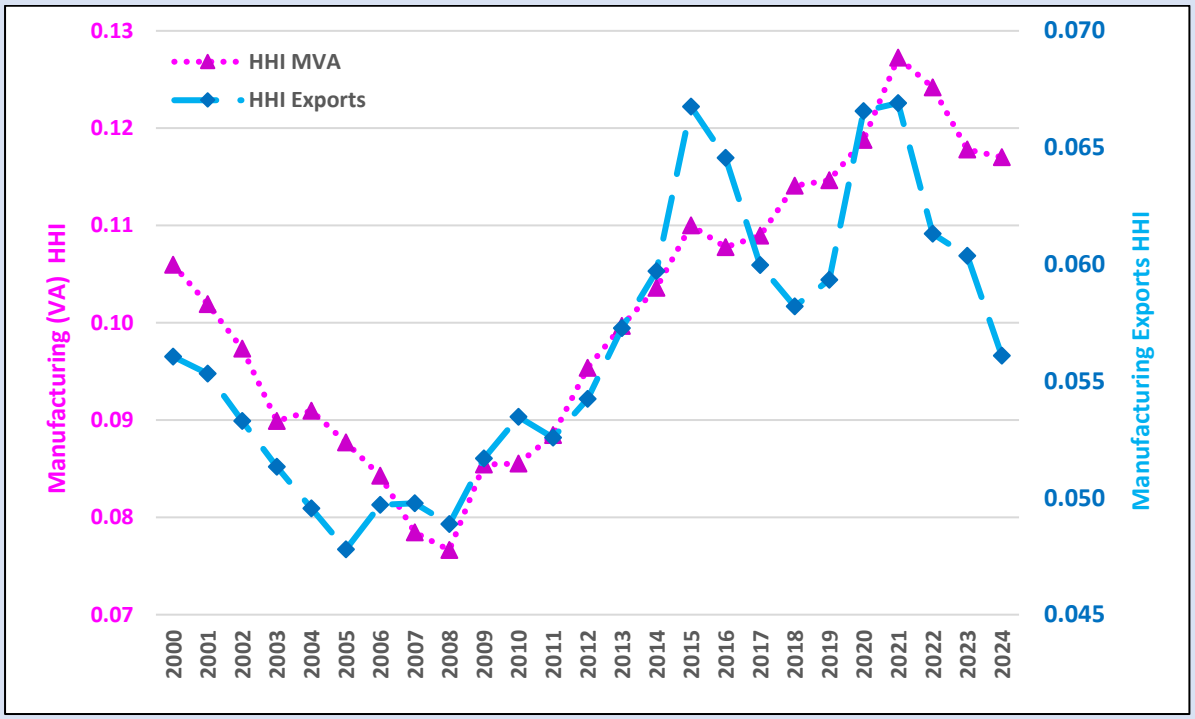
[29] HHI= Sum of squared country shares. Measures concentration with 0 = perfectly diffuse, 1 = complete concentration.

7.1 MVA & Manufactured Exports

The Hirschman–Herfindahl Index (HHI) shows that manufacturing value added (MVA) has consistently been more geographically concentrated than manufactured exports across the series. HHI for MVA rose by almost 50per cent from 0.086 in 2010 to 0.127 in 2021. During the same period the HHI for manufactured exports increased by over 25per cent from 0.053 to 0.0669 **(Figure 30).**

Export concentration declined till 2005 and then started to rise. The manufacturing value added concentration continued to decline for another four years till 2009 and then rose sharply to exceed the levels it was in 2000. China had joined WTO in 2001, post which a decline in concentration of the manufacturing of both exports and production may be observed.

Figure 30: **Global Concentration of Manufacturing Value Added & Exports**



Source: Author's calculation based on World Development Indices

However, by the global financial crisis of 2008-09, China had gained the largest world share as producer and exporter of manufactured goods. Therefore, after the global financial crisis, we again see a rise in concentration of MVA and exports. This trend continued till 2015, after which there was a decline in exports concentration till 2018 However, the production concentration continued to rise after taking a small hit in 2015 until it peaked in 2021. The concentration of the manufactured exports saw a similar trend, where the concentration kept rising till 2021 when it peaked **(Figure 30).** This trend of the sharp rise after 2005 and 2010 in case of exports and production respectively is the reflection of the Export led, import substituting, Infrastructure driven (ELISID) policy pursued by China for since the mid-1980s-early 1990s (see appendix for details).

China laid out the red carpet for MNE/MNC anchor investors in the 1990s, with fully developed industrial infrastructure & connectivity provided by Eastern provinces in months.

After exports from these enterprises boomed in late 1990s, early 2000s, investment thrust shifted to import substitution & real estate. Secondly, its Reverse Engineer and Develop (sREAD) policy initiated after joining the WTO in 2001. China's Socialist Market Economy provides an environment in which Companies owned and/or backed be Provincial communist parties compete fiercely with those from other provinces, after obtaining the technology from the centrally owned technology institutes who do major reverse engineering & development. These policies were facilitated by the free trade ideology of the West, and partly to the success of China's asymmetric mercantilist industrial policy **(Figure 30).**

After 2021 concentration eased by 2024, with exports falling to 0.0561 (−16.2per cent from 2021) and MVA to 0.117 (−7.9per cent from 2021), but MVA remained substantially more concentrated (to the levels close to that of 2020) than exports throughout. The 2021 peaks indicate that production became more geographically focused during the 2010s and into 2021 raising potential supply-chain vulnerability, while export shares tightened less and partially re-dispersed by 2024. China's rising share of exports in many manufactured goods, has played an important role in increasing export concentration since the turn of the century. We explore this in further detail in next section.

7.2 Global Export Concentration: China

For estimating the concentration in exports of manufactured goods, the paper relies on the published trade data at detailed level of disaggregation from UN-COMTRADE. First, it examines the broad categories of the SITC Rev. 4 data manufactured products to identify concentration within each category of manufactured goods by determining its share of exports by China with respect to the world. It then drills deeper into 2-digit and 3-digit levels.

China's share in the world exports of manufactured products has increased from 20.7 percent in 2021 (when the global concentration was highest), to 23.2 percent in 2024, a rise of 2.5 percentage points (***Table 9***). The concentration is highest for Miscellaneous manufacturing articles, with China's share being almost a 1/3rd of total world exports. This includes consumer-oriented finished goods such as furniture, clothing, footwear, travel goods, toys, instruments besides some complex network products like photographic equipment and scientific apparatus. Manufactured goods classified by materials and machinery & transport equipment have about 1/4th of the World export share, each. The smallest share of 11per cent for China is in World export of Chemicals and products nes., of which pharmaceutical product exports are 34.5per cent (***Table 9***).

Table 9: **China's Share in world Manufactured Exports by 1-digit SITC (per cent)**

Code	Product Description	2021	2024	Change
SITC 5	Chemicals & products, n.e.s.	10.0	10.6	0.6
SITC 6	Manufactured goods classified by materials	19.8	25.3	5.5
SITC 7	Machinery & transport equipment	21.6	24.1	2.5
SITC 8	Misc. manufactured articles	30.3	31.8	1.5
SITC (5+6+7+8)	**Total Manufacturing Exports**	**20.7**	**23.2**	**2.5**

Source: Authors Calculations based on UN COMTRADE (SITC Rev. 4)

China reached its highest share of total manufactured exports in 2021, as per WDI data UN UN-Comtrade data, however, shows that its share in 2024 was 2.5per cent higher than in 2021. This was driven by a 5.5per cent increase in China's share in exports of manufactured goods classified by materials (***Table 9***). Major growth driver for manufactured goods category is metals and engineering goods. The share of Chemicals exports declined relative to total, because of a major decline in pharmaceuticals exports, from 6 per cent share of world exports in 2021 to 2.6 percent in 2024.

It is critical to identify the specific manufactured products where China has major concentration in terms of its exports share in the world. These products have impact on the supply chain disruptions (as evident during the COVID times) and subsequently on the global economy. China has a 40 per cent share in world exports of 1/5th all manufactured products at SITC 2-digit level. China's export share is between 20-40 percent, for 28.6 percent of all products at 2-digit. Supply chain diversification by importers is required to reduce country concentration in these manufactured goods. The major items where China has a dominant market share at the SITC 2-digit level are listed in **Table 10**.

There are seven categories at SITC 2-digit level where China's export market share in the world is more than 40 percent. Besides Building fixtures, textiles and others, these also include critical products like telecom equipment and data processing machines. China dominates the export market with more than 1/3rd share in case of furniture and apparels and clothing. China also has 1/4th share in world exports of industrial equipment and more than 1/5th of the global share in metals, non-metals and metalworking machineries (**Table 10**). These raise potential risks for importing countries dependent on supply chains located in China, in terms of both country risk and geographical risk.

Table 10: China's export shares by 2-digit SITC

Code	Product Description	2021	2024	Change
SITC 81	Prefabricated building, heating, lighting fixtures, n.e.s.	54.7	55.7	1.0
SITC 65	Textile yarn and related products	41.3	47.6	6.3
SITC 83	Travel goods, handbag, etc.	37.3	44.6	7.3
SITC 76	Telecommunication & sound recording apparatus	41.7	42.5	0.8
SITC 85	Footwear	35.6	41.8	6.2
SITC 75	Office & Automatic Data Processing (ADP) machines	38.1	40.3	2.3
SITC 82	Furniture and parts thereof	37.1	40.0	2.9
SITC 84	Articles of apparel & clothing accessories	34.7	39.1	4.4
SITC 69	Metal manufactures, n.e.s.	28.6	31.9	3.3
SITC 89	Misc. manufactured articles, n.e.s.	31.9	30.8	-1.1
SITC 77	Electrical machinery, apparatus & appliances, n.e.s.	22.4	27.7	5.4
SITC 74	Other Industrial machinery and parts	20.8	24.1	3.3
SITC 63	Cork/wood manufactures	18.9	22.0	3.1
SITC 67	Iron and steel	14.4	22.0	7.5
SITC 66	Non-metal mineral manuf.	18.8	21.5	2.8
SITC 73	Metal working & machinery	14.4	21.3	6.9

SITC 62	Rubber manufactures, n.e.s.	16.4	20.1	3.7

Source: Authors Calculations based on UN COMTRADE (SITC Rev. 4). Note: SITC categories with export shares below 20per cent in 2024, are not shown.

The share of all these products has increased significantly in the last three years. The products in which the increase is more than twice the average 2.5per cent for all manufactured exports as per UN-Comtrade data are noteworthy. The highest increase during the three years 2021-24, is found in a diverse range of products; These include Labor intensive goods like Travel goods, Handbags et al (7.3per cent) and Footwear (6.2per cent), to process goods like Textile yarn & related products (6.3per cent) and Iron and Steel (7.5per cent) and medium-high tech products like Electrical machinery, apparatus & appliances (5.4per cent) and Metal working equipment and machinery (7.5per cent). This is a likely indicator of the categories of goods which PRC is still targeting with its ELISID and sREAD policies (see appendix for details).

7.3 China's Dominance in Complex Supply Chains

Complex supply chains are those in which production crosses borders more than once—meaning that intermediate goods are imported, processed, and re-exported—whereas simple supply chain involve only a single cross-border transaction (World Bank, 2019). Within this framework, network products refer to those groups where these international fragmentation dynamics are most pronounced. Veeramani (2019) define network products (NP) as those categories in which trade flows primarily reflect the cross-border slicing of production into specialist tasks, so that different countries sequentially undertake design, component fabrication, sub-assembly, system integration and final assembly according to their comparative advantages. Typical examples include electronics, automobiles and ICT goods. To understand China's position the complex supply chain, we look at the emerging trends in network products.

The global trade in network products is declining. However, in case of China the share of all the critical products that together form the network goods have been increasing and the exports are getting further concentrated. **Table 11** lists six sub-categories of network products as defined by Athukurala (2012). Within each of the sub-categories the share has increased in the last three years. In case of telecom and data processing machines, China holds the export share of more than 40 percent of the global market. China now holds one-fifth of the market share in the exports of scientific equipment and professional instruments, besides more than one-sixth of the share in photographic equipment. In the emerging sector of EVs, China has already captured 13.5 percent of the global market.

Table 11: **China's Export shares (per cent) in Network products**

Code	Product Description	2021	2024	Change
SITC 76	Telecommunication & sound recording apparatus	41.7	42.5	0.8
SITC 75	Office & Automatic Data Processing (ADP) machines	38.1	40.3	2.3
SITC 77	Electrical machinery, apparatus & appliances, n.e.s.	22.4	27.7	5.4
SITC 87	Professional & Scientific instruments, n.e.s.	16.2	19.1	2.9

SITC 88	Photo apparatus, optical goods, watches, clocks	14.6	16.7	2.0
SITC 78	Road vehicles	9.7	13.5	3.8
Total Network Products		23.2	25.4	2.3

Source: Authors Calculations based on UN COMTRADE (SITC Rev. 4)

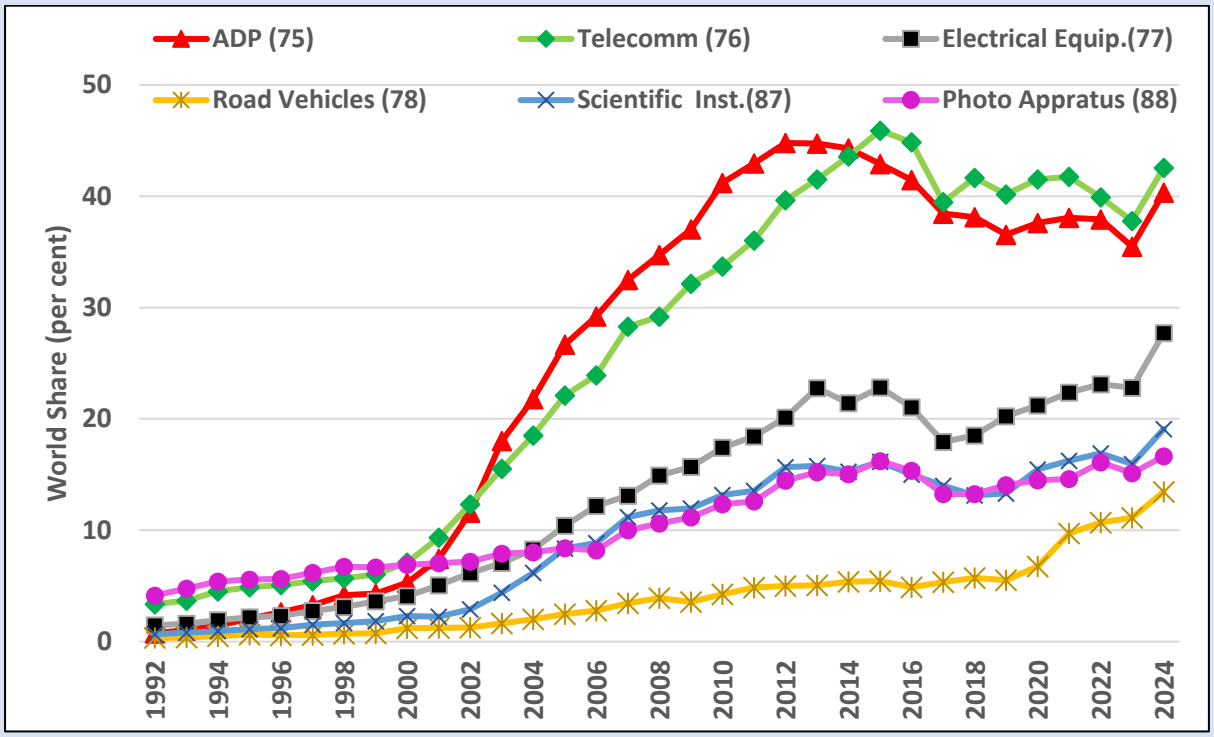
Within network products, the paper defines a special category of products termed 3C, which stands for Communicate, Compute, Control. Examples of these are Telecommunication, Automatic Data Processing and Electrical Equipment, respectively. China dominates each of these three sub-categories and poses a geoeconomic, geopolitical and National security challenge to all the large manufacturing countries/economies discussed in this paper.

China's share of Network Products exports in total world exports was less than 4 percent in the year 2000. It is a little more than a quarter of the world's exports in 2024. ***Figure 31*** shows how China's export share evolved for each sub-category of Network products. Automatic data processing (ADP) machines (SITC 75) and telecommunication and sound recording apparatus (SITC 76) have been the principal drivers of this expansion. The share of ADP machines rose sharply from below 5 per cent in 2000 to a peak of about 45 per cent in 2011–2012, before moderating to the 35–40 per cent in subsequent years. A similar trajectory is evident in telecommunications, which expanded from a negligible share in the late 1990s to a peak of over 45 per cent in 2015, followed by a modest decline to a 40 per cent range (***Figure 31)***.

The growth acceleration of Electrical machinery, apparatus and appliances (SITC 77) was much less, but it emerged as the third largest category, with a steady increase from around 2 per cent in 1992 to about 20–23 per cent during the 2010s. Since then it has reduced the gap in shares with other 3Cs, with a rise to nearly 28 per cent in 2024.[30] These three industries are the most important elements of the special category 3C, which is critical to economic, political and military security of democratic countries.

[30] General Electric's Home Appliance Division was acquired by Haier Group in 2016 for $5.4 billion. Haier absorbed GE's smart appliance technologies, manufacturing footprints, and premium brand legacy to scale its global white-goods presence.

Figure 31: **China's Exports Share of Network Products by SITC 2-digit**



Note: SITC 75-Office machines & automatic data processing (ADP) machines; 76-Telecommunication & sound recording apparatus; 77- Electrical machinery, apparatus & appliances, nes; 78-Road vehicles; 87-Professional scientific equipment nes; 88- Photo apparatus, optical goods. Watches & clocks. Source: Authors Calculations based on UN COMTRADE

Professional scientific instruments (SITC 87) and photographic apparatus, optical goods, watches and clocks (SITC 88) followed an almost identical path from about 8.4per cent 2005, to 15per cent - 16per cent in 2023. The share China's scientific instruments exports at about 19 per cent in 2024, is 4per cent higher than that of photographic apparatus (15per cent). In contrast, road vehicles (SITC 78), , accounted for a 4per cent-5per cent share during 2010s, and then took off during the pandemic (2020), increasing 1.6per cent a year from 2019 to 2024 (***Figure 31)***. This reflects the success of the, "Made in China 2025" policy initiated in 2015, which built on the post-WTO success of the ELISID and sREAD policies. The early success on EV technology, halfway through the ten year plan, coupled with China's dominance of 3C exports, has helped China Inc sweep international markets for EVs in 2025 -26

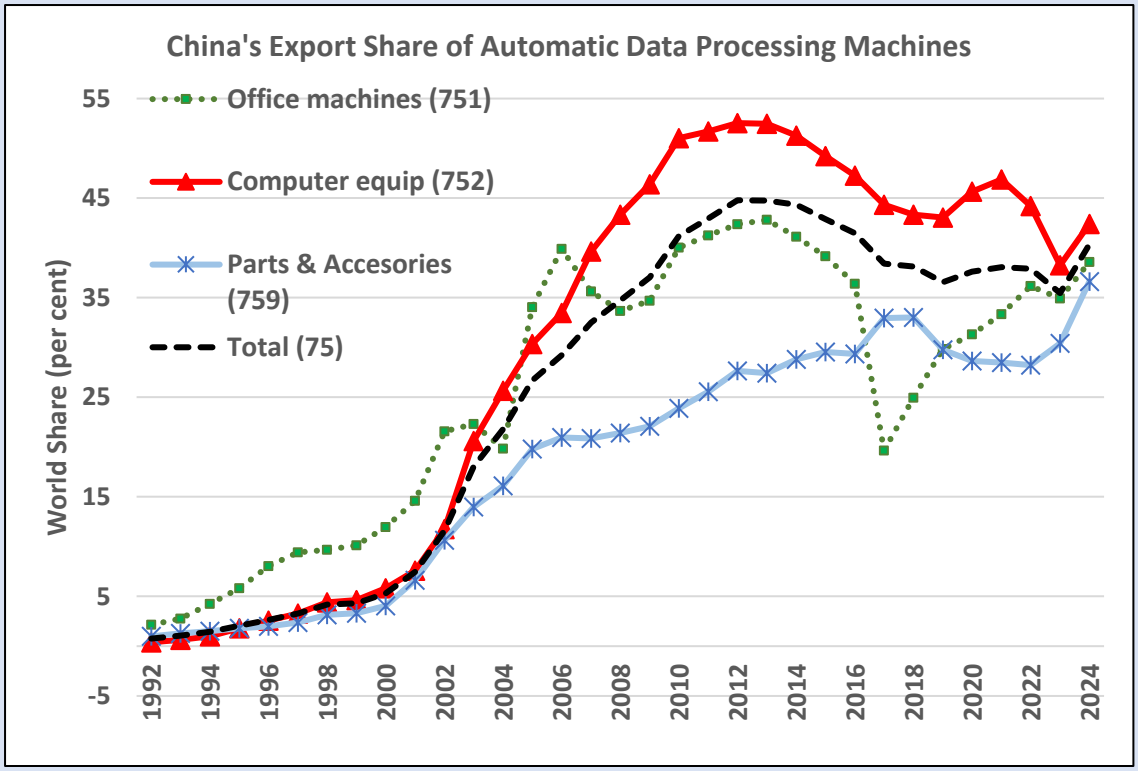
Taken together, the evidence indicates that while ADP machines and telecommunications have historically dominated China's network product exports, other segments—most notably electrical machinery, scientific instruments, and road vehicles—are gradually growing their importance in recent years.[31] It also very significant that the export share of ADP and Telecom segment took-off from the beginning of this century, around the same time when China became part of WTO.

Given the dominance of ADP segment we look briefly at its 3-digit disaggregation (***Figure 32***). China's export shares in ADP and office-machinery were led by Office machines (SITC 751) till 2003, after which computer equipment (SITC 752) took the lead. Computer equipment

[31] Geely bought Volvo cars of Seeden in 2010. This company had expertise in Automotive engineering, and technology for EV platforms & safety systems.

export shares grew rapidly after China joined WTO, climbing from 4.6per cent in 1999 to 51per cent in 2010 and then formed a hump around 50per cent of world exports.[32] China's share in Office machine was much more erratic, weaving below and above Computer share before the Global financial crises and then forming a hump thereafter, just below 45per cent. Export of parts and accessories (SITC 759) accelerated during the period, when the export share Office Machines and computers accelerated after WTO entry, suggesting the initial supply chain included production capacity for some Parts. After this the share rose more gradually, indicating steady backward integration, as demand for individual parts neared or exceeded minimum efficient scale (MES). By 2024 the export share of Computers (42.4per cent), Office machines (38.6per cent) and Parts & components (36.6per cent) were close to the total share of 2-digit ADP & office machines (40.2per cent), suggesting high value added in the ADP supply chain (***Figure 32***).

Figure 32: **China's Export Share of ADP Equipment & Parts**



Note: SITC 751-Office Machines; 752-Automatic Data Processing machines (ADP), n.e.s.; 759- Parts, accessories for machines of groups 751 & 752. Source: Authors' Calculations based on UN COMTRADE

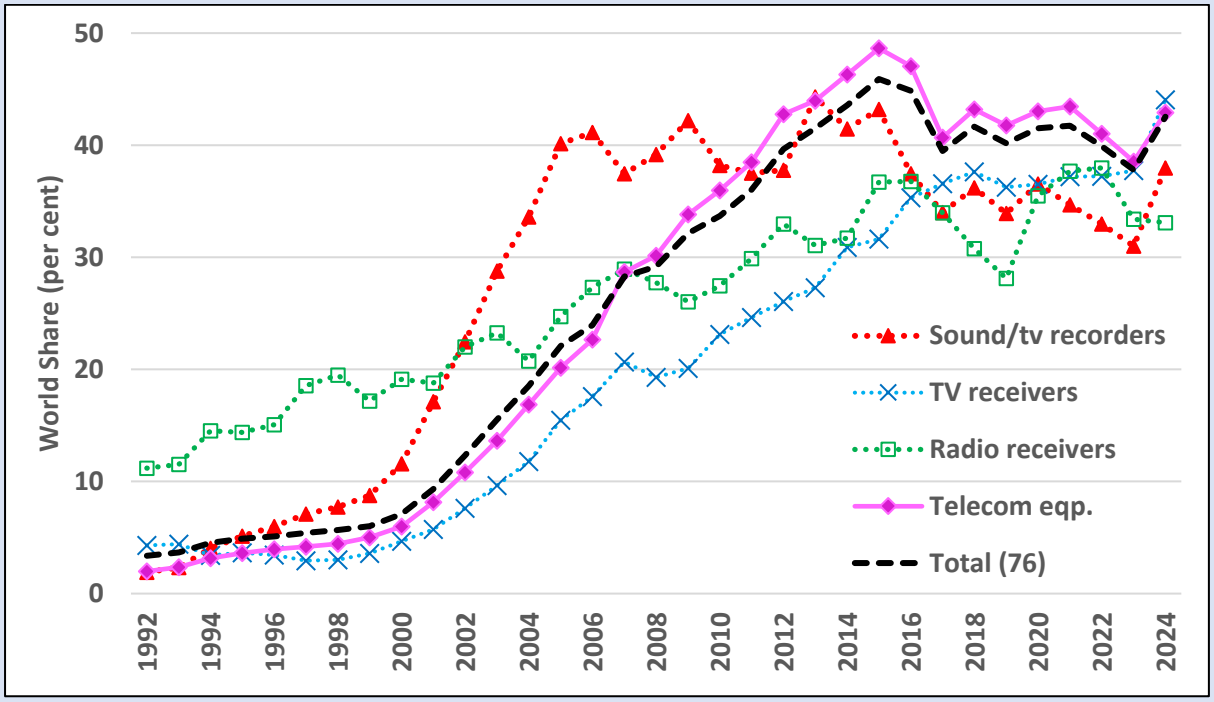
These patterns illustrate the application of the economic concept of Minimum Efficient Scale (MES) to backward integration. Industries with high fixed costs and strong scale economies typically receive investment once demand exceeds MES; Attainment lowers unit costs, supports learning-by-doing, and attracts supplier investment, helping build an electronics eco-system. External economies (supplier clusters, specialized labor, logistics) further reinforce supply chain development and export competitiveness. Computer equipment appears to have contributed to the development of the electronic ecosystem, enabling rapid scale-driven export

[32] Lenovo announced its purchase of IBM's Personal Computing Division in December 2004 and officially finalized the $1.75 billion acquisition in May 2005. This played a role in doubling China's share of world computer exports from 25.6per cent (2004) to 51per cent (2010)

growth. Parts and accessories show the classic lagged catch-up: as large assemblers achieved MES, backward linkages deepened, permitting suppliers to scale, upgrade quality, and expand exports.

The other dominant component within the network products that has driven China's global share is the Telecommunication and sound recording apparatus (SITC 76). In 2024, this is the most concentrated segment within network products, with China's share at 42.5 percent of World exports. Although the world share of China in SITC 76 has declined from its peak of 46 percent in 2015, China still holds a dominant position (**Figure *33***).[33]

Figure 33: China's Export Share of Telecom equipment, Radios, TVs, Recorders



Note: TV, Radio & Sound Recorders products include SITC 761 (TV Receivers), 762 (Radio broadcast receivers) and 763 (Sound recorders or reproducers) merged together as one group. SITC 764 comprises of Telecommunication equipment, n.e.s.; & parts, n.e.s. Source: Authors calculations based on UN COMTRADE.

China's export shares in telecommunications and related products (SITC 76) can separated into two broad categories, Telecom Equipment (SITC 764), which includes mobile telephones, and Electronics Consumer goods like Radio receivers (SITC 762), TV receivers (SITC 761), and sound/TV Recorders (SITC 763). The latter also includes professional receiving & recording equipment. The time path of China's export shares of Telecom equipment (764) is almost identical to that of Total exports of telecom et al (76). Trends of consumer goods follow a stage pattern, with radio receiver export share highest till 2001, sound/TV recorder export shares highest from 2002 to 2016, and TV receivers highest from 2017 to 2024 (**Figure *33***).

[33] Motorola Mobility was Bought by Chinese hardware giant Lenovo in 2014 for $2.91 billion from Google, bringing significant mobile device patents and infrastructure capabilities under Chinese ownership. IBM x86 Server Business: Acquired by Lenovo in 2014 for $2.1 billion, shifting enterprise server and networking hardware operations to Chinese corporate control. Nokia Shanghai Bell: Formed as a persistent joint venture between Nokia and the Chinese state-owned enterprise Huaxin,

In the early 1990s, China had a substantial and rising share of TV receiver exports, rising from 11per cent in 1992 to 19per cent in 2000. All other 3-digit export shares were in the range of 6per cent and 11per cent in 2000. A pronounced acceleration began after 2000. TV, radio and sound recorders rose from around 10 per cent in 2000 to nearly 28 per cent by 2006, then stabilized and grew more gradually, reaching about 35–37 per cent in recent years.[34] Telecommunication equipment, by contrast, experienced a later but sharper take-off: from single-digit shares in the late 1990s to nearly 50 per cent by 2014. After peaking, it moderated to around 40–45 per cent, still maintaining a commanding position in global markets.[35] The aggregate SITC 76 series mirror this trajectory, rising rapidly in the 2000s, peaking in the mid-2010s, and settling at a high plateau thereafter (**Figure *33***).

These patterns align reflect economies of scale and the concept of Minimum Efficient Scale (MES). Telecommunications equipment, with its high fixed costs in R&D, network compatibility, and production tooling, requires very large volumes to achieve globally competitive unit costs. China systematically acquired target technologies or mandated joint ventures with foreign firms in exchange for domestic market access. Once foreign invested enterprises (MNCs and JVs) and Chinese producers reached MES in the 2000s, exports accelerated. Attainment of MES allowed producers to exploit cost reductions through bulk procurement, standardization, and rapid learning-by-doing, enabling China to dominate global markets. The moderation after 2014 is consistent with product-cycle effects, technological transitions (e.g., from 3G/4G to 5G), and partial diversification of production networks.

TV, radio and sound recorders (SITC 761–763) are less R&D-intensive and characterized by lower MES thresholds. Consequently its growth occurred earlier and more smoothly, reaching high shares by the mid-2000s but without the explosive growth in export of telecommunication hardware. Having reached MES relatively early, the category's export share stabilized, reflecting product maturity and slower global demand growth.

7.4 China's Socialist Market Economy (SME)

Peoples Republic of China has seen an unprecedented rise in its manufactured exports share and production (MVA) since the 1978-80 reform and opening. This was further enhanced by its entry into the World Trade Organization in 2001. A detailed analysis of economic history is of the current, "*Socialist Market Economy, with Chinese characteristics*" is given in the Appendix. In the Social Market Economy, with Chinese characteristics, provincial government enterprises (successors of TVEs) compete fiercely with one another, yet remain coordinated from the top through Party directives, state-owned banks, centrally acquired technologies, and public ownership of land and capital. Special Economic Zones, indirect subsidies and the sREAD reverse-engineering policy, and FDI-driven supply chain integration were not ad hoc measures. But they were divisions of a single corporate strategy executed at national scale, transforming China into the world's dominant manufactured goods exporter. Just as a

[34] Distressed assets and factory operations of Philips TV & Monitor division of Dutch conglomerate Philips were gradually taken over by Hong Kong-based **TPV Technology**. TPV gained complete control over the production of monitors and TV sets globally under the Philips brand license.

[35] Nokia Shanghai Bell (2016-2017) JV between Nokia and China Huaxin, with Nokia holding a 50per cent + 1 share majority stake. This allowed Nokia market access while transferring critical networking manufacturing know-how locally.

multinational corporation controls inputs, intermediate production, and final output across geographies while maintaining unified strategic direction, ***China Inc***. controls labor mobility through the hukou system, capital allocation through state banks, and technology acquisition through central institutes. This is all done while deploying market competition as an internal efficiency mechanism.

The role of FDI in developing export-oriented supply chains is particularly relevant. but neglected in the literature. Foreign Direct Investment (FDI) and "Foreign Invested Enterprises" played a central role from 1980 to 1999, not as a source of capital, but as a vital conduit for acquiring technology, managerial know-how, and entrepreneurial capabilities. The influx of FDI enabled China to integrate into global supply chains rapidly, leveraging its vast labor pool, growing infrastructure, and supportive state apparatus. Diaspora networks and the attraction of export-oriented FDI further amplified this growth. The reliance on FDI changed gradually after China became an LMIC (end 1990s) and joined WTO (2000-01) and investment in higher education and Reverse Engineering and Development (sREAD) began to produce results. It changed more rapidly after the Global Financial Crises (2008), as it became a UMIC (2010) and globalization ended & export-led growth became difficult.

This system was enabled by the liberal, free-trade ideologues of advanced economies, which underestimated the long-term implications of China's asymmetric mercantilist policies. Over two decades, China acquired, adapted, and scaled advanced manufacturing technologies, allowing it to dominate critical sectors such as telecom equipment, automatic data processing (ADP) machines, and electronic products. China's export dominance is being recognized as a "country monopoly risk," by many countries. Since 2018–19, importing countries are reassessing their dependence on Chinese manufacturing, especially after the disruptions in global supply chains during the COVID-19 pandemic. These events exposed the risk of overdependence on a single country and geography.

There is also increasing global realization of the strategic risks of China's monopolistic dominance has sparked national security concerns, particularly in high-income developed countries (Virmani, 2024). The potential for embedded security threats, such as malware or trojans in imported digital infrastructure and products is also attracting attention. The leakage of advanced technologies and the embedding of Chinese-made digital infrastructure in critical systems worldwide have prompted calls for diversification and reshoring of manufacturing capacities. This marks a significant shift in global trade policy thinking—one that acknowledges not just economic, but geopolitical vulnerabilities embedded in the current structure of global manufacturing trade.

Part III: Transition from Threat to Opportunity

8. USA-China Coupling and Decoupling

China's accession into the WTO led to a significant rise in the concentration of manufactured exports across technological categories – low-tech, medium-tech and high-tech products. This section looks at how the phenomenon of 'coupling' of the supply chain took place in the initial years of the 21st century, through the dependence of the HICs on China. USA started the process

of 'decoupling' with imposition of tariffs on China in 2017. The effect of these tariffs is analyzed by identifying changes in trend of US Imports and changes in the pattern of imports across trading partners, between 2018 and 2024.

8.1 Import Dependence on China

This section explores the important bilateral dependencies and risks arising from China's monopoly over the production and export of many manufactured products. It starts by analyzing at the dependence of developed economies on China for their manufactured products. It then focuses on the China-USA bilateral trade, the actions taken by USA to derisk its imports, and the impact of tariffs on source countries and product basket. It also makes some projections and contrafactual to estimate the impact of US tariffs.

The dependence of the Rest of the World on China for imports of manufactured products has grown 2.5 times from 7.5 percent in 2000 to 18.6 percent in 2024[36]. **Table 12** shows the import dependence of the top 10 producers of manufactured goods in the World. The United States imports US$442.3 billion worth of manufactured goods from China, accounting for 16.5per cent of its total manufactured imports (US$2.7 trillion) in 2024. This is 10.1per cent lower than the peak of 26.6per cent percent in 2017 and can be attributed to the decoupling process started by President Trump (*next section*). The share of over 1/6th USA's manufactured imports coming from its primary adversary, is still a major geo-economic, geopolitical and national security risk for USA.

The European Union, the second largest producer of manufactured goods (MVA, imported US$ 546 billion of manufactured goods in 2024, nearly 1/3rd (29.9per cent) total manufactured imports. Thus its import dependence on China is twice that of the USA. It dependence has declined from a peak of 32.9per cent in 2022. Paradoxically, EU members Germany, France, and Italy, major contributors to world MVA, are less than half as dependent on China, as the EU as whole. Their shares of manufactured imports from China are 15.7per cent, 13.6per cent, and 12.1 per cent, respectively.

Table 12: **Major Producers Share of Manufactured Imports from China (2024)**

Importing Economy	China's share in total imports (per cent)	Manufactured Imports from (US$ Bil)	
		China	World
United States	16.5	442.3	2686.7
European Union	29.9	546.0	1823.7
Germany	15.7	167.7	1070.1
Italy	12.1	51.9	428.0
France	13.6	76.4	562.3
Japan	34.8	153.3	440.8
India	36.2	124.7	344.6
S. Korea	33.7	133.1	394.7

[36] See appendix for table on trends in import dependence of major producers (MVA) on China for manufactured products from 2000-24.

Mexico	23.9	118.6	495.7
United Kingdom	18.8	95.1	506.6
Russia	30.0	70.8	235.9

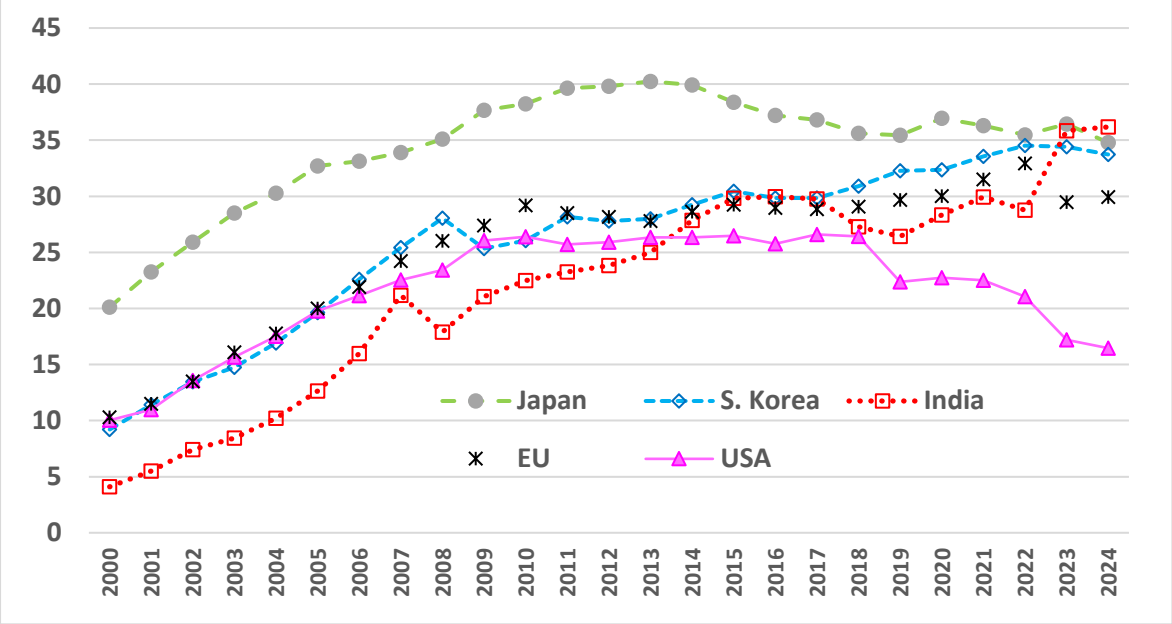
Source: Authors calculations based on UN COMTRADE
Note: Data on Russia is for 2021 (latest available);
Total manufactured products is calculated as sum of SITC 5, SITC 6, SITC 7 and SITC 8.

Japan, India and South Korea are currently more dependent on imports of manufactured goods from China than the EU or USA (**Table 12)**. This requires a deeper analysis of the time patterns. Historically, Japan was the most dependent on Imports from China, plateauing at around 40per cent during 2011-14 and gradually reducing dependence thereafter ***(Figure 34)***. USA followed a broadly similar pattern to Japan but was the least dependent on imports from China among the major producer -exporters of manufactured goods. Manufactured import dependence on China grew during the 2000s, plateaued above 26per cent during 2009-2018 and then declined much more sharply than Japan.

The upward/rising trajectory of EUs and South Korea's dependence on manufactured imports from China decelerated after the Global Financial crisis (2008); first for S Korea and then for EU. EUs dependence has declined significantly during 2023-24, while Korea has declined marginally ***(Figure 34)***. India in contrast shows a mix of all these patterns, with an acceleration in dependence during the 2000s a deceleration after the GFC (2008), a plateauing from 2015-17 at 30per cent the level of Korea at that time, Followed by a big spurt of 8per cent in 2023-24. This jump is almost entirely due to a spurt in imports of Machinery and transport equipment from China, likely associated with solar power, telecom, EVs and batteries. To reverse rising dependence on manufactured imports from China, India will have to promote import substitution without discouraging exports, based on experience of China's ELISID & sREAD policies (details in Appendix).[37]

[37] There are increasing reports of bans on export of advanced machinery and equipment for manufacture used in the electroncs, solar and EV industries.

Figure 34: China's share in Country's total manufactured Imports



Since 2018-19 importing countries have started realizing the risks of depending on one country which holds a virtual monopoly in many manufactured exports, particularly Telecom equipment, Automatic data processing machines and electronic products. This recognition has heightened after the disruption in China linked supply chains during the pandemic and after (2020-21).

8.2 US Tariffs and De-coupling

There was a major shift in US perception of China's asymmetric trade, subsidy, economic and technology policies in 2018, President Trump imposing "special protection" against imports from China (Grossman, 2024). In 2018, the United States deployed its principal tariff actions in four discrete phases. First, in March 2018 the Administration invoked Section 232 authority to impose broad tariffs on steel (25per cent) and aluminum (10per cent), a measure announced by Presidential proclamation following a Commerce Department investigation. Second, under Section 301 the USTR implemented List 1 — a 25per cent additional duty on roughly $34 billion of Chinese-origin products, coming into effect on 7 July 2018 (effective date often reported as 6–7 July). Third, List 2 imposed a further 25per cent duty on about $16 billion of imports from China, effective 23 August 2018. Fourth, the Administration announced List 3 covering approximately $200 billion of Chinese imports in September 2018 (initially implemented at a 10per cent rate in late September 2018 and later increased to 25per cent in 2019), completing the sequence of major tariff rounds initiated that year.

In January 2018 the United States levied tariffs on imports of washing machines and solar cells from China, followed by additional tariffs on imported steel and aluminum from all countries in March. In retaliation, China imposed tariffs on goods worth US$ 3 billion in April 2018 and subsequently introduced anti-dumping tariffs on US sorghum imports valued at US$ 1 billion. In response, the United States announced in May 2018 a fine of US$ 1.3 billion along with other penalties against ZTE, a Chinese telecommunications company. The trade tensions

escalated further on 15 June 2018 when the US declared tariffs on US$ 50 billion worth of Chinese goods, to be implemented between July and August. China responded the same day with a matching tariff announcement of US$ 50 billion on US imports, also scheduled for implementation during the same period. On 6 July 2018, both countries-imposed tariffs of 25 per cent on goods worth US$ 34 billion each (Chang et al., 2021).

By 2019, the US had imposed tariffs on over 60 percent of imports from China, mostly at the 25 percent level. As a result, China's share in US imports fell by 5.3 percentage points (from 21.6per cent to 16.3per cent) between 2017 and 2022 and is now at 2007 level. USA imports from China in tariffed goods were in 2022, 14 percent lower than in 2017, while imports from the rest of the world were 48 percent higher for those same products (Freund et al., 2023). Moreover, World Bank studies on Tariff data collected by Feigenbaum et al. (2020, 2021) for the early rounds of Trump tariffs, and the data assembled by Chad Brown (2021) for the early rounds of Trump tariffs, and subsequent tariff hikes, have found that the weighted average tariffs on US imports from China rose to 17.1 percent by the end of 2019 (Grossman, 2024).

The reduction in China's share in USA's imports was referred as early phases of the *'Great Re-allocation'* of Global Supply Chains by Alfaro et al (2023). Brown 2022; Grossman et al. 2023; Freund et al. 2023; Feigenbaum et al. 2023 have shown that Asian countries have emerged as big winners, in the US-China reallocation. The National Bureau of Economic Research (NBER) working paper has shown India as the third highest gainer of USA import market share, after Vietnam and Taiwan between 2017-22; China's share in USA imports market witnessing significant decline (Alfaro et al., 2023). The World Bank study found India's import market share of 0.57per cent, was fifth highest, after Vietnam, Taiwan, Canada & Mexico (Freund et al.2023). Though the increase in Vietnam's, was highest, because it was easier for Chinese and American companies exporting from China, to shift labor intensive assembly operation across the border and continue to use Chinese intermediate goods, parts and components. India's size of human resources, broad manufacturing capabilities and responsive economic reforms, give it a relative advantage in attracting East Asian, European and USA companies, interested in derisking and diversifying manufacturing supply chains from China.

8.3 Projections on Manufactured Exports and Production

For the projections of Manufacturing Exports and Value Added, we use the data from World Development Indices (WDI) for top six countries in both the categories[38]. As the year 2018 marks the major shift in the global supply chains with imposition of tariffs on China by USA, we take 2017 as the benchmark year for projecting the values of MVA and Manufactured Exports for the years 2030 and 2035. Two projections are done, a Baseline (BL) and Post tariffs (PT). The BL projections reflect the projected values of MVA and Manufactured Exports for the countries in absence of the 2018 intervention in form of Tariffs on China. Similarly, the PT shows the projected values for the two parameters for the years 2030 and 2035 after the announcement of tariffs in 2018. The gap between the BL and PT projections for the years 2030 and 2035 respectively can be helpful in assessing the effectiveness and importance of levying

[38] India also has been included in manufacturing export table, besides the top six leading countries, for comparison.

tariffs on China by the USA. The recent (2025-26) tariffs by USA on China and other countries, are not factored in these projections.

With a little more than quarter of the world share in MVA, USA was leading in the early part of 2000 (**Figure 7**). However, China (18.2 per cent world MVA share) overtook USA (17 per cent world MVA share) in the year 2010 after the Global Financial Crisis (**Figure 7**). The share of China in the world MVA has more than tripled from 8.6 per cent (in 2004) to 28.8 per cent in 2023. In the same period the world share of USA declined by more 30 per cent, from 22.2per cent in 2004 to 15.5per cent cent in 2021.[39] The correlation coefficient for USAs and China's Manufacturing exports is much more negative (-0.94) than the correlation of USA and China's MVA (-0.88).

It is evident from ***table 13 &*** **Figure *35*** and that projected share of China would have reached almost half (48.6per cent) of world Manufactured Value Added (MVA), the World market for manufactured exports, by 2030. USA tariff and other measures may have limited it to a little over one third (34.1per cent). UNIDO in its *Future of Industrialization Report 2024* has also projected that China will account for almost 45 per cent of global manufacturing by 2030. Moreover, the share of USA in world MVA for the year 2030 can be prevented from going below 14per cent.

Table 13: Manufacturing (VA) Projections for top producers

		World share of MVA(per cent)							
		Past				Projections			
						Baseline		Post Tariffs	
Rank	**Country**	**2001**	**2009**	**2015**	**2024**	**2030**	**2035**	**2030**	**2035**
1	**China**		17.3	25.9	27.7	48.6	56.2	29.3	29.6
2	**USA**	25	18.1	17.2	17.3	13.2	12.6	17.0	17.1
3	**Japan**	18	10.8	7.4	**5.2**	3.9	3.1	4.7	4.4
4	**Germany**	6.5	7.4	5.6	4.9	4.2	3.6	4.6	4.4
5	**India**	1.2	2.5	2.7	2.9	2.7	2.4	3.9	5.4
6	**South Korea**	2.5	2.6	3.2	**2.5**	3.3	3.4	2.3	2.2
	MVA Sum	53.2	58.6	61.9	60.6	75.9	81.2	61.8	63.2

Source: Authors' calculations based on trends forecast World Bank WDI. Baseline (BL): Projections based on pre-2017 trends
Post Tariffs (PT): Projections based on post-2017 trends

[39] WDI data of USA share in world MVA is available only till 2021.

Figure 35: China's rising share in world Manufacturing Valur Added

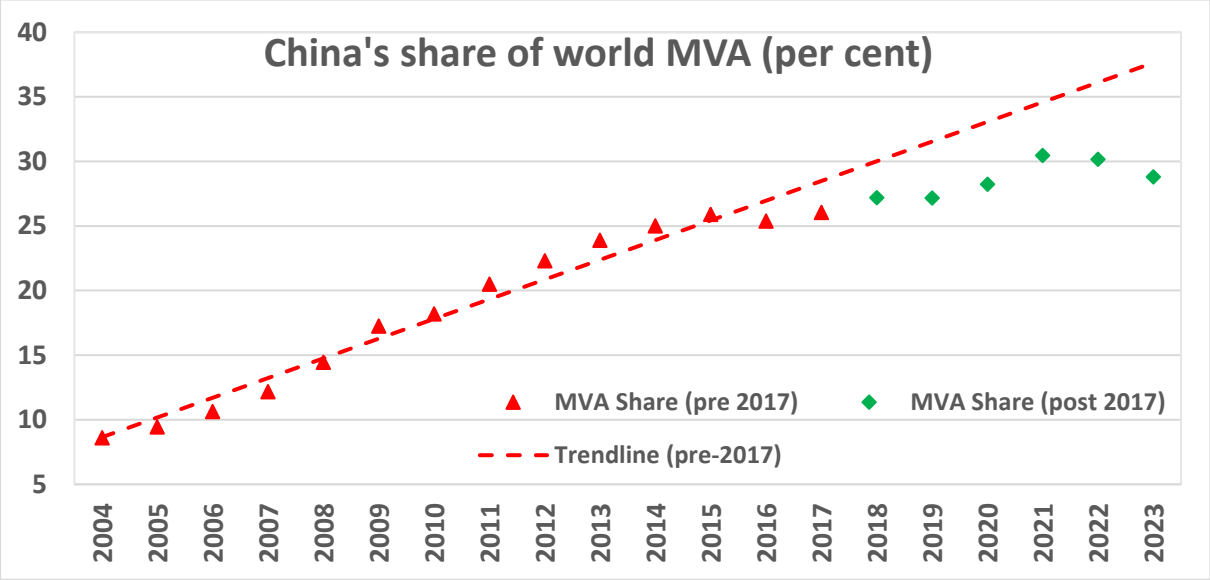
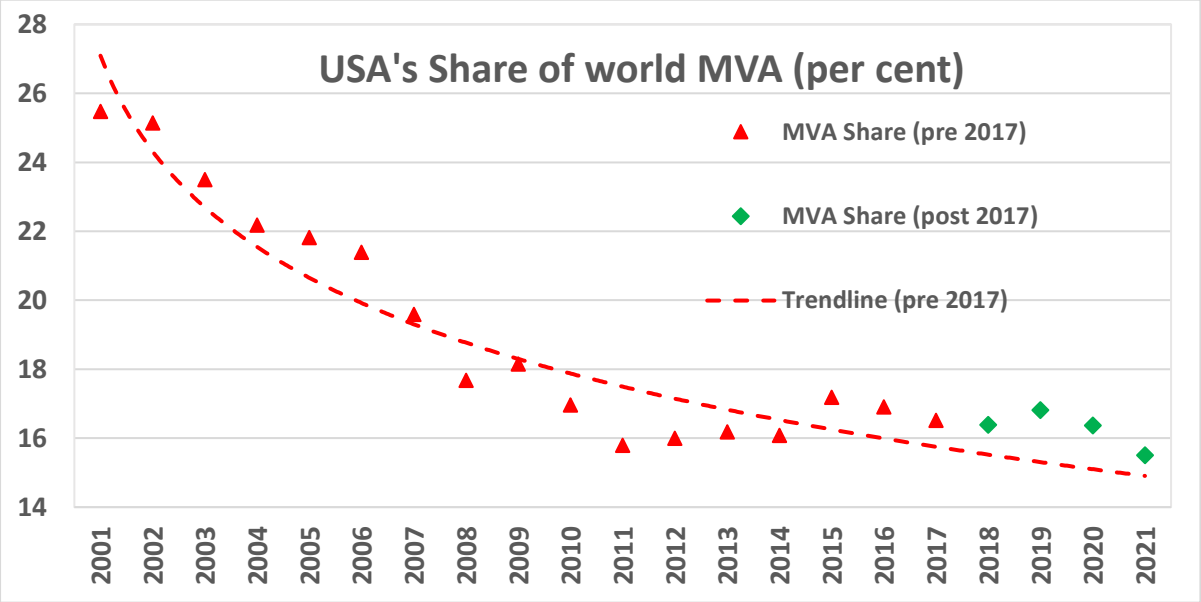


Table 13 and **Figure *36*** also show that USA's MVA trajectory has been improved in terms of USA share of global MVA.

Figure 36: USA's falling share in world Manufacturing Value Added



Source: Authors Calculations based on World Development Indices

USA's 2018 tariffs have affected China's shares of both MVA and Manufacturing Exports. The gainers in case of MVA shares are USA, Japan, Germany and India. The difference between the Base line and post-tariff projections of manufacturing Export shares show that China there is substantial negative effect of the tariff war. Japan appears to be the only gainer, while there is no affect on Netherland's export shares (***Table 14)***. Other Major Exporters like Germany, South Korea and USA, and major producer India, seem to have lost market share relative due to the tariff war. This could be due to rising excess capacity due to unchanged or rising investment in manufacturing capacity, stagnant or falling domestic demand for manufacture, falling capacity utilization and dumping in foreign markets (***Table 14***).

Table 14: Exports Projections for top producers

		World share of Manufactured Exports (per cent)							
		Past				Projections			
						Baseline		Post Tariffs	
Rank	Country	2001	2009	2016	2024	2030	2035	2030	2035
1	China	5.2	13.2	18.0	18.5	30.9	35.3	20.3	20.6
2	Germany	10.9	11.0	10.4	8.0	8.6	8.1	7.8	7.6
3	USA	13.1	8.2	8.4	6.5	6.9	6.7	6.4	6.3
4	South Korea	3.0	3.8	4.1	3.4	4.3	4.4	3.2	3.2
5	Netherlands	2.8	3.3	3.3	3.3	3.4	3.4	3.4	3.4
6	Japan	8.2	6.0	5.2	3.3	2.9	2.5	3.1	2.9
18	India	0.7	1.3	1.7	1.7	2.0	2.1	1.7	1.7
	Exports Sum	43.9	46.7	51.1	44.7	59.1	62.5	46.0	45.7

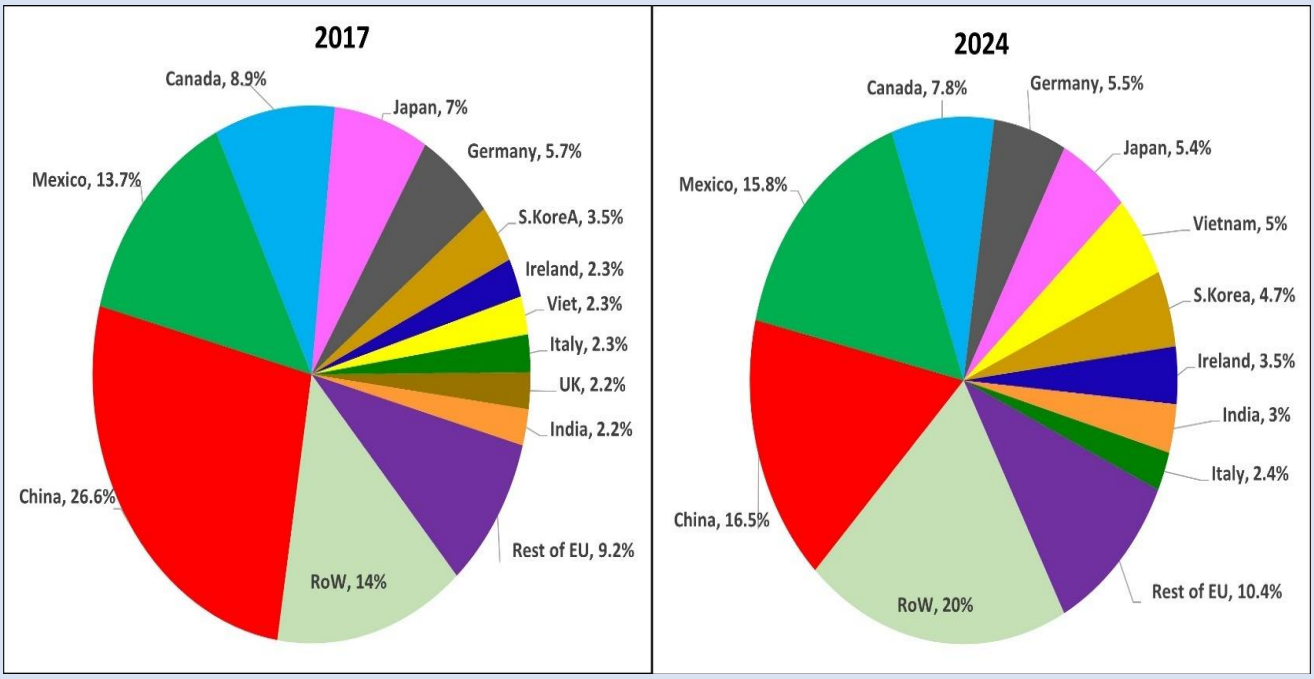
Source: Authors Calculations based on World Bank WDI data. Baseline (BL): Projections based on pre-2017 trends. Post Tariffs (PT): Projections based on post-2017 trends. EFTA: European Free Trade Association

8.4 Impact of USA Tariffs on its Import Basket

There is a diversification of the U.S. import basket away from concentrated dependence on China toward a more diversified pattern of imports across countries and economies. It is unclear however, to what extent it represents a structural shift in manufacturing supply chains and to what extent it is merely a shift in packaging, final assembly and testing operations of China's export-oriented supply chains to a diverse set of countries.

Figure 37 shows the country shares of USA imports of manufactured goods over the seven years from 2017 to 2024.China's share of US imports has declined by 10 percent from 26.6 percent in 2017 to 16.5 percent in 2024, marking a significant erosion of its earlier dominance. The gains were distributed broadly, with the "Rest of World" category gaining 3/5th of China's loss (with share increasing from 14per cent to 20per cent) and Rest of EU (ex-Germany, Ireland, Italy) gaining ~ 12per cent of China's loss. Within the EU, Ireland was the major gainer (+1,2per cent) and Germany a loser with a (-) 0.2per cent loss in US import market share. Japan (-1.6per cent) and Canada (-1.1per cent) were the major losers, from the structural adjustment unleashed by US-China tariff actions (***Figure 37***).

Figure 37: **Manufacturing Imports Market Share of USA**

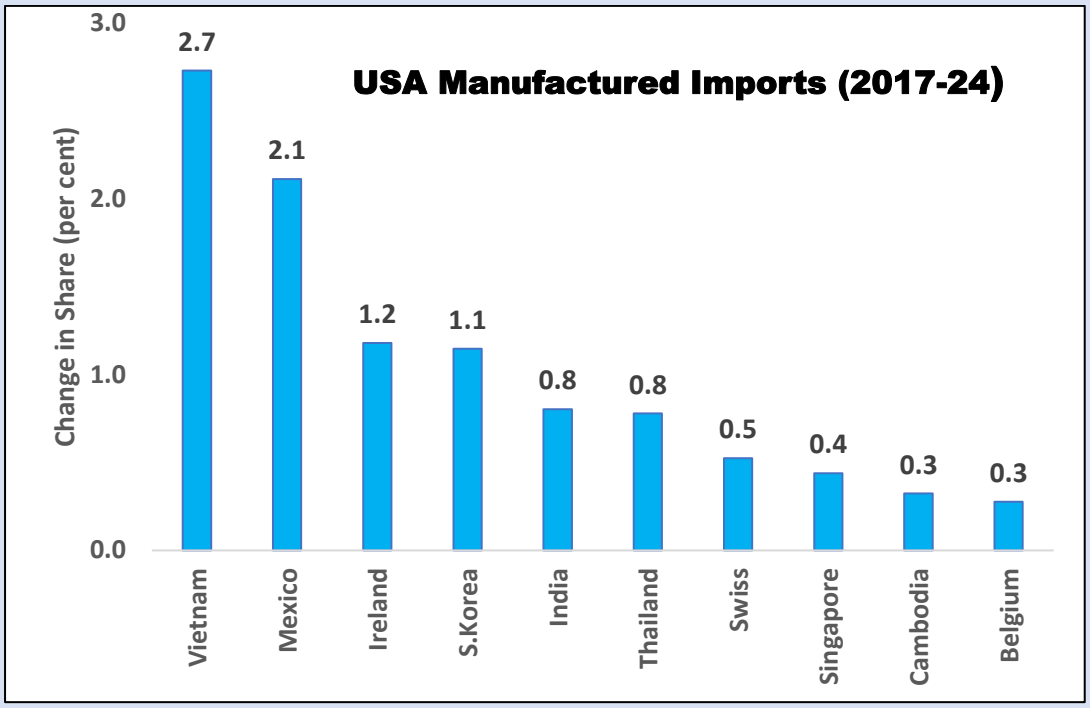


Source: Authors calculations based on UN COMTRADE.
Note: Rest of EU excludes Germany, Italy and Ireland who are amongst the Top 10 exporters to USA.

The top ten countries, ranked by gains in US manufactured import market share, during the seven years from 2017 to 2024 are shown in ***Figure 38***. They can be put into three sub-groups: China's RCEP members, NAFTA/USMC members, and Autonomous. The first group in turn has two sub-groups ASEAN and Rest of RCEP (RoR). The Autonomous group also has two sub-groups, Europe including EU, and Non-Europe Including India. The ASEAN sub-group has the largest number of countries in the top ten: Vietnam (1; +2.7per cent) the largest gainer, Thailand (6; +0.8per cent), Cambodia (9; 0.3per cent) & Singapore (8; 0.4per cent). They appear to have gained from China's strategy of shift the final stage of exports to friendly countries which are not subject higher tariffs imposed on China. It is relatively easy for Chinese and foreign companies to move the final stages of their China located supply chains (assembly, packaging, testing) to countries with which it is highly integrated and physically/logistically nearby.

In the RCEP ROR sub-group S Korea (+1.1per cent) is the 4th ranked gainer in terms of share of US manufactured imports, while Japan (-1.6per cent) was a significant loser (***Figure 38 & Figure 37).*** These changes, however, seem to be linked to S Korea's competitiveness in high-value, technology-intensive manufacturing (e.g. semiconductors) and Japan's reducing competitiveness in high tech products. In the USMC group**,** Mexico (+2.1per cent) is the second largest gainer, with increasing number of Chinese companies using it as an export base to USA, while Canada (-1.1per cent) was a significant loser from the USA-China tariff war (***Figure 38 & Figure 37).***

Figure 38: **Top 10 gainers of USA's Manufactured Import share (2017-2024)**



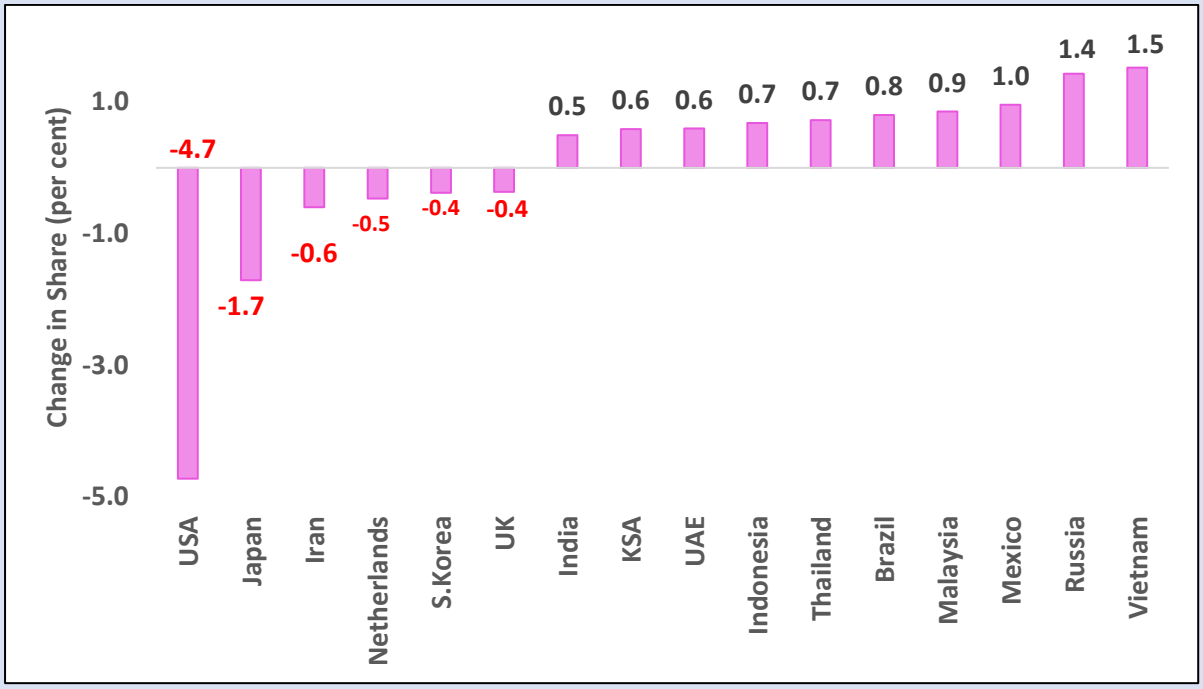
Source: Authors calculations based on UN COMTRADE.

The Autonomous Group's Europe sub-group, Ireland (3; +1.2) was ranked third highest gainer of US manufactured import share reflecting its pharmaceuticals and bio-tech exports to USA.[40] Switzerland (7, 0.5per cent) and Belgium (10, 0.3per cent), were other gainers, likely helped US China tariffs, to offset implicit or explicit subsidies available to Chinese exporters of high tech and medium tech goods. India (5; 0.8per cent) was the only gainer from the Autonomous, non-European, sub-group. Its exports to USA grew, as the US tariff surcharge on China, offset the 5per cent - 15per cent cost handicap of Indian producers on several labor-intensive products, already being produced in India, but not exported to USA. The results for manufactured import shares for Vietnam, Mexico, Korea, India and Thailand are broadly consistent with earlier studies of total import shares, which covered a shorter period.

Figure 39 presents the change in destination of China's manufactured exports during the same period (2017-2024). This shows a 4.7per cent decline in USA's share of (direct) manufactured exports from China between 2017 and 2024. Reflecting the effect of USA tariff surcharges and other bilateral measures, on imports from China. With some exceptions, the share of High-Income countries (HICs) in China's manufactured exports declined, while the share of Middle-income countries (MICs) increased. The exceptions were Iran an Oil & Gas exporting MIC, whose share in China's manufactured exports declined, and Russia, UAE & KSA, HICs which export Oil & Gas to China, whose share in China's manufactured exports increased (**Figure 39**). Leaving out these countries, Vietnam, Mexico, Malaysia, Brazil, Thailand, Indonesia and India saw the highest increase in China's export share. Four of the countries overlap with the top ranked gainers of US manufactured import share

[40] Though some authors have argued that Ireland's large pharma exports to USA reflect a shift of IP returns from high tax USA to low tax Ireland.

Figure 39: **Change in China's Exports Destination for Manufactured Goods (2017-2024)**



Source: Authors calculations based on UN COMTRADE.

Table 15, puts the US import sources and Chinese export destinations together, to judge what has happened to Chinese supply chains targeted at USA. The selected countries are the ones which are in both top ten rankings, plus other ASEAN countries relevant for the discussion of shifting supply chains. Among the Middle-income countries benefiting from US tariffs, Vietnam ranked first in change in USA imports share and in change in China's export share, Mexico ranked second in both. Thailand's share in China's exports increased more than India's, but its gain in USA's share was marginally less than India's (**Table 15**).

Table 15: **Major Change in Manufactured Trading Partners of USA and China**

	USA Imports (%)				China Exports (%)		
Country	**Change**	**2024**	**2017**		**Change**	**2024**	**2017**
Vietnam	**2.7**	5.0	2.3	1	**1.5**	4.5	3.0
Mexico	**2.1**	15.8	13.7	2	**1.0**	2.6	1.6
South Korea	**1.1**	4.7	3.5	9	**-0.4**	4.1	4.4
India	**0.8**	3.0	2.2	6	**0.5**	3.6	3.1
Thailand	**0.8**	2.2	1.4	4	**0.7**	2.4	1.6
Singapore	**0.4**	1.3	0.8	7	**0.3**	2.0	1.8
Cambodia	**0.3**	0.5	0.2	8	**0.2**	0.4	0.2
Indonesia	**0.1**	0.8	0.7	5	**0.7**	2.1	1.5
Malaysia	**0.0**	1.9	1.9	3	**0.9**	2.6	1.7

Source: Authors calculations based on UN COMTRADE. Note: CHN/USA is a ratio of change in China's exports to a country and USA's imports from that country between 2024 & 2017.

S Korea, Singapore and Cambodia were among the top 10 gainers of USA manufactured import share, but are not among top ten in China export share gains. Studies show that around 90per cent of Cambodia's textile exports are by Chinese companies and over half of total exports.

Malaysia and Indonesia were in the top ten of China's manufactured export share increase, but not in the top in USA list.

We also find that the cross-country correlation between US import shares of countries and China's export shares by country, has increased significantly from 0.41 in 2017 to 0.52 in 2024. Given that China is the supply base of many US companies, this suggests that imports from China may help make small countries exports to USA more competitive, likely because China has increased its import-substitution of intermediate inputs, parts and components used in these supply chains, during 2017=24. Small countries' factors of production (labor, land, skills) and domestic demand are limited, so backward integration is eventually constrained. Large countries like India have the incremental demand for manufactured goods, which when added to MNC's existing demand, can provide the minimum efficient scale (MES) for efficient backward integration, of supply chains ***(Figure 1*** & ***Section 11***). As different intermediate inputs have different MES and "potential demand" this generally happens in a sequential manner.

9. India's MVA-Export Gap is Opportunity

India is the 5th largest producer of manufactured goods (MVA) but is ranked 15th in exports of manufactured goods.[41] This gap is both a challenge for India and an investment opportunity for MNCs/MNEs from High Income countries. This section explores the paradox, in the background of the historically different development path and is convergence to the successful path chosen by East and South-East Asian countries. This provides an opportunity for MNC/MNEs from US, EU (Germany), Japan and South Korea to build supply chains in India which can compete with the increasingly monopolized Chinese supply chains.

One of the defining features of globalization in the last three decades has been the expansion of intra-MNEs trade (Baldwin & Freeman, 2022). The largest manufacturing MNEs (like automotive, electronics firms) rely heavily on intra-firm trade to move parts and goods within their networks (World Bank, 2017). The intra-firm trade has enhanced significantly and now accounts for 50-60 per cent of total trade flows (Anderton et al., 2022).

East and South-East (E&SE) Asian economies have undergone sequential structural transformation following the flying geese paradigm (Akamatsu, 1962). Japan, as the lead goose, pioneered capital-intensive manufacturing while successively shifting labor-intensive activities downstream to Korea, Taiwan, Singapore, and subsequently to Malaysia, Thailand and others. This was driven by adoption of export-oriented industrialization (EOI) strategy emphasizing reduced protection, export promotion, and FDI attraction. This dynamic model sequentially upgraded sectoral composition from initial specialization in labor-intensive consumer goods (textiles, apparel) progressed to durable goods (electronics, appliances) and eventually to capital goods (machinery, semiconductors) and knowledge-intensive services.

India adopted import substitution industrialization (ISI) strategy during the early decades, formalized through the Industrial Policy Resolution of 1956 (IPR 1956). It prioritized state ownership and domestic capital goods production with setting up heavy industries and Public Sector Units (PSUs). Imports were controlled, and Foreign direct investment was restricted

[41] South Korea is the has the 6th largest MVA and was the 5th largest manufacturer till a few years ago.

through the Foreign Exchange Regulation Act (FERA, 1973), which capped foreign equity at 40 percent. During 1976-1991 imports were liberalized by expanding the ambit of the Open General License (OGL), and industrial licensing relaxed, Virmani (2004) showed that India's liberalization during 1980s had a disproportionate impact on India's economy, with GDP growth nearly doubling from 2.9per cent per annum (1950-79) to 5.5per centper annum (1980-91), and per capita GDP growth tripled from 1.3per cent to 3.9per cent. The liberalization of capital goods imports, formerly restricted to the USSR, to allow imports from developed countries (OGL)played a critical role in this acceleration, which raised India's growth rate from the bottom quintile of all countries to the top quintile (Virmani, 2004).

The growth acceleration in India was, however, not accompanied by an acceleration in growth of exports. Over the 11 years from 1980 to 1991 India's global export share grew by less than 2per cent percent, while that of South Korea grew by 6.8per cent, of Singapore by 8.4per cent, Malaysia by 13.4per cent and Thailand by 19.4 percent.[42] A key reason for this differential was the slow liberalization of FDI by India, and the non-recognition of the role of MNE/MNCs as anchor investors in developing export quality supply chains. Multinational Enterprises (MNEs) and Corporations (MNCs) *were* attracted to the E & SE Asian countries because of their favorable industrial and FDI policies. They played a critical role in the growth of manufactured exports by E & S.A. Asian countries. MNCs produced '*standardized, mass-scale manufactured goods' and sold them to Developed countries.* MNC networks facilitated transfer of technology, expertise, and access to global markets without requiring decades of domestic capacity building in each of these areas. NIEs (South Korea, Singapore, Taiwan, Hong Kong), and later the NICs(Malaysia, Thailand) and subsequently China joined established supply chains in the 1980s and achieved an increased manufactured exports of low-tech labor intensive, medium-tech and high-tech goods (***section 5 & below***). India missed the opportunity for attracting MNEs/MNCs during 1970-2000, with negative consequences for its manufactured exports.

9.1 India's Manufactured Export Paradox

Like China, India's position in the global manufacturing exports was at a different level from NIEs in the 1960s, before they emerged as the first tier of the Japan led flying geese. In 1963, Indias's share of world manufactured exports (0.8per cent) was double that of Singapore (0.4per cent), eight times that of South Korea (0.1per cent) and 1.6 times that of ASEAN (0.5per cent).[43] In 1960s South Korea sifted from import substitution to export-oriented strategy. As the balance of payments improved in the mid-1960s, it joined GATT in 1967 and gradually relaxed some import controls, laying the groundwork for later market opening (Gills, 1996). South Korea's share of World exports rose rapidly between 1963 and 1973.

The 1970s was the worst phase in Indian external economic policy, with major MNCs like Coca-Cola, IBM and Kodak exited India in 1977 against the backdrop of Foreign Exchange Regulation Act (FERA) which mandated that foreign companies reduce their equity

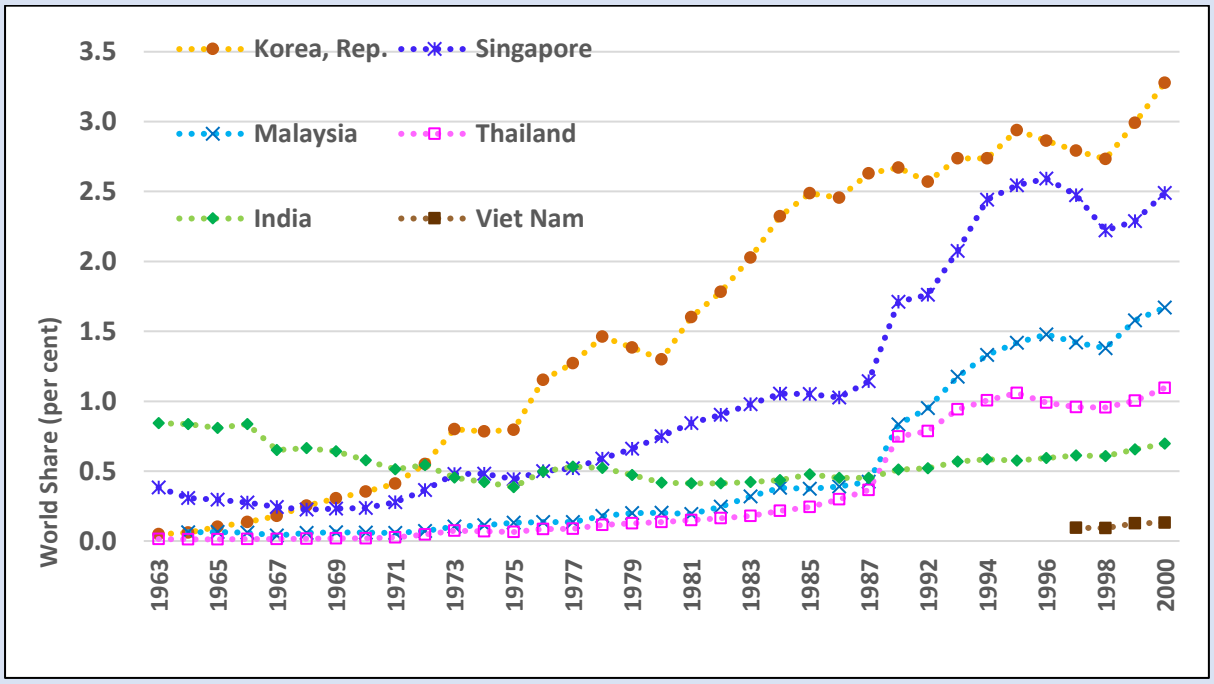
[42] India saw a rise of 0.1 per centage points (from 0.4 to 0.5 per cent), in its exports share of the manufactured goods in the decade of 1980-91. In the same period, South Korea saw a rise of 1.4 per centage points (from 1.3 to 2.7 per cent), Singapore rose by 1 per centage points (0.7 to 1.7 per cent), Malaysia by 0.6 per centage points (from 0.2 to 0.8 per cent) and Thailand by 0.6 per centage points (0.1 to 0.7 per cent).

[43] Data on Manufacturing Exports for China available from 1986 in case of China in WDI.

shareholding to a maximum of 40 percent. India's manufactured export share fell below South Korea, Singapore and ASEAN by 1973, and below Malaysia and Thailand (individually) in 1991.[44] The first tier flying Geese overtook India's manufactured exports in the 1970s, the second tier overtook India's exports in the late 1980s-early 1990s **(Figure 40**). The third-tier geese (Vietnam) exceeded India's manufactured export share in 2020, though the gap has reduced since then, with Vietnam's share declining.

India's export share was on a declining trend till 1981 but improved marginally by 1987 **(Figure 40)**Figure 41. The Alexander committee report on liberalization of Exim policy (1980), after its adoption and implementation in the next few years, marked a reversal in the protectionist approach to trade. Acceptance of its policy recommendations, along with other decontrol measures during the 1980s, resulted gradual recovery of export shares.

Figure 40: **Manufactures Exports Share of India & Asian (East and South-East) countries**



Source: Authors calculations based on World Development Indices, World Bank (accessed on December 2025).

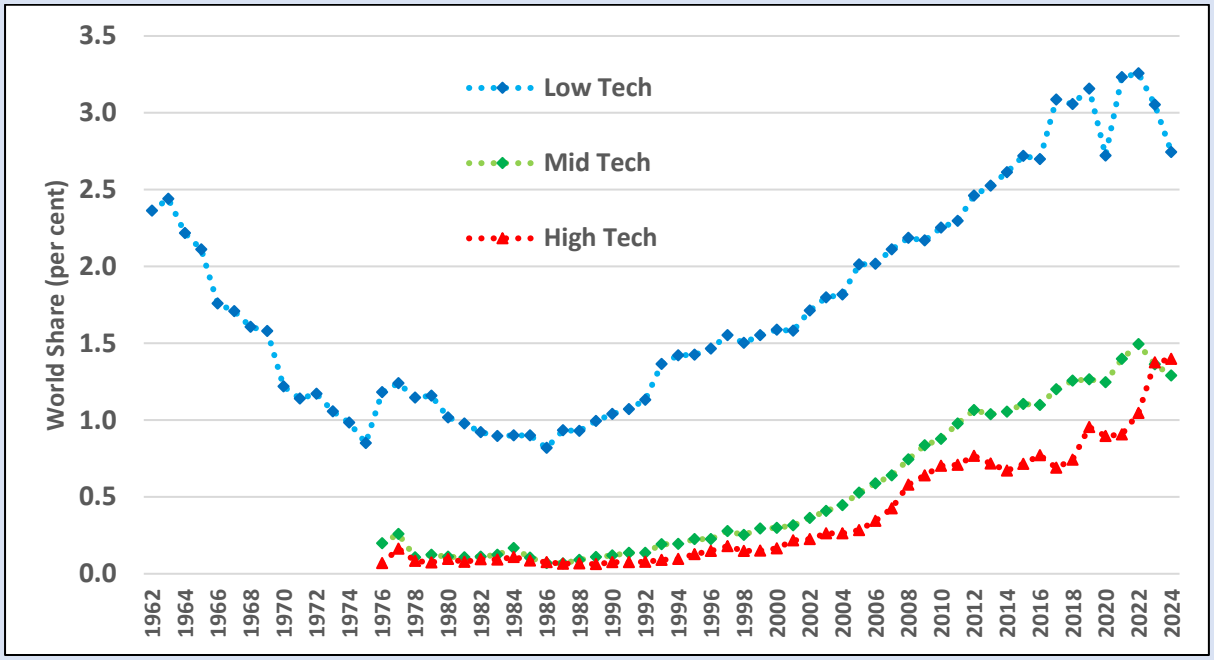
The trend and pattern of India's low, medium and high-tech exports **(Figure 41),** differs from that of China's (**Figure 21**). India's low-tech exports rose from a trough of 0.8 in 1986 to a peak of 3.2per cent in 2021, in a virtual straight line. China's low-tech exports had already risen in this manner from 1per cent in 1971 to 3.6per cent in 1985, with annual increment of 0.19per cent compared to India's 0.16per cent (**Figure 41**). China's share increase, accelerated thereafter, while India's continued its slow increase. FDI from Taiwan and Hong Kong, and MNE/MNC export supply chains played a critical role in China's export success. India's low-tech share started to rise gradually after the 1990s Economic Reforms, followed by medium and high-tech export shares

[44] Data from 1988, 1989 & 1990 is not available on WDI.

There is an equal, or greater, difference in China's an India's growth of medium and high-tech export shares, with India's medium-tech export share being higher than its high-the export share, with exception of a few years in in the late 1970s - early 1980s. It is completely the inverse in the case of China, implying that the stages of growth model fits India's market economy better than China's Socialist Market Economy, in which CCP controls the Commanding Heights of the economy.

The second important difference is that China's high-tech export growth accelerates to raise the share to the same level as low-tech expert shares, while India's have grown in parallel. China's High tech export share reached an infection point in 1999 and rapidly closed the gap with low tech esport share in next two decades, while India's share rising gradually broadly in parallel with low-tech export share (***Figure 21 & Figure 41***).

Figure 41: **India's Manufacturing Exports by Technological Structure**



Note: Low, Medium & High-Tech classification of goods based on Lall (1999) of SITC Rev. 2. Source: Author's estimation using UN-COMTRADE database (accessed using WITS); Estimates are based on mirror statistics for All countries that have reported (import) data from India. Labor Intensive goods are based on *Trade and Development Report, UNCTAD, 1996* (United Nations: New York and Geneva).

The difference in scale between China's and India's export shares after its reform and opening, is illustrated by the following: In 1976 India's Medium and high-tech export shares of 0.2per cent & 0.07per cent respectively compared well with China's 0.1per cent in both. After China's reform and opening in 1978-9, China's global share (0.4per cent in both) increased to 5 times that of India (0.08per cent in both) by 1986. In the 2000s the ratio of China's share to India's share has been 9 for medium (and low) tech exports and 18 for high-tech exports.

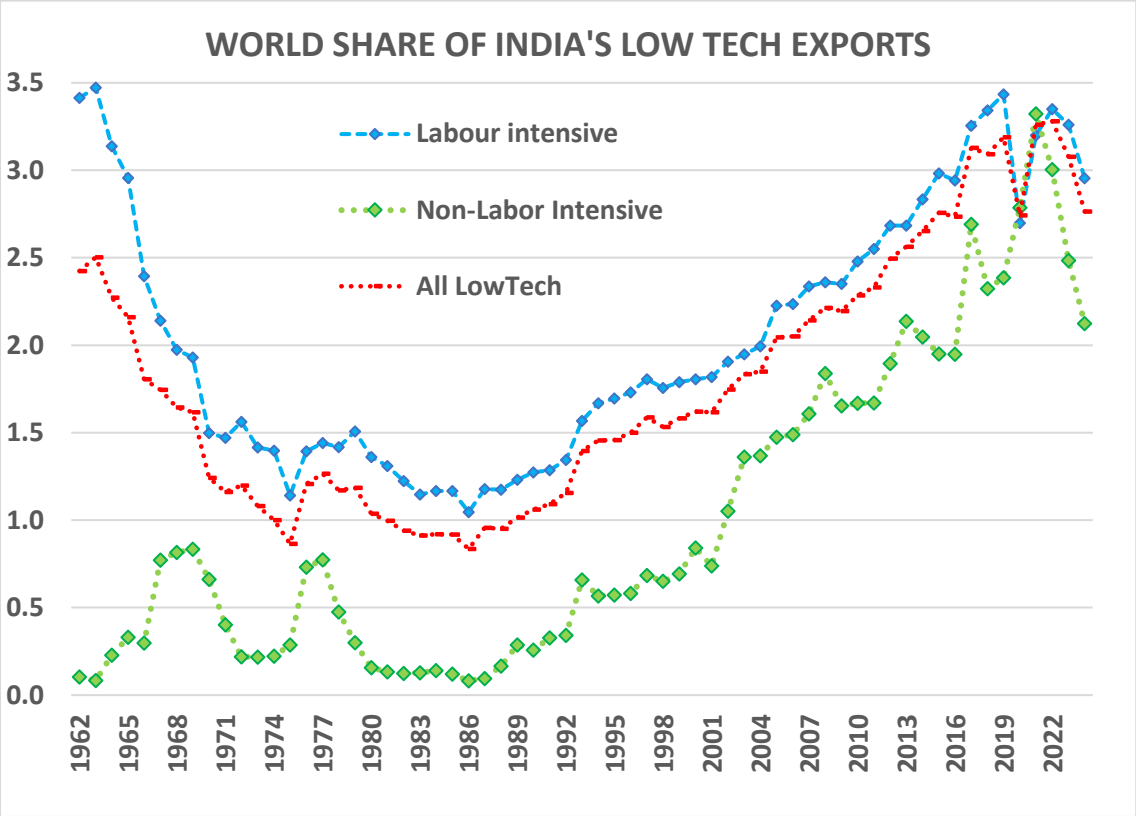
9.2 India's Low-Tech Exports

India's World share of low-tech manufactured exports forms a U-shaped pattern from 1962 to 2024. The share was 2.5 per cent early 1960s, 2.8 times that of China (0.9per cent), and multiple times that of South Korea, Malaysia and Thailand. (**Figure 17**). The share formed a double trough in 1975 and 1986 at less than 1per cent, driven by the labor-intensive portion of low-tech (LILT). The latter also forms a U shape, but with even higher export share of 3.5 per

cent of world's total exports in 1962 (***Figure 42***). The decline of export shares coincided with the period of "Bureaucratic socialism" from 1950 to 1980. It was followed by gradual decontrol of imports and industry during the 1980 [Virmani (2004)], leading to a recovery of LTLI share to 3.4per cent in 2019, marginally less than in 1962.

The non-labor-intensive sectors within the low-tech (LTNLI) have risen sharply after the 1990s economic reform to close the share gap with LTLI and reverse it in 2020. However the export share of LTNLI is 2per cent below the share of LTLI in 2023-4. Post-Covid the export share of LTLI has seen fluctuations compared the earlier years when it followed a relatively smooth pattern **(Figure 42).**

Figure 42: **India's Low-Tech Exports by World Share**



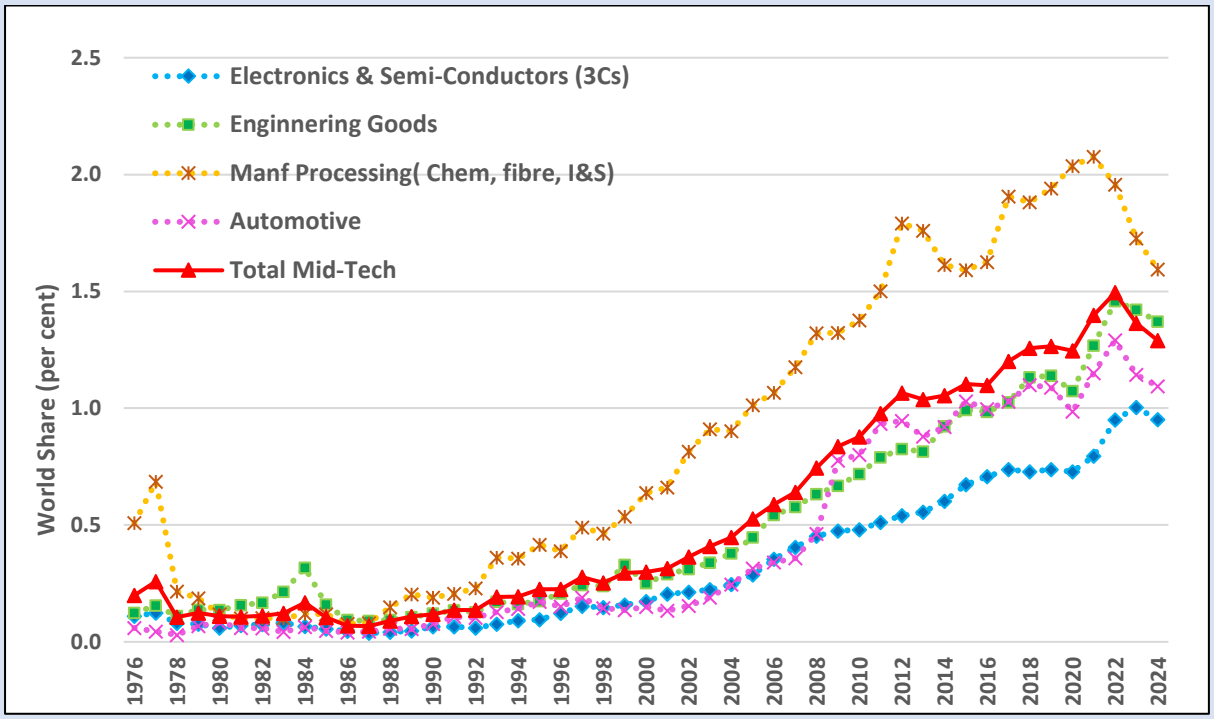
Vietnam's low-tech exports are almost double those of India's. At a disaggregated level Vietnam has 11 times India's footwear exports, over 7 times its furniture exports, 2.6 times its Travel goods, handbags etc, and more than double its clothing & paper products exports. Supply chains set up by MNCs like Samsung, built over decades, and recent shifting of labor-intensive parts of Chinese supply chains, have been critical to this success.

India is competitive in most of these exports but lacks the MNEs who can provide the mass market and the scale & speed of high-quality supply chains, needed supply the HIC markets. Apple I phones has demonstrated that such supply chains can be created as quickly in India as they were in China.

9.3 India's Medium-Tech Exports

This section disaggregates medium tech exports into four sub-aggregates, as in previous section on China. The importance of sub-aggregates was different in India compared to China (**Figure 43 &** ***Figure 24)***. In China Export share of Electronics and semiconductors (E&SC) showed the fastest increase, while it was the slowest in India, post-GFC. Process manufacturing export share were the leader in India but rose slower than total medium-tech in China. Export shares of Engineering were second ranked in both countries, but exceeded total medium tech shares in China, and lagged them in India. Automotive export shares, which were the slowest growing in India during early years, rose to catchup with engineering shares after GFC 2008 in India but remained lowest in China (**Figure 43 &** ***Figure 24)***.

Figure 43: India's Total Medium-Tech Exports & Constituents by World Share



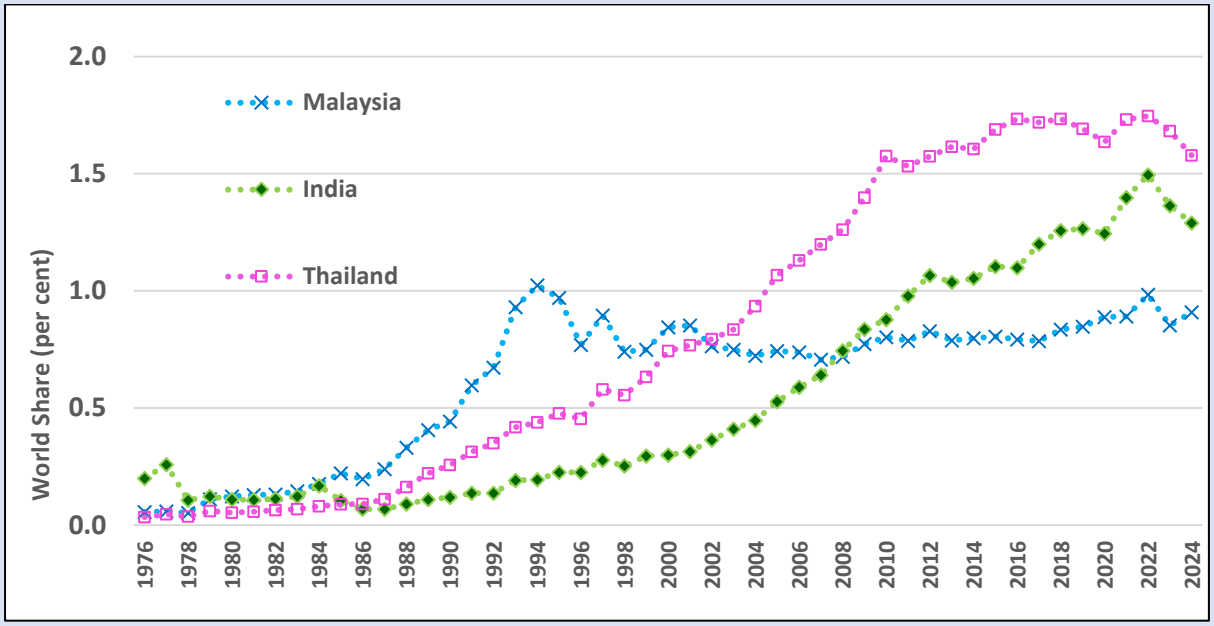
The manufacturing processing segment, which includes synthetic fibers, chemicals, fertilizers, pig iron and fittings, contributed more than 50 per cent to the total rise in the share of the medium-tech sector between 1985 & 2000. It started rising after 1988 and accelerated the economic reforms of 1992. Engineering goods and automotive export shares followed the trends of the total medium-tech exports share but remained below it. There was a significant jump in the world share of automotive exports after 2008, from 0.5 per cent to 0.8 per cent of the total world exports. The *electronics and semi-conductors* (E&SC) are the trailing segment since 2008. E&SC segment is catching up, post-COVID, with a rise in export share to 1 per cent of world exports **(Figure 43).**

Thailand and Malaysia progressed as per the flying geese pattern (*Section* ***5.3).*** While Malaysia surpassed India's share in 1986, Thailand overtook India the following year in 1987 **(Figure 44).** FDI and MNCs played a critical role in raising the Medium-tech exports global

exports share of Malaysia and Thailand. Vietnam's total medium tech manufactured exports are only 70per cent of India's, but it has used the same approach as Malaysia and Thailand, of inviting and laying out the red carpet for anchor MNEs. Consequently it has achieved exports of selective medium tech products which are multiples of India's: These are Gramophones, dictating, sound recorders (40x), Radio broadcast receivers (16x), Ships boats and floating structure (8x), Household electrical & non-electrical equipment (6x), Watches and clocks (4x) and Optical goods nes (3x). MNCs and Chinese companies use Vietnam as a base for labor intensive assembly, testing and packaging, with intermediate parts and components imported from their supply chains in China, and from home country (e.g. S Korea).

India missed the MNE bus during 2000 to 2015, but It now has another, chance to catch up with Thailand and Vietnam in medium tech exports with a labor-intensive production stage, given its demonstrated success with Apple mobile phones.

Figure 44: **Comparative Medium-Tech Exports Trend for India, Thailand & Malaysia**

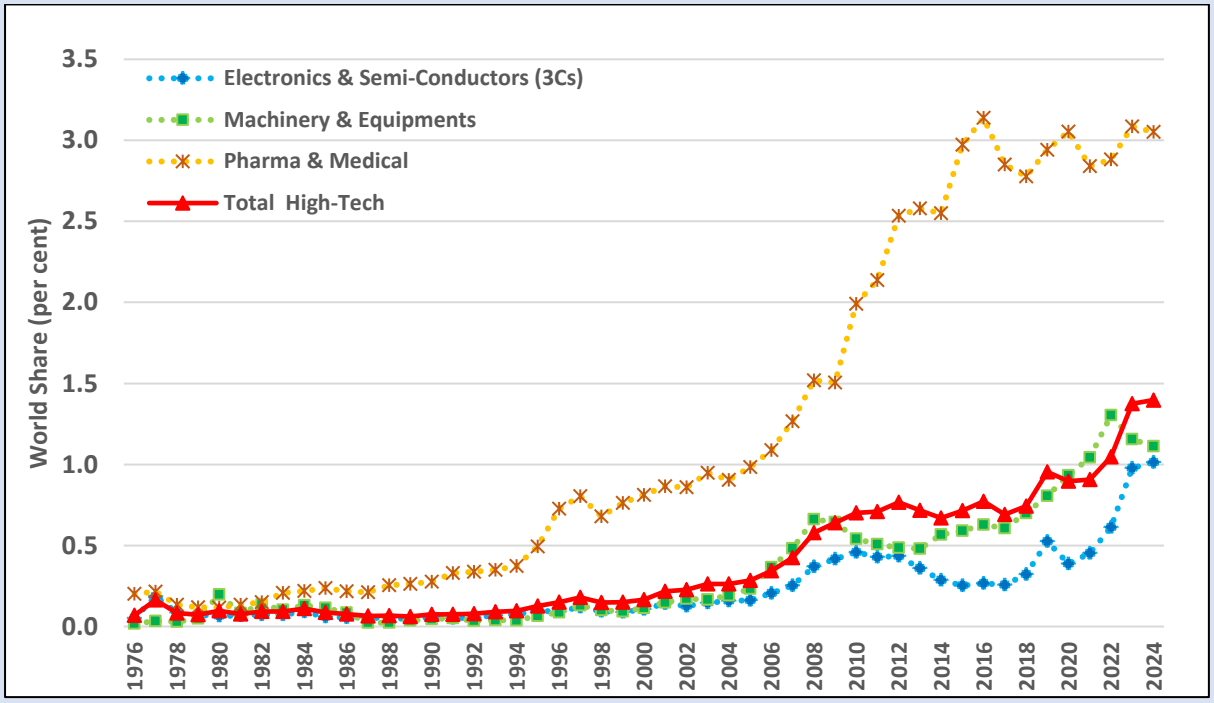


9.4 India's High-Tech Exports

India's High-Tech exports as share of World, started rising after the economic liberalization of 1991, tripling from a trough of 0.06per cent in 1989 to 0.18per cent in 1997 **(Figure 45).** The global share has risen in two spurts from 2005 (0.3per cent) to 2012 (0.8per cent) and 2018 to 2023 (1.4per cent) interspersed with setbacks; almost tripling in the first spurt and doubling in the second**.** The rise in the share of high-tech exports was led by exports of Pharmaceutical and medical products, global share of which increased from 1per cent in 2005 to 2.5per cent in 2012. The share stabilized at around 3per cent from 2015 onwards, with no visible boost from the pandemic (2020). The global export shares of Machinery and Equipment and Electronics & semiconductors remained below the total high tech for most of this period (**Figure 45**).

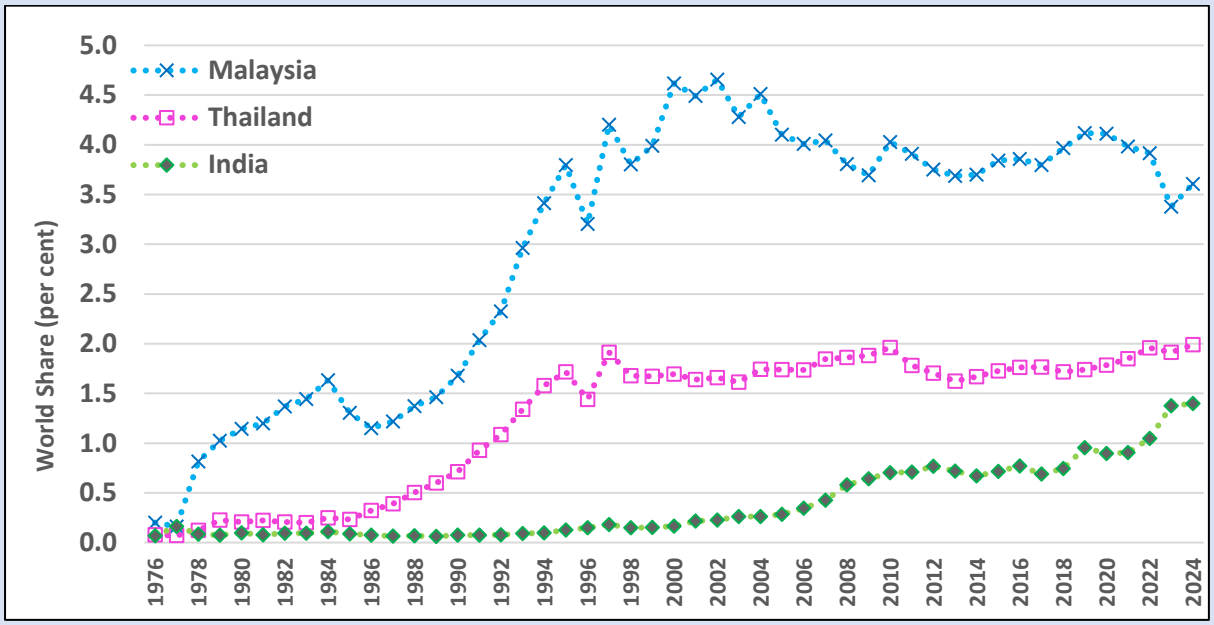
Between 1985 and 2000, pharmaceuticals contributed more than half of the rise in total high-tech exports. After 2017, E&SC has contributed 70 per cent to the rise of India's high-tech exports, consequent to the heightened policy focus on the electronics sector. India currently (2024) has a 1.4 share of high-tech global exports, 1.3per cent share in Pharma and medical, 1.1per cent in machinery & equipment and 1per cent in Electronics & semi-conductors.

Figure 45: **India's Total High-Tech Exports & Constituents by World Share**



India's high-tech exports have lagged those of Malaysia and Thailand, though India has closed the gap since the former peaked at the end 1990s. India's gap with Malaysia is triple that with Thailand (***Figure 46***). Malaysia and Thailand were successful in attracting FDI from American companies as anchor investors starting from the mid-1970s and mid-1980s respectively. These companies started by transferring their labor-intensive assembly operations, and after demand for specific intermediate inputs exceeded Minimum efficient scale (MES), backward integrated to create supply chains.

Figure 46: **Comparative High-Tech Exports Trend for India, Thailand & Malaysia**



India missed this opportunity, because it failed to appreciate this new form of FDI and did not create the policy framework and infrastructure to attract them. This began to change in late 2010 and during & after the pandemic (2020), with the realization that manufacturing focused FTAs with developed countries are as much (if not more), about FDI investment in supply chains, as about trade. Given the global slowdown in growth of manufactured imports and increasing anti-globalization sentiment in HICs, a lot more effort is needed to induce MNE to diversify their supply chains from monopoly locations to India. This is gradually being recognized at different levels of Govt (Center, State, Local).

9.5 Quality Chains and Demand

India's approach of developing its own capacity rather than relying on the MNCs led to India acquiring relatively larger share in *'niche products' and specialized handmade products*. For instance, India had more than 5 per cent share of the leather products in 1990, while the entire low-tech segment share was around 1 per cent. Niche products are batch produced, and labor intensive, with limited mechanization. These methods are competitive for specialized products (eg handicrafts) with limited demand. India's niche products, therefore, generally have high value per unit and strong differentiation, but remain inherently limited in volume and scalability (Gereffi, 1999; UNIDO, 2020). The global demand for niche and special products grew at a slower pace than the mass-scale products, which dominated the global demand led by the MNCs. This is part of the reason for the large gap between its MVA rank (5) and manufactured export rank (15).

Another aspect of the issue is economic dualism in manufacturing sector, with organized/formal and unorganized/informal sectors. The supply chains of these sectors differ in terms of the quality of machinery & equipment, managerial & technical skills and the quality of intermediate goods, parts and components used and the quality of the final output. Formal firms use relatively modern, higher-capacity machinery, apply routine maintenance, and invest

in fixed capital. Informal firms tend to use older, lower-capacity, or improvised equipment. This directly affects unit costs, tolerances and reproducibility of outputs (Kathuria, 2013). Similarly, in terms of skill-level, survey evidence shows formal firms have a higher incidence of formal training and skill certification; informal firms rely more on informal, on-the-job learning and have much lower formal training rates (NCEUS, GOI, 2009). Multiple studies using firm-level data have also shown that formal firms achieve higher measured efficiency and productivity (TFP), controlling size and sector, implying better use of labor and capital (Kathuria, 2013).

Formal/organized and informal/unorganized manufacturing form separate quality chains, though there is some overlap between them.[45] As the complete chain is only as good as its weakest link the intermediate, parts and component cannot be replaced by lower quality parts from the unorganized sector without affect the quality of the final product. For instance, a high-quality leather bag requires high-quality zip-lock and inner fabric material amongst many other intermediate goods. Similarly, in case of mobiles, a very specific quality of aluminum is required, absence of which can halt the entire production process of that product, or the quality of the complete mobile phone.

India's manufacturing industry remains dualistic with narrow formal private apex and a very broad informal base India's socialist policies and bias against MNCs/MNEs. The unorganized (informal) segment accounts for about 3/4th of manufacturing employment, while contributing a much smaller share of manufacturing GVA (estimates around one-quarter to one-third of manufacturing GVA) (Goldar, 2023). In contrast, Malaysia and Thailand today have much smaller shares of unorganized manufacturing in terms of employment and value-added within manufacturing (World Bank, 2024). This means that their international & domestic quality chains are much more integrated than India's.

Table 16 brings-out the progress in India's MVA and exports share ranking over the last three decades (1994-2024). The situation has, however, improved over the last 30 years albeit very gradually. where we can see the gap improve from 13 in 1994 to 12 in 2004 to 10 in 2024. In 1994, India was the 12th largest producer of manufactured products (MVA) in the world, while it was at 25th place in World manufactured exports. In the last two-decades, India has become the fifth largest producer, while its exports-share is still around 15th highest in the world (**Table 16)**. There has been a marked improvement in both these aspects, with enhancement of quality of products, skills and productivity in the informal sector[46]. However, with the entry of MNCs, India has the potential to substantially improve its export share in the world as these MNCs bring-in skills-sets and the know-hows to enhance the productivity of the workforce.

[45] For instance, the informal sector buys many raw materials & inputs like man made fibres, chemicals and plastic materials from the large scale, organized, formal sector, there is far less flow in the other direction.

[46] The PM Vishwakarma Scheme is launched with the objective of providing end-to-end support to traditional artisans and craftspeople by enhancing their skills, access to modern tools, affordable credit, and market linkages. It also aims to integrate them into formal economic systems while preserving and promoting India's traditional crafts and heritage. Early outcomes of the scheme show large-scale enrolment, skill training, and initial access to credit and digital platforms for traditional artisans.

Table 16: **India's Global rank in Manufacturing VA & Exports: 1994 to 2024**

Year	Manufactured Export	Manf Value Added (MVA)	Rank Gap: MVA - Export
2024	15	5	-10
2019	15	6	-9
2014	16	6	-10
2009	20	8	-12
2004	24	12	-12
1999	25	12	-13
1994	25	12	-13

Source: Authors calculations based on WDI.

The experience of East and S.E. Asia provides some lessons. Freedom to import and low or zero tariff imports are critical to building quality chains, as it is inefficient and risky to set up the complete supply chain in one place, at one go. Non-availability of any intermediate input of specific quality becomes the weak link in the quality chain. Access to global quality imported inputs is therefore a critical factor in the decision of MNEs/MNCs, to set up assembly operation and manufacture labor-intensive intermediates. Even if zero duty imports for export production are freely permitted, possibility of import restrictions or bans on intermediate imports is a risk factor which discourages MNE/MNC investment in supply chain. This raises the risk of, (1) Aggregating domestic demand to MNC export demand in raising total demand above "Minimum efficient scale (MES)" of production, and (2) Aggregating the expected growth of domestic demand for quality goods in a middle-income country, with MNCs international demand to build scale ahead of demand.

Democratic India is the only lower middle-income country in the World, which has the potential to match in next 15-20 years, the potential Communist China provided to MNEs/MNCs in 1990-2008, both on the demand and supply side. India's formal sector has the potential to integrate with export quality supply chains, for virtually every product exported by China to the HICs. It has democratic credibility to protect intellectual property and ensure that foreign brands compete fairly with domestic brands and not be driven out by subsidies and unlimited credit and other discriminatory support to provincial party companies. In the OECD Regulatory Restrictiveness Index, India is ranked above Vietnam and three ranks above China, PRC, five ranks above Thailand and eleven ranks above Malaysia[47].

In this environment, MNEs can build secure and trusted supply chains in India, while contributing to the development of export quality eco-systems for network products like electronics and semiconductors. Apple's experience with Mobile production has shown that Indian firms can be individually competitive with China in 3 years. The only thing lacking is the eco-system for intermediate inputs. As demand volumes build above MES for specific items, these will also be produced one by one. There are medium-size companies and startups

[47] Mexico, Cambodia and Bangladesh are 13, 26 and 27 ranks above India, respectively

in India, which can produce the most complex and sophisticated sub-assemblies, components and parts. They just need orders and temporary handholding by MNCs and their large suppliers.

9.6 MNC Parochialism in Supply Chains

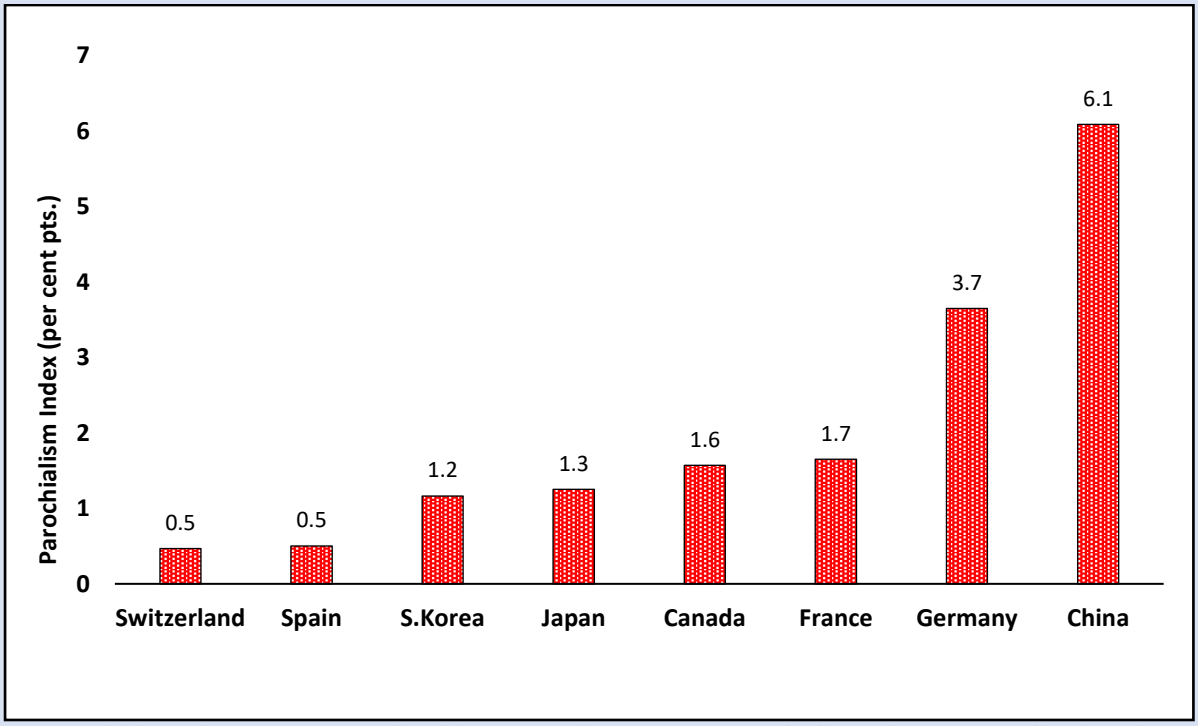
MNCs provide seamless access to the global manufacturing supply chain, resulting in high manufactured export shares of host countries, most of the global trade is intra-MNC and inter-MNC. India, however, signed FTAs with Japan and South Korea in the 2010s, to facilitate the entry of their MNCs into India. Aa latecomer, it has been difficult to break into established Japanese and Korean supply chains in in China and ASEAN. There seems to be an element of inertia and parochialism involved in some MNCs decisions to shift investment and imports to new countries, which are cost competitive. This section presents an index of parochialism which allows a comparison of different host country MNCs, from USA, Europe and Asia, to measure this factor.

The 'Parochialism Index' is defined as the difference between a country's global Import share and its share of (all) exports from India. The index is calculated for the top 25 manufactured goods importers in the world, whose aggregate imports are around 70 per cent of the total World manufactured imports. These 25 countries are also the destination for close to 70 per cent of India's exports. A range of -0.5 to +0.5 is taken as neutral, while positive values above it indicates bias. A negative Index is taken as indicator of the absence of parochialism with more negative values indicate greater flexibility. USA's parochialism index is found to be the lowest of the 25 countries. This is because USA MNCs prioritize profit maximization economic competitiveness and are much more open to the other markets satisfying their quality specifications. This shows the appreciable openness of USA compared to other democratic countries. UAE too has a very low parochial index.

The index is virtually zero (± 0.5 per cent) for European countries like UK, Netherlands, Belgium and Italy. This means that the MNCs in these countries show no parochialism towards India. Therefore, we use these countries as a benchmark for evaluating other democratic market economies. UK, Netherlands and Italy are ranked 6th, 5th and 10th in manufactured import shares, and 12th, 5th and 7th ranked in world manufactured export shares (**Figure 47**). Switzerland (part of EFTA) and Spain are in the neutral zone with a parochial index of 0.5. Singapore (HICs in South-East Asia) is even less parochial than the benchmark.

South Korea and Japan, the High-Income manufacturing giants have a higher parochial index of 1.2 and 1.3 respectively (**Figure 47**). These countries have many leading MNCs, which seem to have an inertial preference for importing from their subsidiaries or partner organizations in Southeast Asia and China, rather than risk of buying from new, potentially more competitive supplier in India. This happened despite a South Korea – India CEPA since 2009 and a Japan - India CEPA since 2011. The lesson is that CEPA's need to be complemented with an MOU on FDI targets, which their MNCs can be guided to attempt to fulfill.

Figure 47: Index of Parochialism vis India's Manufactured Exports (2024)



Note: Parochialism Index = (Country Imports/ World Imports)- (India's Exports to Country/ India's Total Exports to World). Figures for 2024.
Source: Authors calculations based on UN COMTRADE (accessed using WITS)

Canada (8th largest importer) and France (4th largest importer) have the parochial index even higher than Japan's. The Canada index may be distorted by the USA-Mexico-Canada (NAFTA) free trade agreement and can be corrected by a CEPA. In the case of France, the language barrier may require greater attention, after the EU-India FTA is formally signed. Germany's Index of 3.7 is more than twice that of France and almost thrice that of Japan and South Korea (**Figure 47**). German MNCs rightly make a fetish of quality and seem to trust only their own subsidiaries, for quality assurance of their intermediate and final products. Unlike the French, Germans have less of an issue with English language, implying it is not an obstacle. It is hoped that the increasing strategic understanding between Germany and India, will induce German MNCs open their production units in India (post-signing of India-EU FTA).

The parochial Index of China at 6.1 is the highest among the top 25 importers of manufactured goods in the world. It is 65per cent more than Germany. China's economic model functions less like a conventional nation-state and more like its Communist party, with all critical decisions and plans approved by the National leadership, but implemented by provincial party-govts, with a great deal of autonomy and flexibility (see appendix for details). This flexibility must be exercised without violating any fundamental tenet of the Communist party (as defined by current leadership). One of these tenets is that every Chinese company is part of CCP led China Inc, when dealing with external economies and companies. The party (CCP) dictates the rules including for MNCs, as per McGee's *'Apple in China (2025)*.

This corporate-like structure of China Inc makes China's Parochial Index vis-à-vis India, very revealing. When viewed alongside China's high and rising manufacturing trade surplus with India, it captures China's Strategic Economic goal with respect to India. India is seen as a

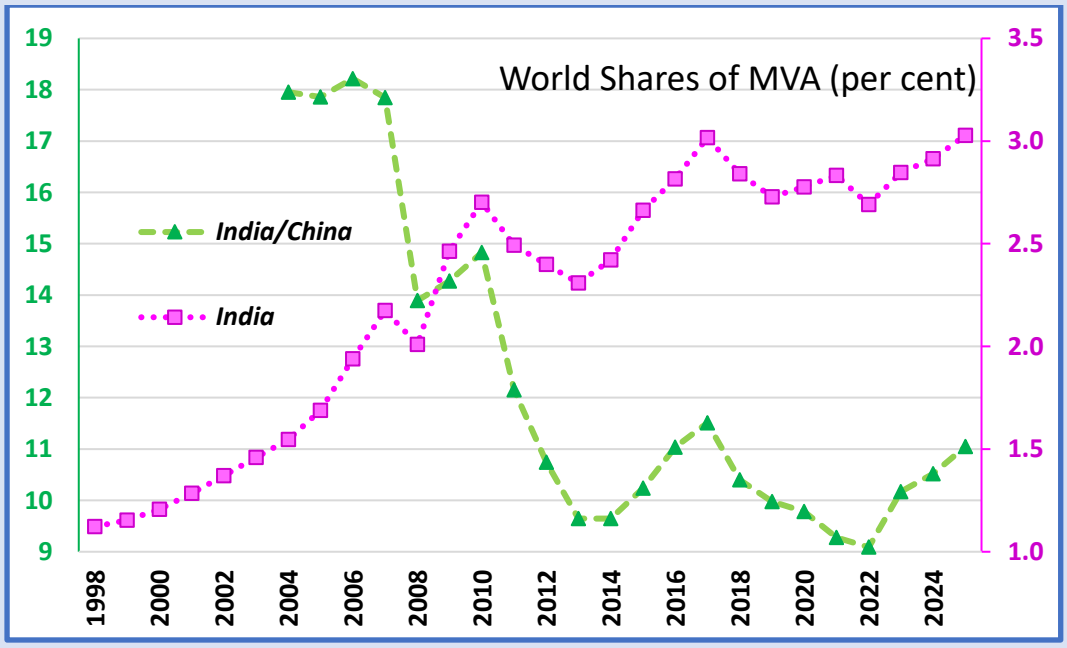
market for its manufactured goods, import from which should be minimized to slow its economic rise and create asymmetric dependence. China's actions, including those since the pandemic, have demonstrated how such asymmetric dependence can be used for geoeconomic, geopolitical and strategic coercion.

Middle-income countries like Thailand and Malaysia have a smattering of MNCs. Their parochial index within the neutral range (0 ± 0.5per cent). Lower Middle-income Vietnam also falls within the neutral range as do upper middle-income Brazil and Turkey.[48]

9.7 India Welcomes MNE Anchor Investors

Since the economic reforms of the 1990s India's share of World MVA has been rising during the decade of the 2000s, with two significant setbacks- during 2011-13 and 2018-19 & 2022 (***Figure 48)***. Consequently India's MVA ratio to China's MVA share was flat at around 18per cent during 2004-07 (the earliest years for which China's MVA data is available) and declining in spurts till 2013. The China/India MVA ratio fell by 4per cent to 14per cent during the Global Financial crisis year 2008, and during 2011-13 (***Figure 48)***, as India's MVA share declined due to retroactive tax issue and related disagreement on BITs, while China's continued to rise (***Figure 7***).[49]

Figure 48: India's Share of MVA relative to China's



India's MVA resumed its uptrend after 2014 as economic reforms resumed, raising the India/China MVA to 11.5per cent by 2017 (***Figure 48)***. Major reforms included (1) Goods and Services Tax (GST), combining numerous State indirect taxes into a single, integrated tax, (2) An Indian Bankruptcy code (IBC) covering all assets, was legislated for first time (not just Debt recovery for Bank lending), (3) A Monetary Policy Committee (MPC) was set up to

[48] Russia's latest data on manufacturing imports is for 2021, so it is difficult to compare with 2024.

[49] These included retroactive tax policies, delays in environmental clearance, 2G spectrum and coal block allocation scam, unrealized capital gains on startups, and moves towards a more restrictive BIT framework, accompanied by non-renewal of expiring Bilateral Investment treaties (BITs), and Land Acquisition Act (2013).

independently determine policy interest rates. (4) FDI caps in defense and insurance were raised from 26per cent to 49per cent.[50]

India's share of World MVA declined after 2017, as did the ratio of India's MVA to China's (***Figure 48)***. Demonetization and other black money related laws, rules and enforcement measures, were largely responsible for turning sentiments. The two waves of pandemic in 2020 and 2021 added to the adverse sentiment, resulting in India's MVA share in World MVA declining to 2.7per cent and its ratio to China declining to a low of 9.1per cent. The govt didn't however, let the Pandemic Crisis go to waste, and introduced more reform measures in the Budget of 2021-22 and thereafter. These helped raise India's global MVA share to a new peak in 2025, marginaly above its previous peak in 2017. It also increased India's MVA by 2per cent from 9per cent (2022) to 11per cent (2025) of China's in three years (***Figure 48***).

There is an uptrend in the ratio of India's global MVA share to China's, from 2013 to 2025, despite the spate of exogenous shocks (Pandemic, Ukraine war, Trump tariffs and Iran war). India's Atman Nirbhar (self-reliance) strategy now clearly recognizes the need for Foreign trade, investment and technology partners, and the need for facilitating MNE/MNC anchor investors. There are a number of Global indicators, which show the effects of India's economic reforms during the past decade. In addition to the reforms mentioned above there has been a change in India's policy towards FDI. Virtually all sectors have been liberalized, including Defense Production, Space and Nuclear sectors. India has put out a red carpet for Multi-National Enterprises/Companies (MNEs/MNCs), and the Indian Government is actively wooing these companies, for the first time in its history.

India has also liberalized trade (imports) from Developed countries during the last five years by signing a host of FTA. All these FTAs are reciprocal — both India and partner HICs grant duty-free entry to 90-99per cent of manufactured goods, though sensitive sectors have phased reductions. Indian exports like textiles, engineering goods, auto components, and electronics gain duty-free access to developed markets, thus removing the disadvantage of 10-12per cent suffered by Indian exporters vis-à-vis Lower Middle-income countries, like Vietnam. These include updated CEPA's with Japan (2011; 2022), South Korea (2010; 2019), ECTA with Australia (2022), TEPA with EFTA (2024-25), CETA with UK (2025-26), EU (2026-27).

The OECD FDI regulatory restriction index is just one indicator of the positive chages. Since 2018 India has been more open to FDI than Thailand, Malaysia, Philippines and Indonesia, and is more open than Vietnam and China in 2024. Only Mexico and India have improved their rank between 2018 and 2024 (**Table 17**).

[50] Macro stability was restablised afer the mini-BOP crises of 2013, retrospective taxation was circumscribed, registered startups were exempted from the capital gains tax, Environmental clearances were eased,

Table 17: FDI Restrictiveness Index & ranking

Country	Index		Ranking	
Year	2018	2024	2018	2024
Cambodia	0.10	0.10	56	58
Korea	0.10	0.10	58	61
Mexico	0.15	0.15	72	71
India	0.23	0.22	85	84
Viet Nam	0.22	0.22	84	85
China: PRC	0.17	0.23	75	87
Thailand	0.24	0.24	89	89
Indonesia	0.48	0.28	100	93
Malaysia	0.32	0.32	92	95
Philippines	0.42	0.36	98	100
Lao PDR	0.40	0.40	97	102
Source: OECD FDI Regulatory Restrictiveness Index				

India has further reformed its Goods and Services Tax and replaced its 50-year-old Income Tax code with a modernized one. India's new Income Tax Code (Income-tax Act, 2025) was passed by Parliament in August 2025 and came into force on 1 April 2026 after the Income-tax Rules, 2026 were notified in March 2026. GST 2.0, a major overhaul of India's indirect tax system, was notified in September 2025 and became effective from 22 **September 2025**.

Four new labor codes which consolidate 29 existing labor laws into a streamlined framework for wages, social security, industrial relations, and workplace safety is in effect from 2026. These are the Code on Wages (2019), Industrial Relations Code (2020), Code on Social Security (2020), and Occupational Safety, Health and Working Conditions Code (2020). They were officially notified in 2025 and came into effect on 21 **November 2025**, with rules fully framed and effective from that date.

The World Bank's Logistic Performance Index, LP (1.0) had shown that India had made good progress on logistics between 2016 and 2023, performing well compared to East and Southeast Asian. The new index LPI (2.0) uses digitally recorded data on all countries. This data can be viewed in two parts, the number of trade-related partnerships and data on delivery times through different transport methods such as air, postal, and sea. The number of India's partner countries in Aviation, Postal delivery (B2C and B2B) and Maritime is more than Thailand, Mexico, Vietnam, Indonesia and Malaysia and just behind China's ***(Table 18)***. India's country partners in services are however less than those of Malaysia and Vietnam (besides China). India's weakness in Alliances is being rapidly corrected, through a spate of FTAs including UAE, New Zealand, Oman, besides the HICs mentioned earlier.

The second set of Logistic Performance Indicators relates to delivery times. India's performance falls broadly in the middle of the seven countries shown, namely China, India, and the MIC 5. ***Table 19*** *(columns 3, 8 & 9) show that I*ndia's mean and median aviation delivery times are 1.1 days and 2.2 days, which is far better than those of Vietnam.

Table 18: Logistic Performance Index – Number of partners (2024)

Country	Number of partners countries in								Number of			
	Aviation		B2C postal		B2B postal		Maritime		Services		Alliances	
	score	rank	score	rank	score	rank	score	rank	score	rank	score	rank
China	145	1	153	1	145	1	94	1	627	1	4.2	1
India	141	2	124	2	126	2	64	3	139	4	1.0	6
Thailand	123	3	102	4	102	4	38	6	98	6	3.2	2
Mexico	123	4	81	7	84	6	52	4	59	7	3.0	5
Malaysia	117	5	120	3	111	3	74	2	208	2	3.0	4
Vietnam	108	6	87	6	83	7	48	5	187	3	3.2	3
Indonesia	107	7	92	5	99	5	28	7	128	5	1.0	7

Source: World Bank, Logistics Performance Index (2.0)

Table 19: LPI (2.0) Delivery Times (2024)

Indicator	China	India	Indonesia	Malaysia	Mexico	Thailand	Vietnam	Ind/VT
1	2	3	4	5	6	7	8	9
Aviation import dwell time (days)								
Median	0.4	0.9	1.1	0.4	0.8	1.2	1.7	0.53
Mean	1.3	1.8	2.2	0.9	2.0	1.9	2.4	0.75
Interquartile	8.3	9.2	7.7	7.8	8.1	6.3	7.5	1.2
B2C postal delivery time								
Median	4.4	5.0	6.2	2.2	7.9	2.0	8.0	0.63
Mean	6.0	6.3	12.2	3.8	10.0	2.1	10.8	0.58
Interquartile	5.0	5.0	8.1	4.0	7.9	1.2	13.7	0.36
B2B postal delivery time								
Median	4.9	5.6	5.7	1.3	7.1	1.8	4.5	1.2
Mean	7.0	7.9	10.7	4.7	10.9	2.2	6.4	1.2
Interquartile	7.2	8.0	12.0	5.0	11.9	2.9	13.4	0.60
Container import dwell time								
Median	4.0	3.0	2.0	3.5	6.9	2.9	3.6	0.83
Mean	5.9	4.7	3.1	5.5	9.3	4.0	6.2	0.76
Interquartile	5.8	5.8	3.0	4.9	7.1	3.0	4.7	1.2
Container export dwell time								
Median	3.7	4.3	3.2	4.4	9.1	4.3	3.1	1.4
Mean	4.7	5.1	3.7	5.6	10.3	5.1	4.0	1.3
Interquartile	3.6	3.5	3.1	4.0	5.9	3.5	4.2	0.83
Turnaround time at ports (days)								
Median	0.6	0.9	1.1	0.9	1.1	0.8	0.8	1.1
Mean	1.0	1.2	1.8	1.1	1.3	1.0	0.9	1.3
Interquartile	0.4	0.6	0.9	0.6	0.8	0.8	0.5	1.2
TEU wtd Median	0.9	1.0	1.1	1.0	1.3	1.1	0.9	1.1
TEU wtd Mean	1.2	1.2	1.5	1.1	1.5	1.3	0.9	1.3

Source: World Bank, Logistics Performance Index (2.0)

India's B2C postal delivery times are better than Vietnam's in Median (5 days), Mean (6.3 days) and Interquartile (5 days), but are only better in B2B for Interquartile (8 vs 13.7 days), with Vietnam better with respect to the other two measures. Intriguingly Container dwell time performance of India is better than Vietnam's for Imports and worse for exports using Median and Mean dwell times, and the inverse for Interquartile dwell times (columns 3, 8, 9, ***Table 19***). India's container dwell times fall, in the middle

among the seven countries, with Indonesia performing best and Mexico worst. Turnaround time at India's ports is 3rd after China and Vietnam for the three key comparators, TEU weighted median (1.1 days), TEU weighted mean (1.2 days), and interquartile (0.6 days) ***(Table 19***).[51]

In conclusion it should be noted that India has the lowest wage rates among the countries competing to attract MNE/MNC investors from China. Vietnam's wages are already 86per cent higher than India's, while Mexican wages are 2.5 times those of India (***Figure 49***). This table also supports the argument that China's wants to dominate even low-tech production and exports despite its wages being almost 7 times India's, the country with the lowest wages in this sub-set of countries.

Figure 49: ***Average hourly earnings of employees (US$)***

Country	2023	2024
India	0.99	1.02
Indonesia	1.07	
Cambodia	1.32	
Viet Nam	1.76	1.86
Philippines	2.02	
Thailand	2.68	2.59
Mexico	2.87	3.11
Malaysia	3.27	3.41
China	6.73	6.81
Source: ILO, DOSM Malaysia, NBS China		

Source: Authors calculations based on data from ILO, Dept of Statistics, Malaysia and National Bureau of Statistics, China

10. China's Technology in Comparative Perspective

This section briefly compares the technology and innovation performance of China, India and some of the other middle-income countries of Southeast Asia. The comparison of key research and development indicators is followed by a discussion of China's technology development strategy and some of the industries where China established its dominance in production because of these initiatives.

Virmani (2026) highlights China's strong performance in Research and Development (R&D) and innovation. His comparative analysis is summarized in **Table 20.** Starting with input indicators, China's R&D expenditures in 2020 were 2.4per cent of GDP, 1.6 times its income benchmark of 1.5per cent of GDP, and twice that by Thailand. This places China well ahead of other competing economies, reflecting a sustained policy emphasis on technological upgrading. Its Human capital base is less impressive, just matching that of Thailand; With 1.7 researchers in R&D per billion population, China is 0.4 per billion below the expected/benchmark value for its per capita GDP (Virmani, 2026). Further there is no data available on the number of technicians in R&D, raising suspicions (**Table 20)**.

[51] Though there is great improvement in transport and energy infrastructure, telecom connectivity, financial and digital access during the last decade, there is still room for improvement of the framework for exports. The core of this is the digital integration of, simplified customs rules, forms & process, GST exemption & refunds, foreign exchange remittance procedures and financial credit.

Table 20: ***R&D in selected Asian Countries:*** **China Dominates**

Parameters	China	Malaysia	India	Thailand
Global Innovation Index (Rank)	10	34	38	45
Patents (applications/million)	1010	26	19	12
Hi-Tech Exports (per cent of Manf. Exports)	26.6	59.4	14.9	26.1
Firms R&D Investments (per cent)	18.2	8.1	1.4	0.8
R&D Expenditure (per cent of GDP)	2.4	1.0	0.6	1.2
Researchers in R&D (per billion)	1.7	0.7	0.3	1.7
Technicians in R&D (per billion)		0.2	0.1	0.3

Source: Virmani (2026)

China dominates in firms which spend on R&D. The share of firms, that have developed products, improved processes and invest in R&D, is 18.2per cent in China more than double that of Malaysia with 8.1per cent (**Table 20)**.

On the output side China's performance is outstanding on two indices and alright on one. China is ranked tenth among all countries in the Global Innovation Index (GII), with Malaysia trailing it at 34th position and India at 38th position. China, with 1010 Patent applications per million residents, is way above the USA (790), Germany (479), France (197) and UK (173). It is second only to Japan which has 1770 patents application per million

China however lags Malaysia in High tech exports as a share of total manufactured exports. China's high-tech exports are only 26.6per cent of manufactured exports, marginally more than Thailand at 26.1per cent and about half of Malaysia's (**Table 20).** This along with the performance on researchers and technicians raises questions about how much of the R&D expenditure is being used in industrial espionage and Reverse engineering to displace foreign invested firms from the domestic market followed by export market for existing products and technologies.

The UNCTAD Technology and Innovation Report 2025 evaluates national readiness for frontier technologies across 170 economies (2024 data). India ranked 36th, up from 48th in 2022. The sub-component scores were 3rd R&D, 10th industry, 99th ICT, 113th skills and 70th finance.[52]

ASPI's (Australian Strategic Policy Institute) Critical Technology Tracker shows that China led in 57 of 64 technologies in 2019–2023. China leads in all newly classified "monopoly" technologies (24 categories rated high-risk), mostly defense-oriented fields like drones, satellite navigation, and radar. In the 2025 update, China holds a clear lead in 8 of the 10 newly added technologies. India is recognized as a rising "third pole", ranking in the top five for 45 of 64 technologies, and 2nd place in 7 technologies.[53]

[52] https://unctad.org/publication/technology-and-innovation-report-2025
[53] https://www.aspi.org.au/programs/critical-technology-tracker/

10.1 From sREAD Policy to Dominance

China's Socialist Market Economy model of economic growth and development layered a *"Reverse Engineer and Develop"* (READ) policy[54], above its pre-existing ELISID policy. One of the authors of this paper has dubbed this the sREAD policy, where s stands for spy/steal (details in appendix). This utilized central technology institutes for reverse engineering global technologies. These were then adapted and scaled through provincial-level competition, often led by state-backed firms with close ties to the Communist Party. China's socialist market economy enabled provincial enterprises to compete fiercely while benefiting from centrally acquired technologies—a model that proved remarkably effective (see appendix).[55] Rush Doshi in his book *'The Long Game: China's Grand Strategy to Displace Americal Order'* documents that Beijing, operating under the frame of the 'Fourth Industrial Revolution,' is pursuing a state-directed industrial policy explicitly designed to indigenize foreign technologies and build domestic competitive capacity. He has also documented that state-backed acquisitions were one of the instruments used to secure technology, and that state-owned enterprises and national champions were central actors in executing industrial policy. The book also notes (p. 341, Chapter 13) that Jiang Zemin gave a private post-WTO speech to all provincial Party secretaries framing WTO accession in geopolitical terms — evidence of central direction being transmitted to the provincial level, consistent with the concept of the Socialist Market Economy (Virmani (2005, 2006).

Earlier, China lagged the United States and Europe during 1970-1990s, relying heavily on imported technologies and foreign firms operating within its market. However, through Strategic industrial policy and planned implementation, such as coerced technology transfers, leveraging joint ventures, and investing heavily in domestic capabilities—China systematically acquired and improved upon foreign know-how[56] China has used the opportunity of integration into MNCs' global supply chains. After attracting multinational enterprises with high-quality industrial infrastructure and connectivity, low wages and potentially large domestic market, it used access to domestic market as a carrot, while coercing them to transfer technology to local firms. BYD is an example of scaling-up the value chain. BYD was a Chinese sub-contractor to Apple, started as a supplier of the metal casing to Apple in 2008, is now leading the EV-producer. The reverse engineering and development of Tesla technology was done by State research institutes, with which BYD, CATL and other Chinese companies worked closely. BYD, CAT and EV startups now compete globally, while China has also built strength in upstream areas such as rare earths and battery supply chains (Chan, 2026).

Studies have shown that China has achieved a significant "tech reversal," moving from being a follower in global technology to becoming a serious competitor—and in some sectors, a leader (Chan, 2026). Over time, Chinese companies—especially in sectors like electric vehicles, batteries, robotics, and telecommunications—developed their own innovations.

[54] The 's' refers to systems used to pressure FDI invested enterprises to disgorge their technology to domestic companies and PRCs comprehensive commercial intelligence network in developed countries and in cyber space.
[55] Virmani refers to this aspect as sREADm, where the m refers to "manufacturing competition" among Party Sector companies associated with, and supported by, different provinces.
[56] https://www.ft.com/content/785103f1-1151-45c7-9867-ee65433c29c4

Chinese brands hold 50 per cent smartphones market share, plus straight chokepoints in lithium-ion batteries, rare earth metals, printed circuit boards, and more (Macgee, 2026)[57]. In Between 2005 and 2023 China global market share for Solar PV has risen from less than 20 per cent to a virtual monopoly of 90 per cent. Shipbuilding too China now holds a share that is more than 50 per cent. Other products include steel, aluminum, telecoms amongst others[58].

After attaining technological dominance China has orchestrated an import substituting policy which affects Germany's high-tech exports, administering a "second China shock" to Europe. China aims to dominate sectors where Germany has traditionally been strong, such as automobiles, machinery, and chemicals, as well as future industries like robotics and biotechnology. As a result, Germany's trade position with China has worsened sharply, exports to China are falling, and Chinese firms are increasingly undercutting German companies both in China and in third-country markets (Benner et. al, 2026).

Chan (2026) has pointed out that China's rise faces growing geopolitical constraints, particularly from the United States. Export controls, restrictions on advanced chips, and scrutiny of Chinese tech firms have complicated China's access to cutting-edge technologies. In response, China is doubling down on self-reliance and tightening control over strategic resources.

A key concern is that Germany has become deeply exposed to Chinese dependencies in critical raw materials, supply chains, and infrastructure. Benner (2026) argues that Beijing has learned to weaponize these dependencies, especially through export controls on rare earths and related materials, which can disrupt production in Europe and force companies to reveal sensitive information. They describe this as a broader strategic attack, not just retaliation against the United States, because it can paralyze key industrial sectors and weaken Europe's defense and manufacturing base.

Benner (2026) criticizes German policy makers for underestimating the problem and focusing too much on short-term profits in China. He argues that Germany and Europe need a new model of "systemic competitiveness": reducing dangerous dependencies, protecting core industries, investing in strategic resilience, and cooperating more closely with like-minded partners such as Japan, South Korea, Australia, Canada, and others. The authors reject both defeatism and naive faith in open markets and concludes that Europe must adopt a more active industrial and economic security strategy if it wants to remain resilient in a world shaped by Chinese state capitalism.

10.2 USA's China challenge, India opportunity

Though HICs retain the lead in legacy manufacturing technologies, they are fast losing their edge in futuristic technology to China Inc. ASPI's Critical Technology Tracker shows that in 2019-23 US leads in only 7 technologies, namely small satellites, genetic engineering, quantum computing, vaccines and medical countermeasures, nuclear medicine/ radiotherapy, and natural language processing. This is down from 60/64 in 2003-2007. India ranks in top five for 45 of

[57] https://www.ft.com/content/95fda471-0694-4445-8222-30e09b03887b?syn-25a6b1a6=1.
[58] https://www.ft.com/content/7d51a630-a3de-4cc7-9f5f-0f3e7f0d305a?syn-25a6b1a6=1

64 technologies (up from 37 the year before), surpassing UK with top five in 36 technologies. In AI India ranks just behind the US and China in advanced data analytics, algorithms, hardware accelerators, machine learning, integrated circuit design, NLP, and adversarial AI. The HIC's current comparative advantage in technology can only be sustained, by stepping up their collaboration with fast rising, trusted partner like India.[59]

According to PitchBooks (2026) Global VC Ecosystem Rankings, based on number of startups and total funding, USA is top ranked across every category – overall, development and groeth scares, with China in second place and India in third. UK, Germany, Israel, Singapore and South Korea form a distant second tier. According to Harun Research Institute's Golden Unicorn Index 2026, identifies 1603 unicorns worldwide, with the top five countries (number of unicorns in bracket) as USA (806), China (381), UK (70), India (61) and Germany (31).[60] Dealroom.Co which uses a much broader definition of startups shows, USA (2298), China (497), UK (205), India (110), Germany (88), Canada (80), France (53), Israel (50), Sweeden (48) and Australia (44) in top ten.

It is the main hypothesis of this paper, that it will be very costly in national resources, for High income economies, even large ones like EU or USA to build alternative value chains that can compete with China on a sustained basis. Competing with China requires the major, developed, manufacturing powers (HIDCs) to combine their comparative advantage in (high quality) Manufacturing Demand and FDI/MNEs (***section 12.3 & 2.3- 2.5***), with India's comparative advantage in Human resources (***section 13.3),*** expected increase in demand (for high quality) manufactured goods (***section 11.3***) to reduce the cost of building efficient, trusted, supply chains which can compete with China Inc.

Part IV: Opportunity: Build Competitive Networks & Scale through Cooperation

11. Demand for Manufactured Goods

Figure 1 showed how demand for Imports is a key element in the successful development of supply chains in LICs and MICs by MNCs headquartered in HICs. This section analyses manufactured goods trade from the demand side. It identifies the principal importers of manufactured goods in terms of their shares in global imports and assesses the contributions of different countries to the growth of global import demand. It also examines economies with substantial domestic consumption of manufactured goods. It draws on projections of GDP (PPP) and incremental shares to project the cross-country pattern of import demand, pointing to a likely reconfiguration of demand patterns in next 25 years.

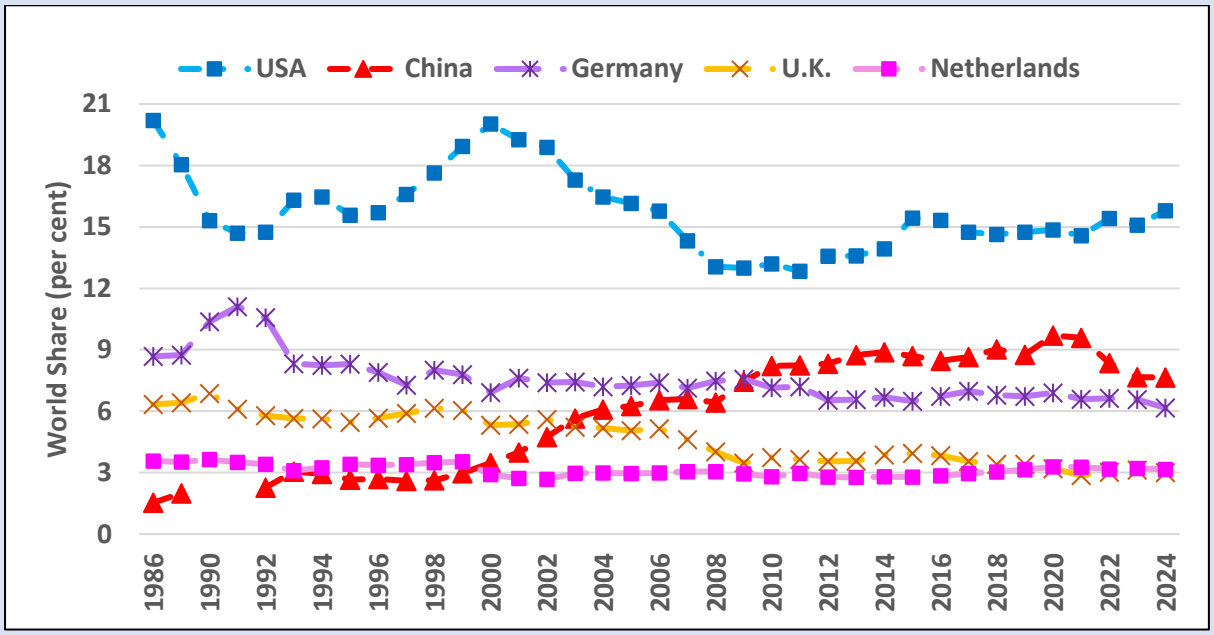
11.1 HICs are Open for Manufactured Imports

The distribution of world manufactured imports between 1986 and 2024 demonstrates a pronounced shift in the relative positions of major economies. **Figure 50** shows the trend of the top 5 importers of manufactured goods (in 2024) over last four decades. EU and USA are

[59] A majority of the World's top 100 MNEs/MNCs already have Global Competency Centers (GCCs) in India to Design and Develop technology.
[60] India had more unicorn's than UK in Haruns previous year ranking.

the world's largest importers, at US $4.8 Trillion and US $2.6 Trillion respectively, followed by China, at US $1.2 Trillion – a quarter of the EU and less than half of that of the United States.

Figure 50: **Top Five Importers of Manufactured Goods by World Share**



Source: Authors Calculations based on World Development Indices

The United States, while remaining the single largest importer, has witnessed a decline in its share from 20.5 percent in 1986 to 15.5 percent of World imports in 2024. European economies' shares also declined, with Germany's falling from 9 percent to 6 percent and United Kingdom's from 6.2 percent to 2.8 percent, and The Netherlands from 3.2 percent to 3.0 percent (**Figure 50)**.

China presents a divergent pattern. Its share of world manufactured imports increased from 1.5 percent in 1986 to 7.5 percent in 2024- making it the second largest importer (country-wise) of manufactured products. However, China has been witnessing a decline in the import demands since 2021 when its imports had peaked at 9.6 per cent of the world share. Post-pandemic while the import demand shares of the rest of the countries in top 5 have either risen or maintained their levels, China has witnessed a decline by close to 2 per centage points of the world share (**Figure 50)**.

World manufactured imports have grown in volume terms (USD) by 32per cent during the past decade (2014-2024)**.** The growth has, however, accelerated from over 7per cent in the first five years to 23per cent in the next five years. **Table 21 shows** the major countries that have led the rise in global demand for manufactured products over the decade from 2014 to 2024. USA contribution to the increase in import demand was more than one-fifth, followed by Germany and Netherlands – together contributing close to 9 per cent. Four EU countries in the top 10, Germany, Netherlands, Poland and Italy, together contributed approximately 15 per cent to the increase of the global demand. European Union as whole contributed close to 30 per cent to the total increase in global import demand in the last decade (2014-24).

Table 21: **Country Share in Incremental World Import of Manufactured Goods**

Country	Incremental Share Over (per cent)				Current Position (2024)		
	2014-24	Rank	2019-24	Rank	Share (per cent)	$ Bil.	Rank
United States	21.6	1	20.3	1	15.8	2633	1
Germany	4.5	2	3.7	3	6.2	1027	3
Netherlands	4.3	3	3.3	4	3.2	527	4
Mexico	4.3	4	4.4	2	3.0	496	6
China	3.8	5	2.8	5	7.6	1275	2
India	3.4	6	2.6	10	2.0	326	12
UAE	3.3	7	2.7	8	1.5	258	16
Viet Nam	3.2	8	1.4	20	1.5	243	17
Poland	3.1	9	2.8	6	1.7	291	15
Italy	2.7	10	2.7	9	2.5	410	9
EU	29.2		25.1		28.9	*4812*	
World	100		100		100	*16676*	

Note: The incremental shares over last 10 years and 5 years denotes the difference between 2024 & 2014, and 2024 & 2019 respectively. The import values for UAE and Vietnam are shown for 2023 (latest available).
Source: Authors calculations based of World Development Indices.

In contrast, China, the second largest manufactured products importer since 2010, has contributed only 3.8 per cent to incremental imports, only a little more than the 3.4 contribution of India, the 12th largest importer of manufactured goods. It is followed by UAE and Vietnam, each with more than 3per cent share in incremental manufactured imports (**Table 21)**. In the last five-years (2019-2024), USA and China's rank is unchanged at one and five, Germany and Netherlands have slipped by one rank each, while India remains in top 10, but Vietnam falls out of it. These changes are partly due to the differential impact of the Pandemic (2020-21) on different countries.

Mexico has expanded its manufactured imports to become the second highest contributor to incremental manufactured imports, possible reflecting an increase of imports from China for re-export to USA to skirt higher tariffs on China (**Table 21)**.

11.2 Manufacturing Demand is falling in China, stable in HICs

Total demand for manufactured products in each country is estimated subtracting manufactured exports from the sum of Manufacturing Value Added (MVA) and imports of the manufactured products in constant USD. World demand for manufactured goods is estimated to be about 16 trillion in 2024. In USD terms it grew by 33.6per cent from 2014 to 2024. However the growth was very uneven with only 5.4per cent increase in demand in first five years (2014-19), and 26.8per cent during next five years (2019-24).

To obtain the world share for each of these countries we divide the demand for manufactured goods by each country by the total world demand of these products. **Figure 51** shows that the USA is the largest market for manufacturing products, followed by China. China surpassed the

Japan in 2007 and EU in 2011, its share has declined since 2021. Consequently, its gap with the EU is narrowing, and with USA widening. India is the fourth largest market for manufactured products, and its gap with Japan is closing, as Japanese share in global demand declines.

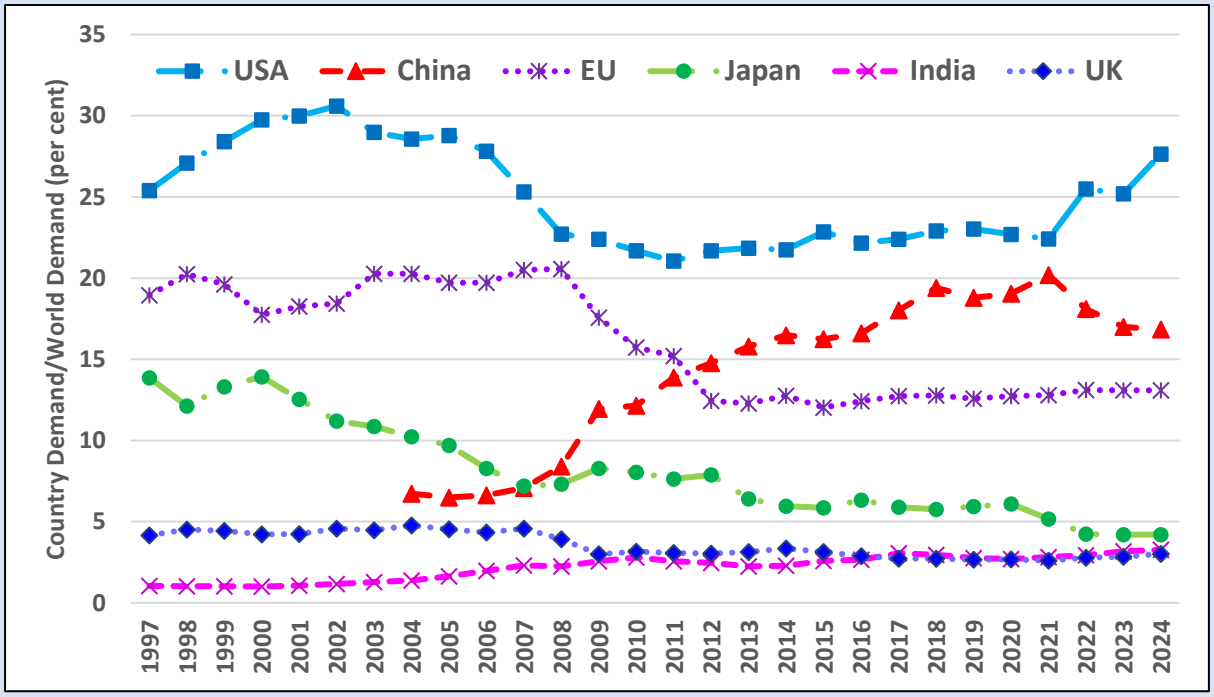
Of the total increase in global demand for manufactured goods (2014-24), more than 50per cent originated in USA. China was the source of 18per cent of the increase in global manufactured goods demand in last decade, only a third of USA. India emerged as the third largest source of the increase in global demand for manufactured goods, with 7.2per cent share during 2014-24 (**Table 22**).

These trends have accelerated over the second half of the decade (2019-24), with both USA and India increasing their share in the global demand for manufactured goods. USA and India's share increased to 69per cent and 7.8per cent, respectively. Mexico, Singapore and Vietnam also raised their incremental share in the last five years. China's demand for manufactures sharply after peaking in 2021, so that it was lower in 2024 than in 2019 before the pandemic**.** ***China's contribution to global manufacturing demand is negative during 2019-24***.[61] The contributions of UAE, South Korea and Bangladesh have also contracted during the second half of the decade (***Table 22***).[62]

[61] All available evidence for 2025 and 2026 indicates the situation has worsened since, as Setzer and others have analyzed.

[62] The EU was the source of almost 18per cent of incremental demand, 3per cent higher than 14.5per cent over the whole decade.

Figure 51: **Demand for Manufactured Goods in Countries as Share of World**



Source: Authors Calculations based on World Development Indices

Table 22: **Country Share in Incremental World Demand for Manufactures**

Country	Incremental Shares Over (per cent)				Current Demand (2024)		
	2014-24	Rank	2019-24	Rank	Share (per cent)	$ US Bil.	Rank
United States	51.5	1	68.9	1	27.6	4396	1
China	18.2	2	-0.8		16.8	2676	2
India	7.2	3	7.8	3	3.3	519	4
UAE	4.2	4	5.4	7	1.6	264	13
Mexico	3.3	5	7.6	4	2.3	372	8
Singapore	3.0	6	3.6	10	0.6	89	25
Korea, Rep.	2.3	7	0.4	39	1.5	253	14
Bangladesh	2.2	8	1.5	19	0.6	99	24
Viet Nam	2.2	9	3.9	9	0.7	116	21
Germany	2.1	10	3.0	12	2.9	457	6
EU	*14.5*		*17.8*		*13.1*	*2083*	
World	*100*		*100*		*100*	*15901*	

Note: The incremental shares over last 10 years and 5 years denote the difference between 2024 & 2014, and 2024 & 2019 respectively. Values of South Korea & UAE is for the year 2023 (latest available).
Source: Authors calculations based of World Development Indices.

11.3 Projected Demand for Manufactures: Total & Imports

An investment in supply chain diversification and FDI depend on future demand patterns its useful to have an estimate of future demand for imports of manufactured products and the total

global demand for manufactured goods. For this purpose, this paper uses GDP growth projections by the OECD and applies the growth rates to derive changes in real GDP (PPP) of major economies, over the next 25 years. Incremental shares of real GDP are linked to manufacturing demand and imports of the major economies to estimate likely changes in the cross-country distribution of total and import demand for manufactured goods.

The last column of **Table 23** shows the GDP (PPP) and the first two columns show past changes in it during 2019-24 and 2014-24. Columns 4 & 5 show the projected changes in GDP PPP in next ten years and subsequent fifteen years. China, the largest economy with a share of over 19per cent also contributed the most to the increase in world real GDP in the last five years (32per cent) and last ten years (<32per cent).

Table 23: **Share (per cent) of Countries in Incremental Global GDP (PPP): Past & Future**

Country	Incremental Contribution to Global GDP (PPP)				Country Share (2024)
	2019-24	2014-24	2024-35	2035-50	
China	32.0	31.7	22.9	11.8	19.3
India	14.6	13.7	23.2	31.8	8.2
USA	12.8	12.2	9.6	9.2	14.7
EU	6.2	8.5	6.3	5.8	14.0
UK	0.6	1.1	1.1	1.7	2.1
Japan	0.2	0.6	1.0	1.3	3.3
World	*100*	*100*	*100*	*100*	*100*

Note: The GDP (PPP) expressed as shares, is in constant international dollars, converted by Purchasing Power Parities (PPPs).
Source: Authors calculations based on WDI and OECD long term forecasts (Updated 19th December, 2025)

India the fourth largest economy (after EU) was however the second largest contributor (14.6per cent) to growth of World GDP, with 42per cent of the real GDP of China its incremental GDP growth was 45per cent of China's. to the increase in global GDP in the last five years. USA, the second largest economy in real GDP PPP was the third largest contributor to incremental growth (12.8per cent). A similar pattern is observed over the whole decade (**Table 23**).

This scenario is projected to change in next decade (2024-35), and thereafter during the subsequent 15 years (2035-50). The incremental contribution of India to World GDP is projected to equal that of China in the next decade and to become 3 times that of China during 2035-50. According to this projection India's GDPppp will equal that of China by 2050. The share of the United States in incremental World GDPppp is projected to decline below 10per cent, but with the contribution gap with China narrowing to 2.6per cent. EU's contribution to World GDP will remain in the 5.8-6.2per cent range and those of UK and Japan increasing (**Table 23**).

India is already the third largest market for manufactured goods, in terms of incremental demand for manufactured goods during 2019-24 or 2014-24 (***Table 22***). Its demand for manufactured goods will increase along with its GDP. To judge how good the incremental GDP is as an approximation to incremental demand for manufacture goods we compare the two for

the recent past. **Table 24** shows that China, India and Japan's incremental GDP contribution to the increase in World GDP, is higher than each country's incremental contribution to world manufacturing demand. Therefore for China, India and Japan, the contribution of manufacturing demand (to the global demand) is over-estimated by the incremental GDP (PPP) demand. We therefore expect approximately the same catchup pattern for the incremental demand for manufactured goods as for overall GDPppp.

Table 24: **Country Share in Incremental World Demand: GDP & MVA**

Country	*Manufactures*	*Total (GDP)*	GDP (Projected)	
	2014-24	*2014-24*	*2024-35*	*2035-50*
China	18.2	31.7	22.9	11.8
India	7.2	13.7	23.2	31.8
Japan	-2.1	0.6	1.0	1.3
USA	51.5	12.2	9.6	9.2
EU	*14.5*	8.5	6.3	5.8
UK	1.6	1.1	1.1	1.7
World	*100*	*100*	*100*	*100*

Note: Manufactures *(demand)* is calculated by subtracting the exports from the sum of MVA & imports of the manufactured products in constant USD. GDP (PPP) expressed as shares, is in constant international dollars, converted by Purchasing Power Parities (PPPs).
Source: Authors calculations based on WDI and OECD long term forecasts (Updated 19th December, 2025)

On the other hand, the incremental demand for manufactured products is underestimated by incremental growth of GDP (PPP) for high-income economies, USA (1/4th), EU (2/5th) and UK (0.7). We can therefore conclude that most of the incremental demand for manufactured goods will continue to come from the USA, EU and other High-Income economies like UK, EFTA, Canada and Australia.

11.4 Imports of Low, Medium and High-Tech Manufactures

This sub-section looks at the pattern of manufactured imports by technological level and the changes in this pattern over the past decade, for the countries considered in previous sections. The previous analysis showed that the EU and the USA had the largest share of total imports in 2024, but also the largest share in the increment of exports during the past decade and the gap between them and China was much larger in the latter.

Table 25 shows that these two economies (EU, USA) have the largest increment in demand for low technology and medium technology imports, while China has the largest share in the increase in High-Tech imports. Four economies have driven the increase in import of low-tech imports: USA with a share of over 100per cent, EU with a share of over 2/3rd, China a bit less than 1/3rd and India a little less than 1/6th of the increase in low tech imports. This implies that there is a massive decline in low-tech imports during 2014-24 by the Rest of the World, including Japan, UK and S Korea (***Table 25***). The EU and USA are expected to remain the best markets for LIC & LMIC exports of low-tech manufactures, while India's share of low-tech imports is likely to increase from around 2/5th of China's to equal it in next 10-15 years.

Table 25: Shares of manufactured Imports by technology level

Economy/	Incremental World Import(2014-24) Share				Share in World Imports 2024 (%)			
Country	All	High-Tech	Mid-Tech	Low-Tech	All	High-tech	Mid-tech	Low-tech
USA	21.6	20.4	24.8	114.8	15.8	17.2	16.4	15.9
Germany	4.5	4.4	6.1	-20.4	6.2	5.8	6.9	6.9
Netherlands	4.3	3.5	4.0	17.9	3.2	3.6	2.6	3.2
China	3.8	22.0	3.5	30.9	7.6	12.6	1.8	3.4
India	3.4	3.5	0.3	15.2	2.0	2.1	2.0	1.3
S. Korea	2.6	2.2	1.0	-3.8	2.3	2.7	3.3	1.9
Japan	0.5	1.3	1.4	-38.3	2.5	2.8	1.9	2.7
UK	0.3	-0.2	2.1	-35.2	3.0	2.2	5.8	3.3
EU	29.2	19.2	39.3	67.9	28.9	26.8	34.9	37.0
World	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations based on WIITs data.

The EU (39per cent) and USA (25per cent) have absorbed almost 2/3rd of the increase in medium-tech imports and China's incremental share a distant third behind them. China share of world Medium-tech imports was less than India's 2per cent in 2024, consistent with earlier discussion of China using cheap subsidized capital to build capital intensive industries at scale, to reduce imports and eventually raise exports (***Table 25)***.

China has the third highest share of High-tech imports in 2024 (12.6per cent) but the highest share of incremental high-tech imports over the decade (22per cent). This is consistent with its plan to dominate frontier technology industries. These require higher quality capital goods, equipment & instruments and components, currently manufactured largely in USA, Germany and Japan, which consequently have a relatively large share of High–tech exports. India's share of High-tech imports (2.1per cent) is marginally lower than that of UK(2.2per cent), S Korea (2.7per cent) and Japan (2.8per cent), but is larger on an incremental basis (3.5per cent, and is likely to exceed them in next 10-15 years (***Table 25)***.

12. Manufacturing FDI, Supply Chains and MNCs

Foreign Direct Investments (FDI) has played a crucial role in the development of the manufacturing sector of the East Asian economies (World Bank, 1993). Lall (2000) has noted that the MNC-led FDI-inflows in the East and the South-East Asian countries were largely export-oriented and designed to integrate the host economies into the global production and distribution networks. The FDI inflows by these MNCs/MNEs did not just bring capital and technology, but access to the pre-existing global markets, product-specific 'know-how' and training & skilling of workers from the host economy.

In this context, the first subsection reviews the literature on FDI and MNCs/MNEs (from high-income countries) and their role in boosting the manufacturing sector of the emerging economies and facilitating the development of the manufacturing ecosystem. The next few subsections examine the data on countries which are the major sources of FDI in the manufacturing sector. The flow of FDI from USA to China is also analyzed as a case study of the role of Anchor investors.

12.1 HICs Dominate FDI Outflows

Foreign direct investments (FDI) through the anchor investors from high-income countries (HICs) have been a catalyst for industrialization in East and Southeast Asian countries transforming them from developing to developed nation (OECD & UNIDO, 2019). These anchor investors brought capital and modern technology, including modern management techniques, which local economies lacked. Critically, FDI also plugged host country firms into established global supply chains. Foreign firms brought their own supply chains (often relocating suppliers or contracting local producers) and guaranteed *'access to demand'* in HIC markets. **Figure 1** puts these interlinkages between demand, supply, technology and skills in a graphical framework, followed by a review of the research literature on the different aspects of this framework which have been studied by economists over time.

Urata (2002) explains, FDI "brought technologies and managerial know-how" and enabled host economies to tap into the multinationals' "sales, procurement, and information networks". This integration accelerated export growth which we have seen in case of several east and southeast countries discussed in the flying geese model section. For example, after Japan's Toyota launched its IMV pickup project in Thailand, the country became Toyota's global production hub, exporting millions of vehicles worldwide and expanding Thailand's local supplier base. Similarly, Samsung's massive smartphone investment in Vietnam (2009–2017) catapulted Vietnam into electronics manufacturing – by 2017 Vietnam produced roughly 30 per cent of all Samsung phones and Samsung alone accounted for close to 25 per cent of Vietnam's exports in 2017 (UNIDO, 2019).

When foreign plants connect with local firms, host-country's productivity and capabilities see a significant rise. Blalock and Gertler (2008) show welfare gains from technology transfer via foreign suppliers, and Javorcik (2004) finds that productivity spillovers occur mainly through backward linkages – i.e. when multinationals source inputs from domestic firms. Furthermore, the empirical studies have also emphasized the deep supply-chain linkages that unlock many of the benefits. In practice, HIC investors often co-locate with or develop local suppliers (the "follow-the-leader" phenomenon). OECD (2019) finds that FDI linkages can help local firms "develop managerial skills, improve products, innovate, [and] reduce costs" when they become part of these networks. Conversely, purely enclave-style FDI (e.g. isolated EPZ assembly plants importing all inputs) tends to yield few spillovers (OECD, 1999).

In addition to capital and technology, one of the biggest manufacturing drivers brought by the anchor investors is the 'market demand' for higher quality manufactured products. FDI in NIEs and NICs was often not aimed at building domestic consumption in the host country but at serving **pre-existing demand** in the home country or other global markets. This is a central feature of export-platform FDI. The foreign firms that re-located their production units in the host economies re-export these products back to the HICs where there is already a well-established market for the products. There are several instances that illustrate this mechanism. We look at the case of Malaysia for electronics, Thailand for automotive exports and Vietnam for gaining dominance in mobile manufacturing.

In Malaysia, US and European chipmakers (Intel, AMD, Bosch, etc.) have built fabrication and assembly plants since the 1970s. Malaysia's rise as a semiconductor manufacturing center began in the 1970s when anchor investors like Intel, AMD, and Hewlett-Packard established operations in Penang. Intel's arrival in 1972 marked a turning point as the company's export-oriented plant injected capital, transferred chip-assembly expertise, and triggered a local industrial ecosystem (Athukorala, 2012). Over time, Intel expanded into design, packaging, and testing, while training a generation of Malaysian engineers and managers. These efforts enabled spin-offs and local supplier formation (Liouka & Vidler, 2009). As of the 2000s, Malaysia was exporting over $60 billion in E&E products annually, with the majority produced by or for multinationals (OECD & UNIDO, 2019). Critically, Intel's production was never intended for the Malaysian market—it fed into Intel's global supply chain, serving demand in the U.S., Europe, and East Asia. This integration ensured that Malaysian exports grew in tandem with global demand for semiconductors (Athukorala, 2012).

Similarly, the experience of Thailand has been with the Automotive industry. Thailand's transformation into a global automotive manufacturing hub was anchored by Japanese investment, particularly from Toyota. In the early 2000s, Toyota selected Thailand as its base for the global "Innovative International Multi-Purpose Vehicle" (IMV) project, aimed at producing pickup trucks and SUVs for over 100 markets (Kuroiwa et. al., 2017). The project brought $500 million in investment and deepened Thailand's parts supplier base, with over 2,000 localized components sourced from Thai-firms. By 2015, Thailand was producing nearly 3 million vehicles annually, of which the majority were exported (Kuroiwa & Techakanont, 2017; OECD & UNIDO, 2019). This growth was not just industrial, it was systemic. Toyota's global demand created a pull effect that anchored Thailand's production in global value chains (Athukorala & Kohpaiboon, 2010).

In a relatively recent experience, Vietnam's leap into electronics manufacturing was driven by Samsung's decision to relocate a major portion of its smartphone production there between 2009 and 2017. With over $17 billion invested, Samsung Vietnam became the firm's largest overseas manufacturing hub, producing about half of all Samsung phones globally (Tong et. al., 2019). Samsung's presence catalyzed the development of local suppliers and introduced advanced production technologies, logistics management, and export certification practices. Vietnam's exports of phones and electronics surged from under $5 billion in 2010 to over $80 billion by 2020 (OECD & UNIDO, 2019). Crucially, the majority of output was exported to developed markets. Samsung brought with it not only capital and production systems, but also a guaranteed global demand pipeline. As the UNIDO study emphasizes, Vietnam did not build a domestic smartphone market first; it integrated directly into the global value chain through anchor FDI (Tong et al., 2019).

One can look at the building of the manufacturing 'Ecosystem' in three stages. The first is to attract MNCs to do labor intensive production like 'final assembly' and testing. The second stage involves more skill intensive work, and greater pool of better educated supervisors and managers must be trained in job skills, so that operations can move up the quality ladder and do more complex operations, like those involving CNC machines. This stage also involves selective backward integration, and more complex supply management. In the third stage, other

multinational firms who are either suppliers of the established multinationals, or their competitors, are attracted to set-up their own unit in the host economy. This cultivates what can be referred to as the enabling *'ecosystem'* for manufacturing. In 2020s India, given the diversity of talent, and experience of making almost every manufactured goods (perhaps of non-standard quality, for low-income consumers), the stages can be compressed given genuine EODB, the right incentives and motivation.

12.2 Trends in FDI Outflows: Source countries

The major sources of the overall FDI Outflows continue to be high-income countries but individual country outflows have been highly volatile. The United States is the largest supplier of FDI to the World with 18.4per cent of total (outflows). followed by Japan at 11.9per cent of total FDI (outflows) to the World in 2024. Member countries of the European Union (EU) together supply 23.5 per cent of the total FDI (outflows) to the World, which is more than either USA or Japan (**Table 26)**.

China was the third largest source of the FDIs with the global share of approximately 10 per cent. Over the last decade (2014-24) its investment outflows were US$ 49.1 billion, the change over last 5 years (2019-24) has increased to 35.3 US$ billion. China's share of world investment outflows was highly volatile. But three year trailing moving average of FDI shares, shows that it peaked in 2020. While China seems to be the third largest overall FDI investor, a large share of its FDI is absorbed by Hong Kong. In 2024, Hong Kong was the recipient of more than two-thirds (67.4 per cent) of the total outwards investment of China. Between 2003 to 2024, the total FDI outflow from China were US $ 2.28 Trillion, out of which, Hong Kong received US $ 1.35 Trillion, making it a destination for 58.8 per cent of China's total investments (**Table 26)**.[63]

If China's FDI outflow is adjusted by subtracting the investments to Hong Kong, there is a significant drop in remaining FDI from China for other countries. With the adjusted values, China's global shares drop by 6.7 per centage points, and its rank falls by six places from third to ninth largest.

Table 26: **Major Source Countries of Total FDI by Outflows (US $ Billion)**

Country Name	Levels in 2024			Change over			
	Value	Share	Rank	10 Yrs	Rank	5 Yrs	Rank
United States	322.2	18.4per cent	1	-65.4		207.2	1
Japan	208.2	11.9per cent	2	70.3	2	-50.1	
China	172.2	9.9per cent	3	49.1	4	35.3	5
China (-FDI to HK)	*56.1*	*3.2per cent*	*(-6)*	*3.8*	*(-17)*	*9.7*	*(-8)*

[63] China's total FDI outflow over last two decades have been obtained from World Development Indices. CEIC database has been used from China's outflow of investments to Hong Kong from 2003 to 2024. The share of Chinese FDI outflow to Hong Kong is even higher for the year 2024, if we use the UNCTAD data for China's total FDI Outflow (71.3 per cent).

Luxembourg	108.6	6.2per cent	4	65.2	3	-68.2	
Canada	86.6	5.0per cent	5	21.6	7	10.7	14
Germany	80.2	4.6per cent	6	-25.3		-91.2	
United Kingdom	68.3	3.9per cent	7	182.2	1	89.8	4
Spain	56.7	3.2per cent	8	10.0	15	15.9	9
Singapore	55.3	3.2per cent	9	2.8	23	-14.0	
Korea, Rep.	48.6	2.8per cent	10	20.6	8	13.3	10
World	1748	100per cent		-111.6		174.6	

Note: China (- FDI to HK) represents the total Chinese outwards FDI to the world except Hong Kong. The ranking in () denotes the fall in ranks from the current position of China.
Source: Authors Calculation based on World Bank WDI. Chinese FDI Outflows to Hong Kong obtained from CEIC.

The change in China's outwards investments (Ex Hong Kong) in the last 5 years is only US$ 9.7 billion, and during last 10 years is US$ 3.8 billion, reducing its rank by more than 15 places (**Table 26)**. While Hong Kong is the major recipient of Chinese FDI, the reverse is also true. China mainland is the recipient of more than 52per cent of Hong Kong's FDI outflows in 2024. Furthermore, between 2022 to 2024, 71 per cent of the total Hong Kong's FDI has gone to China[64]. This raises the issue of '*roundtripping'* of FDI by Chinese companies or individuals.

Besides China, other major sources of cross-border investment are all high-income countries. The top 5 exporters of manufactured goods are also in the list of World's top 10 FDI (outflow) countries. The top 5 HIC producers (MVA) i.e. except for lower middle-income India, are also in the list of top 10 FDI countries. However, Luxemburg and Canada, which feature in the top 10 FDI sources overall, are not major investors in manufacturing (section 8.3).

12.3 FDI in Manufacturing is HIC comparative advantage

This section analyses FDI in manufacturing sector by major sources of investments in manufacturing, because it is closely related to the development of manufacturing supply chains by MNEs/MNCs. To get a holistic picture, section examines both the cumulative figures, which approximate the stock of FDI, and annual FDI outflows in manufacturing. Consistent data on total FDI outflows in manufacturing for the whole world is not available. Therefore, the analysis uses country shares of FDI in manufacturing relative to total OECD countries plus China, which constitute about 83 per cent of the total world FDI outflows (IMF). Subsequent sections consider how foreign investment has shaped supply chains since 2000.

12.3.1 FDI Stock in Manufacturing

OECD data does not include data for China, so these are obtained from CEIC. These indicate US$ 5.67 trillion of cumulative (FDI) investment by OECD countries plus China in the

[64] Hong Kong's Outward and Inward FDI Outflows have been obtained from the *Census and Statistics Department, Government of Hong Kong, SAR (2024 Edition)*.

Manufacturing sector of other countries. The top 10 countries constitute close three-forth (73 per cent) of the cumulative outwards investment by OECD plus China. United States and Japan together hold one-third (32.8 per cent) of the investment stock in the manufacturing sector. Germany, South Korea and Netherlands are among the top five exporters of manufactured goods and are also among top five owners of FDI stock in manufacturing. Switzerland (part of EFTA) somewhat surprisingly, has the third largest stock of FDI in manufacturing sector. Other EU countries like France, Sweden and Italy also have large stocks of FDI in manufacturing (top 10). China is the sixth largest FDI investor and holds 6 per cent of the world FDI stock in manufacturing sector. **(Table 27).**

Table 27: **Cumulative Manufacturing FDI Outflows (US $ Billion)**

Countries	Status by 2024			Previous Rankings	
	Value	Share	Rank	2023	2019
United States	1090.2	19.2per cent	1	1	1
Japan	770.6	13.6per cent	2	2	2
Switzerland	531.7	9.4per cent	3	4	4
France	484.6	8.5per cent	4	5	5
Netherlands	464.3	8.2per cent	5	3	3
China	338.9	6.0per cent	6	7	7
Germany	311.6	5.5per cent	7	14	12
Korea	295.6	5.2per cent	8	6	10
Sweden	235.5	4.2per cent	9	8	8
Italy	189.0	3.3per cent	10	10	9
Total OECD*	5670.4	100per cent			

Note: Pink denotes estimated values. Switzerland and South Korea's latest available data is for the year 2023, Germany & Sweden have latest data available till 2022 UK data not available after 2018. OECD* includes OECD countries and China.
Source: OECD Direct Investment Statistics (Updated: Feb 09, 2026); for China valued calculated from CEIC.

This is subject to the caveat about 1/3rd of China's overall FDI going to Hong Kong, and may be round tripping through Hong Kong, back into the manufacturing sector of China itself (**Table 26**). These facts indicate very limited investments of China in the manufacturing sector, contrary to the common belief that there is a huge boom in investment outflows related to its Belt and Road initiative.

12.3.2 Manufacturing FDI Outflows

Turning from FDI stocks in manufacturing sector to recent flows into manufacturing sector USA and Japan are still the top two sources of FDI in manufacturing (**Table 28**). In 2024, both countries together contributed 47.6 per cent FDI by the OECD countries (plus China). Switzerland, Germany and Sweeden are estimated to rank next, though their 2024 data is not available. Spain and Ireland have recently emerged as important source of FDIs in manufacturing, though they do not feature in list of countries in terms of stocks of FDI in manufacturing sector (**Table 28**).

Table 28: **Manufacturing FDI Outflows (US $ Billion)**

Country	2024	Change in 2017-24

	Value (US$ bi)	Share	Rank	7 Years (US$ bi)	Rank
United States	118.5	33.0per cent	1	35.7	2
Japan	52.4	14.6per cent	2	-3.0	32
China	37.5	10.4per cent	3	8.0	10
Switzerland	27.2	7.6per cent	4	36.9	1
Germany	25.5	7.1per cent	5	21.4	3
Sweden	21.6	6.0per cent	6	8.4	9
Spain	16.2	4.5per cent	7	16.1	4
Ireland	14.9	4.1per cent	8	15.6	5
Italy	13.6	3.8per cent	9	6.3	11
South Korea	13.6	3.8per cent	10	-1.1	31
Total OECD*	359.3	100per cent		177.5	

Note: Pink denotes estimated values. Germany, Sweden and Spain latest available data is for year 2022; UK latest data is for the year 2018.
Source: OECD Direct Investment Statistics (Updated: Feb 09, 2025).

China has a higher ranking in flows of FDI into manufacturing (3rd) with share of around 10per cent, than in stocks of manufacturing assets (6th) where its share was 6per cent. Its share of change in OECD (+China) outflows during last seven years, was around 10 per cent. Among the top ten in inflow shares in 2024, Only Japan, South Korea and Italy did worse on incremental basis than China, with Japan and South Koreas reducing their FDI in USD terms over those seven years (**Table 28**). China's share of investments in the manufacturing sector out of its total FDI outflows is also less than USA, Japan, South Korea and even Spain. In 2024, while China invested close to 22 per cent of its total investments in manufacturing, USA and Japan invested close to 37 per cent and 25 per cent respectively. South Korea and Spain also invested close to 30 per cent of its total investment in manufacturing sector.

The emerging economies stand to gain from these investments from the high-income countries that are led by the MNCs/MNEs which establish production units in the host economies and lead to the growth of the manufacturing sector. China's slowing FDI in manufacturing compared to other leading countries, its lower allocation of total FDI to the manufacturing sector (vis-à-vis mining & agriculture), the roundtripping of the large share of its investments through Hong Kong, and its declining net imports (IMP-EXP) of manufactured goods, limits its future contribution to development of the manufacturing sector in emerging economies.

Given the volatility in FDI outflows of individual countries, it is useful to look at the average FDI outflows from the major economies into manufacturing sector, during 2022-2024 ***(Table 29)***. The EU20 and USA were each the source of more than a quarter of FDI outflows, while Japan contributed a little less than a fifth. Together they were the source of more than 3/4th of total FDI in manufacturing by the OECD plus China ***(Table 29)***.

Table 29: **Manufacturing FDI by Major Economies**

	Avgerage: 2022-24		Year		
Economy	**Share (%)**	**Amt ($ bil)**	**2022**	**2023**	**2024**
United States	26.4	81.8	84.8	42.0	118.5
EU-22	27.2	84.4	145.8	14.5	92.8
Japan	18.4	56.9	54.5	64.0	52.4
China	9.9	30.7	27.2	27.3	37.5
EFTA	6.6	20.4	4.6	27.2	29.2
Korea	6.1	18.9	29.6	13.6	13.6
OECD*	*100.0*	*309.7*	*378.0*	*204.3*	*347*

Note: EU22 refers to top 22 EU nations whose data have been provided by OECD. Pink denotes esti values.
Germany, Sweden and Spain latest available data is for year 2022; UK latest data is for the year 2018.
Source: OECD Direct Investment Statistics (Updated: Feb 09, 202)

The share of China is a little more than half of Japan's and one-third of the sub-total of Sweden, France, Netherland and Germany. Though China, has stepped up its manufactured exports, it neither invests much in manufacturing sector of Rest of the World (ex-Hong Kong), nor contributes to their manufactured goods exports by importing more (section ***11.1***). The high-income economies, which are the source of more than two-thirds of FDI, also provide the most important market for manufactured exports, through their imports (section ***11.1***).

12.3.3 Risk Capital: Equity

Besides FDI flows there are also equity flows, which sometimes complement FDI flows. Only the Net Investments Inflows data is available from WDI, not the Outflows. So this section assumes that the reverse of net inflows is Net Outflows of equity investments. China doesn't feature in the top 10 countries, which have added the highest amount to their net equity investments in the last ten years and five years. The USA, Germany and Italy are leading portfolio equity investors. The net investments from China over the last ten years (2014-24) have declined by US$ 270 Billion, while in last five years (2019-24) have contracted by US$ 245 Billion (**Table 30**). China is a minor equity investor compared to the HICs.

Table 30: **Net Investments Outflows (US$ Billion)**

Country	Change Over			
	10 Yrs.	**Rank**	**5 Yrs.**	**Rank**
United States	846.1	1	716.1	1
Germany	132.7	2	47.6	5
Italy	80.9	3	28.6	8
United Kingdom	57.7	4	81.1	2
Austria	43.5	5	23.6	10
Russian Federation	40.0	6	-12.7	
Canada	23.9	7	56.2	4
Saudi Arabia	19.9	8	-19.5	
Belgium	16.8	9	27.8	9
Mauritius	16.7	10	-0.4	

Source: Authors calculations using World Development Indices (WDI)

12.4 FDI and MNC Supply Chains in China

China's trade to GDP ratio surged in the late 1990s and 2000s as FDI-driven manufacturing boomed. During this period, China opened to foreign investment, including from U.S. firms, which helped "jump-start" its export growth (World Bank, 2021). Foreign-owned factories imported advanced machinery and parts—often duty-free—from abroad to build China's manufacturing capacity. Amiti and Freund (2008) show that most of China's growth of machinery exports came from assembling duty-free imported inputs of high-skill content originating in countries such as the United States and Japan. Similarly, Moran (2014) notes that China's rise as an exporter of electronics and industrial goods "is largely due to the increased skill content of inputs imported from North America that are then assembled by foreign investors within China for export."

China's reform policies, particularly after 1992, triggered a sharp surge in FDI in manufacturing. World Bank analysts describe this as an "FDI spurt in the 1990s" that helped catalyze China's export expansion, noting that by 2001, approximately 400 of the top 500 global firms had operations in China (World Bank, 2021). This wave included numerous U.S. multinationals in electronics, machinery, and apparel. By the 2000s, foreign-funded enterprises were leading China's export growth (RAND Corporation, 2006). As Branstetter and Lardy (2006) and other NBER research highlight, China's openness to FDI from advanced economies was critical in integrating it into global production networks.

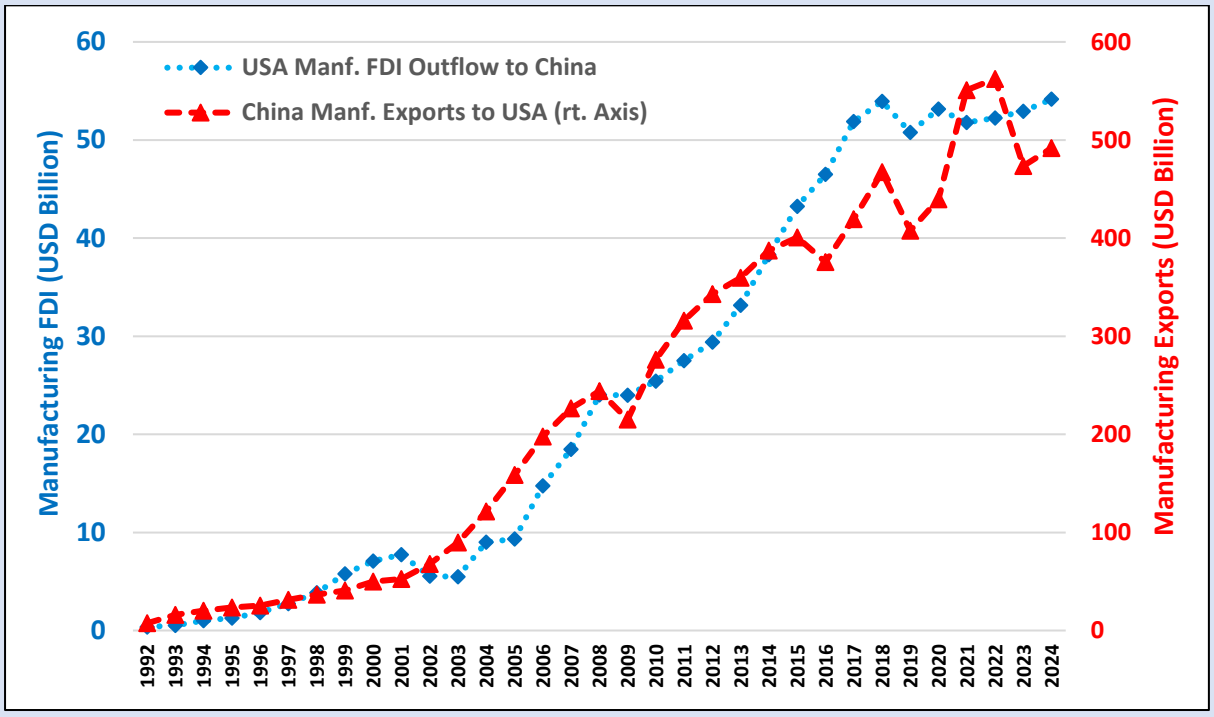
These foreign-invested factories brought in machinery, components, and electronics—often from their home countries—for local assembly. In Chinese trade accounts, this model is captured as "processing trade." Under this system, parts were imported duty-free, assembled into products such as computers, phones, and appliances, and re-exported. This dynamic is empirically well documented. For instance, Amiti and Freund (2008) confirm that a large part of China's machinery export boom came from processing high-tech imports from the U.S. and Japan. Similarly, Moran (2014) emphasizes that foreign affiliates in China imported advanced inputs and that the resulting increase in China's exports of electronics and machinery was "largely due to the increased skill content of inputs imported from North America." In essence, China's export platform was built by importing U.S.-made parts and equipment and assembling them for global distribution.

To assess the depth of these input–export linkages, research examined the foreign content embedded in China's exports. A USITC (2007) study found that the share of imported inputs in Chinese exports to the U.S. rose from about 25per cent in 1996 to approximately 30per cent by 2005. Xu and Lu (2009) further show that industries with higher levels of foreign investment and processing exports also exhibit more export sophistication, implying that FDI and imported components not only increased export volumes but also raised product complexity. While most imported inputs came from within Asia—especially Japan, Taiwan, South Korea, and ASEAN—nontrivial shares were supplied by the United States and European Union (each contributing roughly 8–9per cent of China's intermediate imports) (USITC, 2007). These patterns reflect China's emerging role as a global assembly hub.

The relationship between outflow of manufacturing FDI from USA to China and the exports of manufactured products from China to the USA is shown in **Figure 52**. This figure shows three phases in bilateral exports from China to USA. A slowly rising export phase before China was an WTO member (1992-2000), a more sharply rising phase after China was admitted to the WTO (2001-15) and a more volatile phase thereafter. Bilateral FDI follows a broadly similar pattern, except that it stopped growing after 2018, the year in which USA imposed tariffs on imports from China. The imposition of protective tariffs by USA on China during 2018 and the restrictions imposed by China on export of medical supplies and equipment during the Pandemic (2020) solidified the structural break **(Figure 52).**

Section 6.6 showed that that there were two spurts of import substitution. One after China gained membership of the WTO and another after the Pandemic. The first one during 2003-2008 complemented FDI and exports through backward integration and supply chain development. The second (2021-24) was a substitute for slowing exports to USA and other High-income countries.

Figure 52: **USA's FDI to China in Manufacturing & China's Manufactured Exports to USA**



Source: USA Total Manufacturing FDI to is from *Bureau of Economic Analysis (BEA)* and China's Manufactured Exports to USA calculated using *UN Comtrade* (using WITS).

There was a high correlation of 0.96 and 0.97, between bilateral USA-China FDI and China's exports to USA during the first two phases, 1992-2000, and 2001-2014 respectively. The virtually perfect correlation in both the nine years before WTO accession, and the 14 years after it, suggests that US firms found it profitable to set up supply chains there, whether due to low labor costs, cheap high-quality infrastructure, size of domestic market or due to asymmetric trade or economic policies. China's 2001 WTO accession intensified this relationship, through comprehensive tariff reductions and supply chain liberalization, making China an indispensable manufacturing hub for US companies. The correlation declined dramatically to

0.57 during 2015-2024 after China's mini-BOP (capital outflow) crisis of 2015, after which several capital account restrictions were imposed.

The literature consistently supports the view that FDI and imported inputs were the primary enablers of China's export success. Xu and Lu (2009) find that sectors with larger OECD-investor shares and more processing trade exhibit more sophisticated output. Similarly, Amiti and Freund (2008) conclude that China's dramatic export growth in machinery, electronics, and related sectors is largely explained by its role in processing imported high-tech inputs. In summary, a wide body of academic and policy literature—from the NBER, World Bank, IMF, and USITC—converges on the same conclusion: U.S. and other FDI into China's manufacturing base drove both imports of capital goods and components, and China's surge in manufactured exports back to the United States and global markets.

13. Demography & Human Capital: India vs China

Human capital has played and will continue to play a role in the growth of manufactured sector and the services, agricultural raw material and mineral used in it. Demographic changes which have taken place in the last three decades and those projected to take place in the next three decades will dramatically change the global distribution of human resources. Artificial Intelligence (AI) will both substitute and complement brain power. This paper assumes that educated Humans (having social & cultural consciousness) complemented by AI in education and Jobs, will be as, if not more, competitive, than pure AI which has substituted human brains.

This section starts with discussions on the working-age population and projections for next decade (2035) and two-and-a-half decades (2050), followed by changing scenario in case of the labor force. It further delves deeper to understand the workforce by their education attainment levels and its distribution across the countries.

13.1 World Working-age population: HIC decline, India's rise

A rising share of the working-age population (WAP), often referred to as a Demographic Dividend, has served as a driver of manufacturing growth in East and southeast Asia, As the ratio of working-age individuals increases relative to dependents, the labor force becomes younger and larger, relative to population, raising competitiveness in manufacturing (Bloom et al., 2003; IMF, 2013). The economy can transition from low-cost advantage to skill-based comparative advantage, when human capital investments are made in education, vocational training, and technology adoption (Dabla-Norris et al., 2013; Martins, 2019). The Human capital ladder from unskilled labor to semi-skilled labor, to skilled labor, supports countries in moving up the value chain in manufacturing. Expanding female labor force participation, maximizes the productive use of unused human capital, raising productivity industrial competitiveness (World Bank, 2020).

A rising share of WAP can enhance a nation's capacity for production, savings, and investment, especially when supported by appropriate economic policies and institutions (Bloom et al., 2003; World Bank, 2023). Countries with expanding WAPs are positioned to reap a "first demographic dividend" through increased labor supply and a lower dependency ratio (Bloom

& Williamson, 1998). This demographic shift is particularly relevant for low- and middle-income countries seeking to build comparative advantages in labor-intensive manufacturing, as it offers a growing, youthful labor pool that can meet the demands of industry and global supply chains (IMF, 2013; RAND, 2007).

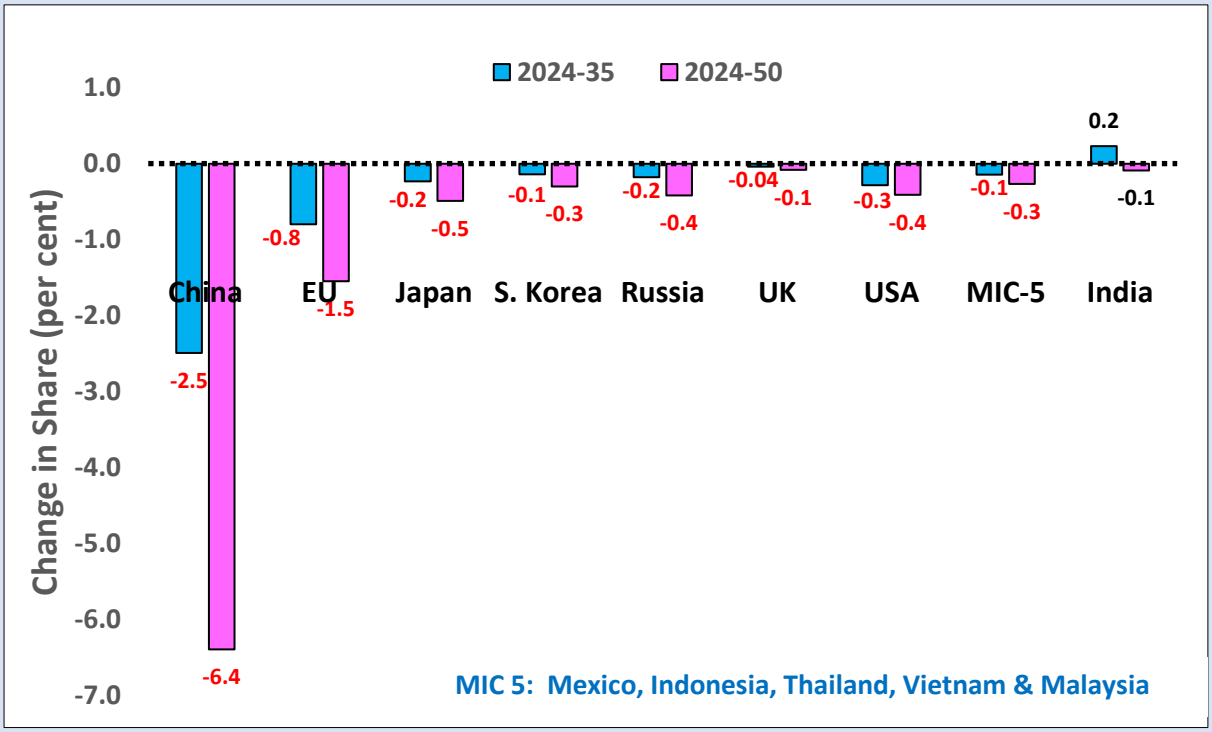
India has the highest share of World Worling age population (18.7per cent), followed by China (18.4per cent). The MIC-5 group of countries (Malaysia, Mexico, Thailand, Indonesia and Vietnam) combined WAP is 8per cent about 2/5th of India's (***Table 31***).

Table 31: Global share of Working Age Population

	WAP as Share of World (per cent)			Working-age Population (millions)		
	2024	**2035**	**2050**	**2024**	**2035**	**2050**
High-Income Economies						
EU	5.4	4.6	3.8	285	264	233
USA	4.1	3.8	3.7	218	221	226
Russia	1.8	1.6	1.4	94	92	83
Japan	1.4	1.1	0.9	73	66	54
S. Korea	0.7	0.5	0.4	36	31	23
UK	0.8	0.8	0.7	44	45	45
Middle-Income Economies						
China	18.4	16.0	12.1	976	920	734
India	18.7	18.9	18.6	990	1092	1134
MIC-5	8.0	7.8	7.3	425	450	446
Indonesia	*3.6*	*3.6*	*3.5*	*193*	*208*	*211*
Mexico	*1.7*	*1.7*	*1.6*	*88*	*96*	*98*
Viet Nam	*1.3*	*1.3*	*1.1*	*68*	*72*	*69*
Thailand	*0.9*	*0.8*	*0.6*	*50*	*46*	*39*
Malaysia	*0.5*	*0.5*	*0.5*	*25*	*29*	*30*

Note: The WAP is taken for the age group 15-64 as done by World Bank and OECD
Source: Authors Calculations based on UN World Population Prospects (2024 Rev) & WDI

Figure 53: **Change in Country shares of world working age population (WAP)**



Note: The working -age population take here is for the age-group of 15-64 years.
Source: Authors Calculations based on WDI & UN World Population Prospects (2024 Rev)

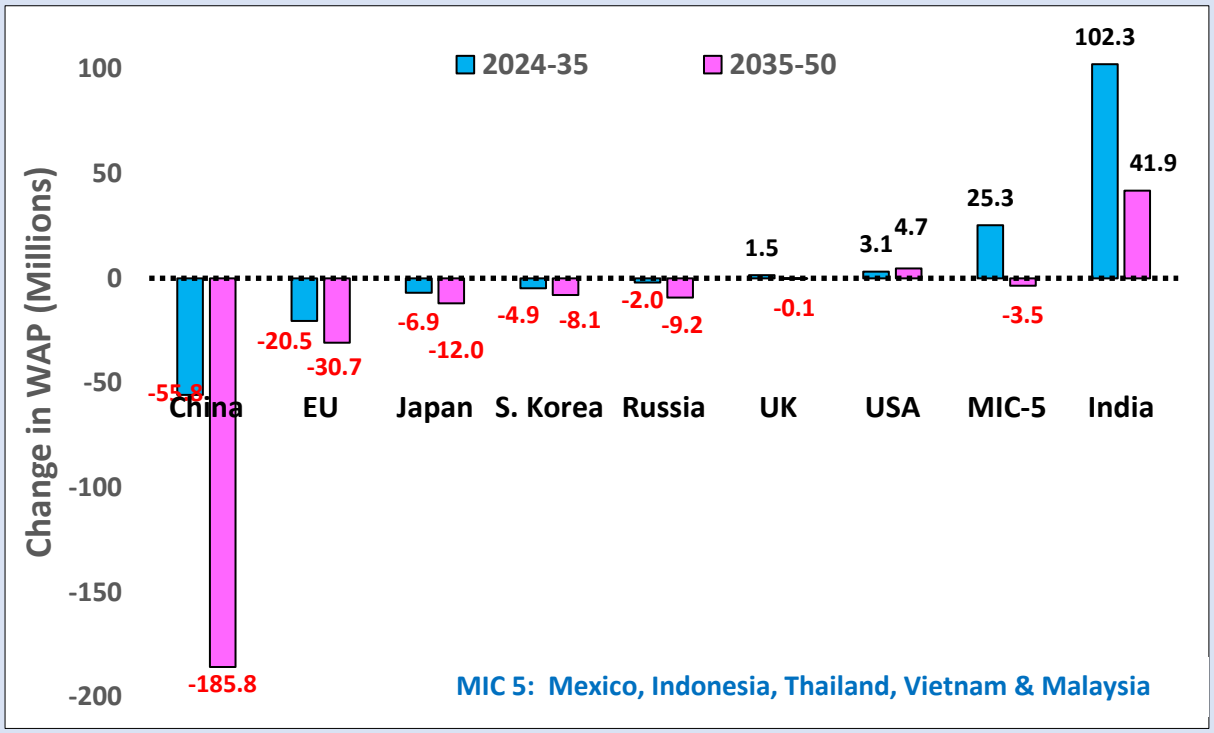
Among the High-Income economies/countries, EU, Japan, South Korea and Russia are projected to have an absolute decline in their Working Age population during the second quarter of 21st century. Only the USA is projected to have a significant increase in WAP from 218 million IN 2024 to 226 million in 2050 (***Figure 54*** & ***Table 31***). China's WAP is projected to decline dramatically by (-) 242 million. In contrast India's working age population is projected to increase by 192 million, more than five times the increase in WAP of the MIC5. In 2050, India's working age population will be 1.54 time that of China, 1.71 times the HICs in ***Table 31*** (664 mi) and 2.5 times MIC-5 group (446 million).

If the second quarter of the century is divided into two phases, one from 2024 to 2035, and from 2035 to 2050, the contraction in WAP accelerates for declining countries and goes from positive to negative for other countries except India and USA. [65] India's WAP increases by 102 mi during the first phase and 50 mi during second phase. The USA WAP increases by 3.1 million and 4.7 million during the two phases (***Figure 54***). India's increasing human capital advantage WAP will be reflected in the younger labor force. ***Figure 55*** presents the distribution of youth (15-24 ages) across countries. India, China and MIC-5 group of countries are projected to have the highest numbers of Youth, followed by USA and EU. India's youth will be 1.4 times and 2.7 times China's youth in 2035 and 2050 respectively. MIC-5 together will have about 40per cent of the youth population of India in 2035 and 2050. USA and EU

[65] The UN Population projections have not taken into account the changes in the immigration laws of the USA. This might change the projections, if taken into consideration.

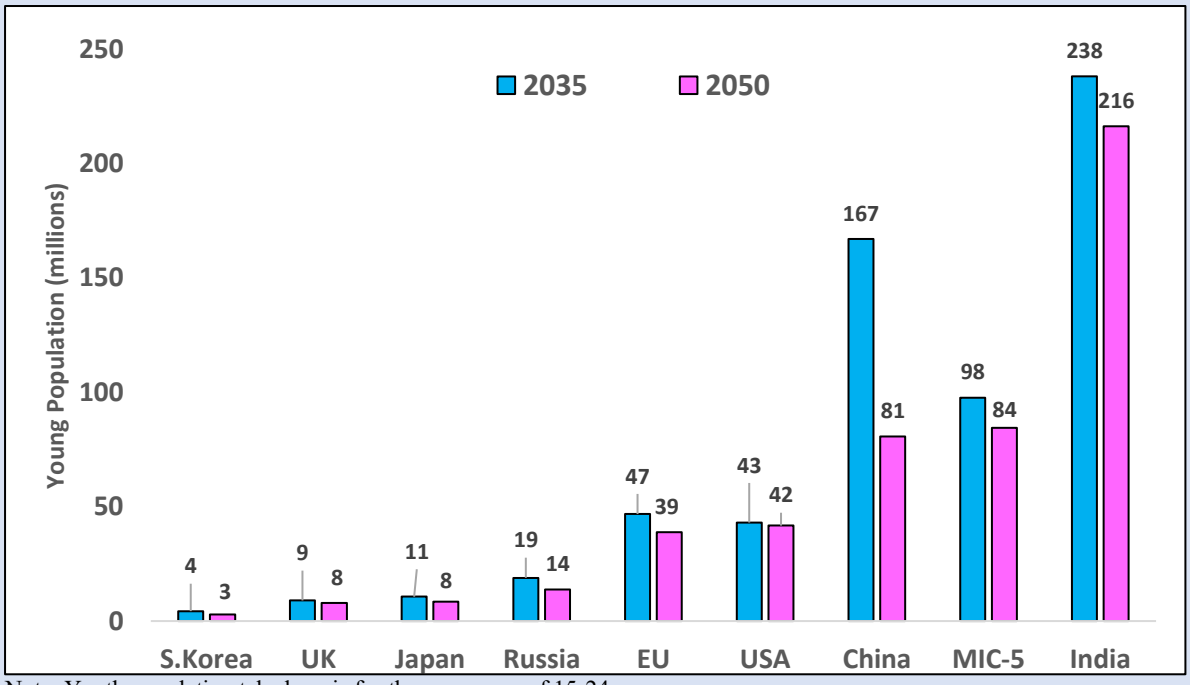
will each have less than 1/5th the youth population of India. In 2050 India's youth population will be larger than the sub-total of all others in ***Figure 55***.

Figure 54: Projected Change in WAP by country (millions)



Note: The working -age population take here is for the age-group of 15-64 years.
Source: Authors Calculations based on WDI & UN World Population Prospects (2024 Rev)

Figure 55: **Projected Youth Population (2035 & 2050)**



Note: Youth population take here is for the age-group of 15-24 years.
Source: Authors Calculations based on WDI & UN World Population Prospects (2024 Rev)

A large youth population is associated with a better educated labor force, higher potential for innovation, and increased dynamism in the economy. Economic research shows that a higher

proportion of youth is associated with more research, innovation and the generation of new ideas, as youth tend to be more open to change, more technologically adept, and more likely to take risks (OECD, 2017).

13.2 India, Global Labor Force supplier 2050

While the expansion of the working-age population (WAP) creates a demographic opportunity, its incorporation into the labor force determines whether the demographic dividend translates into actual economic gains (Bloom et al., 2003; IMF, 2013). The labor force (aged 15 to 64) who are actively engaged in or seeking employment—represents the productive core of an economy. Labor force participation is the key parameter which translates WAP into a productive labor force, the foundation for growth of labor-intensive manufacturing and sustained development (World Bank, 2023). The Labor force participation rate (LFPR) is assumed to remain constant for High income countries and rise for Middle income countries with low LFPR relative to HICs.[66] In India the male LFPR is very high and is assumed to be the same in 205. The female LFPR is low but rising, so it is assumed to rise to 50 per cent by 2050.[67]

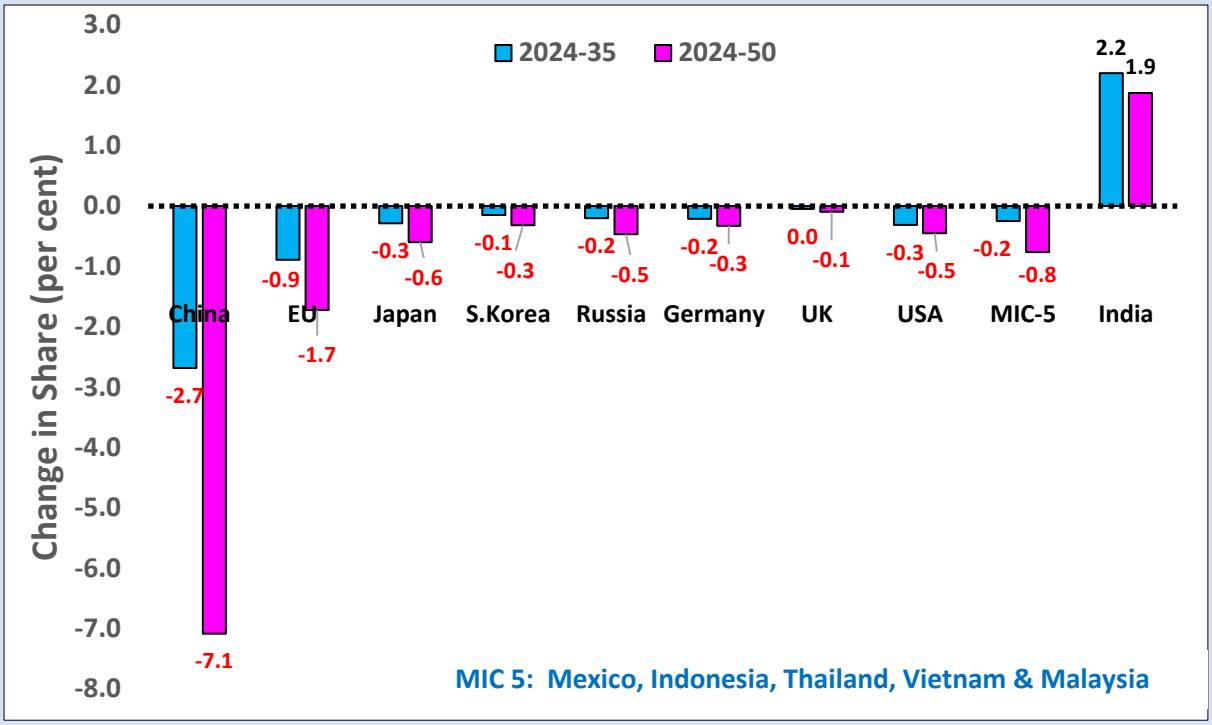
The labor force projections based on UN WAP projection data, and the assumption for LFPR are presented in ***Figure 56***. These show a dramatic change in the distribution of the global labor force across HICs, China, MIC5 and India during the second quarter of the 21st century. The Global share of labor force is projected to decline in every HIC and MIC (analyzed in this section) except India. India's share of World labor force is projected to be 2.2per cent higher in 2035 and 1.3per cent higher in 2050. At the other end of the spectrum, China's share is projected to decline by (-) 2.7per cent by 2035 and by (-) 7.1per cent by 2050 (***Figure 56***). Over the entire quarter century Global Labor shares will decline by (-)1.7per cent for EU, (-) 0.8per cent for MIC5, (-) 0.6per cent for Japan and (-) 0.5per cent for USA & Russia and South Korea by (-) 0.3per cent. The total labor share of the HICs (USA, EU, Japan, Russia, S Korea and UK) will decline by 2.7per cent from 14.9per cent to 12.2per cent in 2050.

This will reduce their labor force from 80per cent of India's in 2024 to 67per cent of India's in 2050 (***Table 32*** **Table *32***). India will consequently become, the trusted labor supplier to the High-Income Countries in the next two decades, for manufacturing and social & government services. This could be through different modalities like labor intensive exports, online services, temporary migration or blended (human-AI) services.

[66] Appendix -1 has the LFPR and PcGDP PPP (intl. $) graph to justify the assumption

[67] The Viksit Bharat 2047 vision has the objective to achieve female LFPR of 70per cent by 2050. Moreover, as per PLFS data, India's female LFPR has already reached 41.7per cent in 2023-24. So, as a conservative assumption we have taken the female lfpr to be at 50per cent by 2035 and same vale for 2050. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2108281

Figure 56: Change in Country Shares of World Labor Force (estimated)



Note: Labor Force is calculated for the age group of 15-64.LFPR is from WDR.
Source: Authors calculations based on WDI & UN World Population Prospects (2024 Rev)

Table 32: Projected Global share of Labor Force

	Labor Force as Share of World (per cent)			Labor Population (millions)		
	2024	**2035**	**2050**	**2024**	**2035**	**2050**
High Income Economies						
EU	6.0	5.1	4.3	214	198	175
Germany	*1.2*	*1.0*	*0.8*	*42*	*37*	*35*
USA	4.5	4.2	4.1	161	163	167
Russia	2.0	1.8	1.5	71	69	62
Japan	1.7	1.4	1.1	60	54	44
UK	0.9	0.9	0.8	34	35	35
S. Korea	0.7	0.6	0.4	26	22	17
Middle Income Economies						
China	20.4	17.8	13.4	729	690	549
India	16.4	18.6	18.3	584	722	749
MIC-5	8.4	8.2	7.7	301	318	315
Indonesia	*3.7*	*3.7*	*3.5*	*133*	*143*	*146*
Mexico	*1.6*	*1.6*	*1.6*	*58*	*63*	*65*
Viet Nam	*1.5*	*1.5*	*1.3*	*54*	*57*	*55*
Thailand	*1.1*	*0.9*	*0.7*	*38*	*35*	*29*
Malaysia	*0.5*	*0.5*	*0.5*	*18*	*20*	*21*

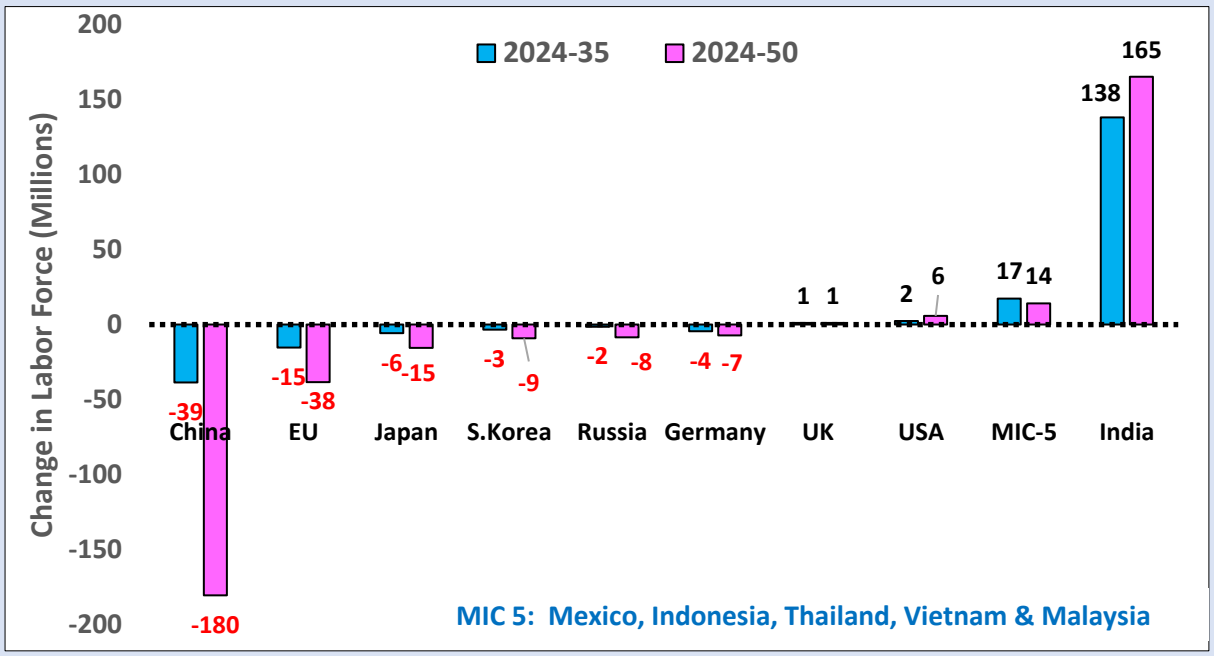
Note: Labor Force is calculated for the age group 15-64, based in standard international practice.
Source: Authors Calculations based on WDI & UN World Population Prospects (2024 Rev.)

Absolute changes in labor force reinforce this conclusion. One noticeable difference from change in shares, is that USA, UK and MIC 5, whose global share in labor force decline (***Figure***

56), still have an absolute increase in labor force (***Figure 57)***. Among High-Income Countries (HICs), United States is projected to add 27.2 million during 2024-50, reflecting continued population growth. In contrast, the European Union labor force shrinks by 33.8 million during 2024-50, driven in part by aging populations, including that of Germany (-7.5 million). Japan's labor force declines by 15.2 million, South Korea's by 8.8 million and Russia's by 9.6 million, during 2024-50. Within the Middle-Income Countries (MICs), China's dramatic loss of 178.7 million workers during 2024-50, will be more than offset by increase of India's labor force by 236.4 million. MIC 5 are projected to add 14 million workers to their labor force, due to Indonesia. Thailand's labor force will shrink, Vietnam and Malaysia's grow marginally, and Mexico's will grow modestly (***Figure 57* & Table 32***)*.

In 2050 India will have the largest labor force in the world, 5per cent larger than China, inverting the ranking in 2024, when China's was higher than India's by 4per cent (**Table 32**). MIC 5 labor force will decline from around half of India's in 2024 to about 40per cent of India's in 2050. (**Table 32**). India's potential competitors will not have the human resources to compete with labor intensive products. The only sustainable, medium-term solution to China +1 is a China- India duopoly, with the rest will be part of the competitive fringe of Middle-Income countries.

Figure 57: **Change in Total Labor Force by Country**



Note: Labor Force is calculated for the age group of 15-64.
Source: Authors calculations based on WDI & UN World Population Prospects (2024 Rev)

These projections point to a pronounced eastward and southward shift in the center of global labor-force gravity over the next three decades, underscoring divergent demographic trajectories between aging high-income regions and youth-rich emerging markets. This gives India a critical comparative advantage over the other countries during the next 25 years.[68]

[68] Rising WAB and labor force in Africa will play an increasing role in the second half of the 21st century.

13.3 Human Capital and Comparative Advantage

The quality of the labor force is key to sustained growth of manufacturing An educated and skilled labor force creates Human capital as a source of comparative advantage. Size of labor force gives an advantage in labor-intensive manufacturing, an educated labor force with job skills can drive the sustained growth of Manufacturing. It is the key to productivity, adaptability, and the capacity to absorb technology.

Countries with higher levels of educational attainment in their labor force are more likely to achieve faster productivity growth in manufacturing, particularly in sectors requiring precision, quality control, and basic technical skills (Dabla-Norris et al., 2013). Economies with broader access to secondary and tertiary education experience more robust structural transformation, as educated workers are better positioned to transition from informal employment to formal manufacturing jobs with higher value-added (Martins, 2019). This education-led productivity premium allows countries not only to attract foreign direct investment (FDI) in labor-intensive sectors but also to retain a cost advantage as wages rise; effectively shifting the basis of comparative advantage from mere labor abundance to skilled labor intensity.

Broadly speaking, one can think of labor force with primary education going into low-skilled manufacturing jobs, labor with secondary education catering to semi-skilled/medium-skilled jobs in industry, and those with post-secondary/ tertiary education forming the base for high-skilled jobs (Virmani (2026). As the discussion is on dynamic comparative advantage India and HICs this section focuses on the medium and high-skilled labor force. Given that there is also a question of the comparative advantage of India with China and other UMIC, the section also compares their primary educated labor force.

This section presents projections of the labor force classified according to education level: Primary, secondary and tertiary. The projections for the proportion of population at various stages of education attainment, are obtained through cross country regression of secondary and tertiary education attainment with Per Capita GDP (PcGDP PPP (2021 intl $)). The total labor force projections calculated for each of the countries are used to get the labor force with secondary and tertiary education attainment.

By 2050, India is projected to be the largest provider of ‘human capital’ for the medium and high-skilled jobs. India is projected to have a comparative advantage in skilled labor force vis-à-vis not just the HICs, but also but also relative to China and the MIC5 group**.** This pool of human capital in each of the skill categories shall cater to both the domestic and international demand. Even in Low-skilled labor force, currently dominated by China (449 million), India (273 million) and MIC5 (147 million), will be dominated by India by 2035 (data appendix-1).

13.3.1 Low Skill Labor with Primary Schooling

The projected labor force with primary education as the highest level of attainment is presented in ***Table 33***. In the United States the share of the labor force with only primary education is very low at 7 million and will grow to 7.8 million by 2050. These projections do not account for the increase in anti-immigrant sentiment and are therefore likely to by overestimates. The European Union (EU) with the largest numbers of labor with only primary education, is

projected to have a sharp decline from 52.4 million to 45.6 million by 2050. reflecting demographic transitions and higher educational attainment over time. These projections are also likely to be affected by changing immigration policies. All other countries HIC show declines in primary educated labor force as do the China and HIC5 (***Table 33***).

In MICs the absolute numbers are substantially larger. China shows a steady decline from 465.9 million in 2023 to 174.7 million in 2050, indicating rapid educational upgrading. India, in contrast, shows an inverted U-shaped pattern, based on the rapid rise of education levels in the last few decades, with 100per cent primary education of the youth, an increasing percent of youth with secondary schooling. The structural transformation in labor force lags, as older, less educated workers exit the labor force. The group of five middle income (MIC-5) countries shows a shallower, inverted U-shaped pattern, suggesting the education structure of labor force is closer to steady state (***Table 33***). Their low-skill labor force is therefore projected to decline from around 3/4th of India's to less than 40per cent during 2035-2050.

Table 33: Projected Labor Force with Primary Education (15-64 ages; in millions)

Country	2023	2035	2050
High Income Countries (HIC)			
USA	7.0	7.7	7.8
EU	52.4	52.1	45.6
Germany	8.1	7.2	6.6
Japan	8.6	8.0	6.5
UK	6.9	6.8	6.8
S. Korea	4.2	4.3	3.2
Russia	0.0	0.0	0.0
Middle Income Countries (MIC)	5.7	5.4	4.9
China	465.9	259.1	174.7
India	156.9	342.2	265.9
MIC-5	119.8	130.7	104.1

Source: Authors calculations based on World Bank UNESCO Institute of Statistics (UIS)
Labor force with primary education projected through cross-country regression with PcGDP PPP (2021 intl $).
Note: MIC 5: Malaysia, Mexico, Thailand, Indonesia, Vietnam;
*Latest data for year **2020**: China, Japan, Mexico; **2021**: Russia; **2022**: Germany, Malaysia, Thailand, EU.*

13.3.2 Semi-skilled Labor Force with Secondary Schooling

Secondary and Tertiary education are two components of Human capital. This sub-section looks at the projected changes in the labor force with a secondary education. Most high-income countries are projected to undergo an absolute decrease in their secondary-educated labor force, during 2023-35 and 2035-50, except USA and UK. European Union secondary educated labor force will decline by almost 17 million, Japan by 9 million, Russia by over 5 million and S Korea by over 4 million, during 2023–2050. USA as an exception, with an increase of 1.7 million and 2 million during 2023-35 and 2035-50 respectively. Despite the increase in USA

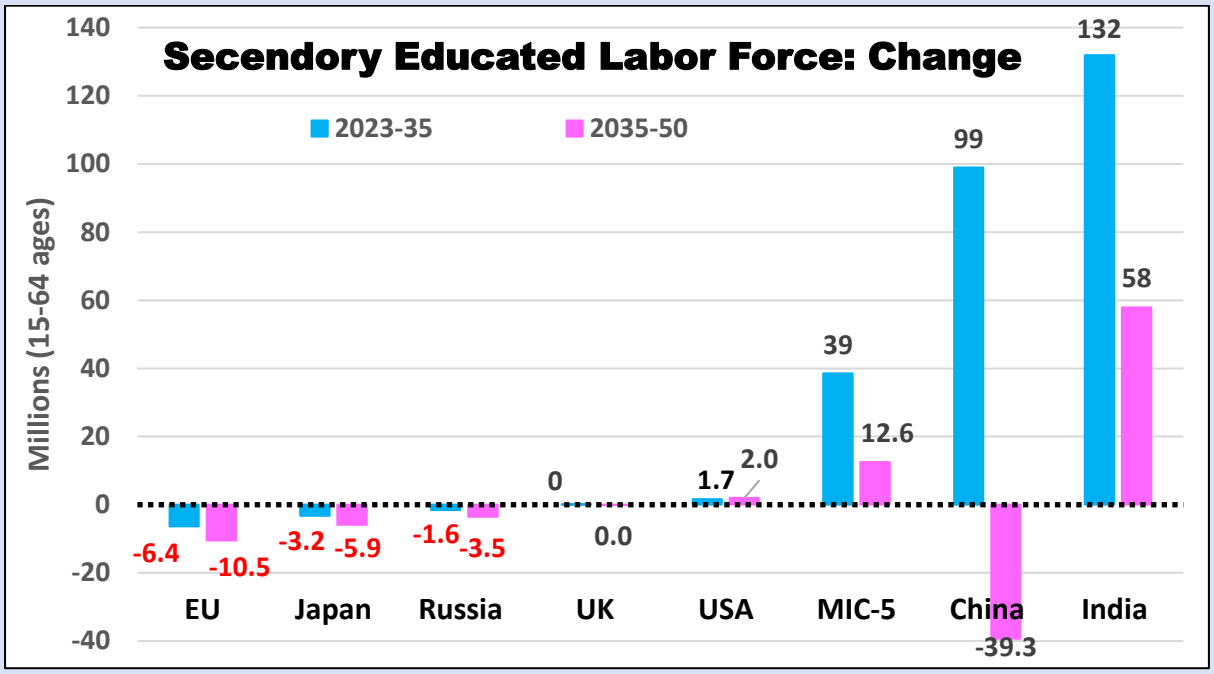
and UK, this HICs secondary educated labor force is projected to decline by (-) 11.4 million and (-) 20.5 million during 2023-35 and 2035-50 respectively. **(*Figure 58 & Error!* Not a valid bookmark self-reference.** shows the labor force with secondary education currently and projected in 2035 and 2050. The secondary labor force in HICs (including Russia) will decline from 2.7 times that of India in 2023 to 1.2 times in 2035 and to 0.9 of India's in 2050. EU will decline from 0.97 (2023) to 0.38 (2035) to 0.27 (2050) of India's, while USA will decline from 0.78 (2023) to 0.37 (2035) to 0.31 (2050) of India's secondary labor force, over the same years. China's secondary educated labor force will decline from 1.5 times India's to 1.1 times (2035) to a little over 3/4th of India's by 2050. MIC5's secondary educated labor force is also projected to decline from the current 7/10th of India's to half in 2035 and even less in 2050 ***(Error!* Not** a *valid bookmark self-reference.***)**.

Table 34).

India, China and MIC 5 are projected to see an increase in the secondary-educated labor force during 2023-50, but China will peak during this period and start declining. In 2023-35, India, China & MIC5's secondary educated labor force, increases by 132 mil, 99mil and 39 million respectively. In 2035-50 China's secondary educated labor force is projected to decline by almost 40 million, reversing 2/5th of the earlier gain. Secondary educated labor force in MIC5 (12.6 mi) & India (58 mi) will continue to grow but at a slower pace ***(Figure 58 & Error!* Not a valid bookmark self-reference.** shows the labor force with secondary education currently and projected in 2035 and 2050. The secondary labor force in HICs (including Russia) will decline from 2.7 times that of India in 2023 to 1.2 times in 2035 and to 0.9 of India's in 2050. EU will decline from 0.97 (2023) to 0.38 (2035) to 0.27 (2050) of India's, while USA will decline from 0.78 (2023) to 0.37 (2035) to 0.31 (2050) of India's secondary labor force, over the same years. China's secondary educated labor force will decline from 1.5 times India's to 1.1 times (2035) to a little over 3/4th of India's by 2050. MIC5's secondary educated labor force is also projected to decline from the current 7/10th of India's to half in 2035 and even less in 2050 ***(****Error! Not a valid bookmark self-reference.*)**.

Table 34).

Figure 58: Change in Labor Force by Secondary Education (in millions)



Source: Authors calculations based on World Bank UNESCO Institute of Statistics (UIS)
Note: MIC-5: Malaysia, Mexico, Thailand, Indonesia, Vietnam

Error! Not a valid bookmark self-reference. shows the labor force with secondary education currently and projected in 2035 and 2050. The secondary labor force in HICs (including Russia) will decline from 2.7 times that of India in 2023 to 1.2 times in 2035 and to 0.9 of India's in 2050.[69] EU will decline from 0.97 (2023) to 0.38 (2035) to 0.27 (2050) of India's, while USA will decline from 0.78 (2023) to 0.37 (2035) to 0.31 (2050) of India's secondary labor force, over the same years. China's secondary educated labor force will decline from 1.5 times India's to 1.1 times (2035) to a little over 3/4th of India's by 2050. MIC5's secondary educated labor force is also projected to decline from the current 7/10th of India's to half in 2035 and even less in 2050 ***(****Error! Not a valid bookmark self-reference.****)***.

Table 34: Projected Labor Force with Secondary education (15-64 ages; in millions)

Country	2023	2035	2050	
High Income Countries (HIC)				
USA	90.8	92.5	94.5	
EU	101.0	94.6	84.1	
Germany	21.9	19.3	17.8	
Japan	35.4	32.2	26.3	
UK	14.1	14.2	14.2	
Korea, Rep.	11.7	10.1	7.5	
Sub total	274.8	262.7	244.4	
Russia [RF]	36.9	35.3	31.8	
Middle Income Countries (MIC)				

[69] If Russia is excluded the ratios are 2.4 (2023), 1.06(2035) and 0.9 (2050).

China	175.2	274.2	234.8	
India	116.0	247.9	305.8	
MIC - 5	81.8	120.3	132.9	
	90.8	92.5	94.5	

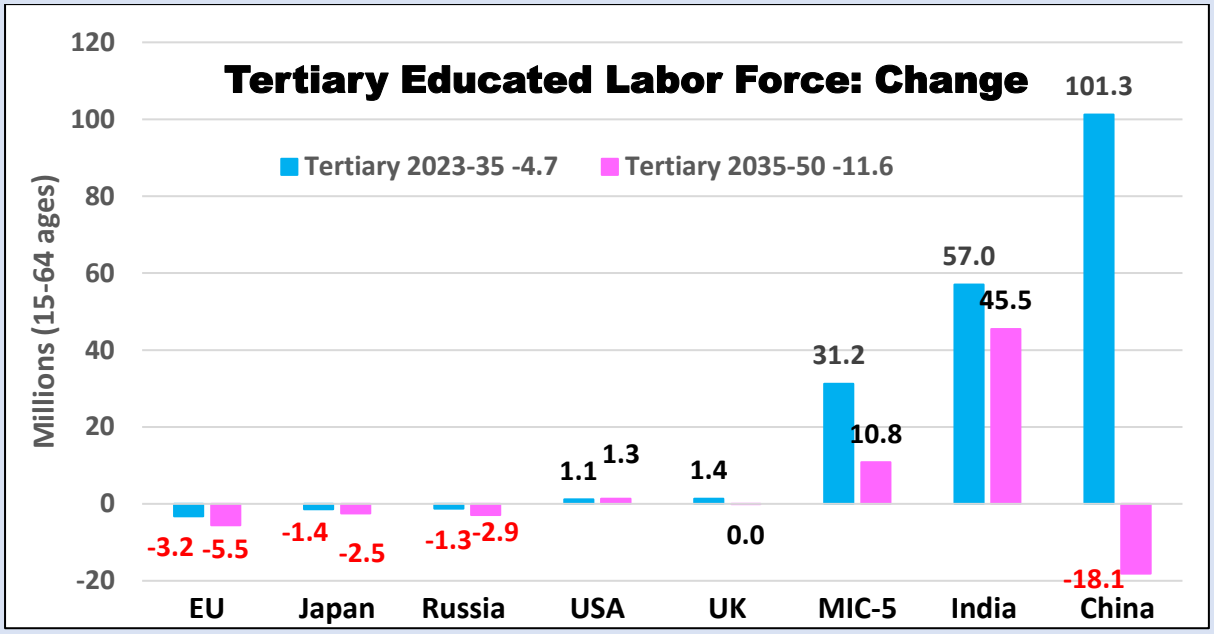
Source: Authors calculations based on World Bank UNESCO Institute of Statistics (UIS)
Note: Labor force with secondary education projected through cross-country regression with PcGDP PPP (2021 intl $). *Secondary Education is defined as attainment of upper secondary.*
Note: MIC 5: Malaysia, Mexico, Thailand, Indonesia, Vietnam;
*Latest data for year **2020**: China, Japan, Mexico; **2021**: Russia; **2022**: Germany, Malaysia, Thailand, EU.*

These changes suggest the comparative advantage in semi-skilled-labor intensive industries and manufacturing processes, will shift gradually but steadily from China and MIC 5 to India during the next 25 years. With declining competition from China and MIC 5, expected returns from producing & importing semi-skill intensive goods from India, will increase dramatically over the next 25 years. This provides a golden opportunity for MNEs/MNCs with headquarters in HICs, to establish their manufacturing supply chains in India, during the next ten years.

13.3.3 High Skill Labor with Tertiary Education

The structural transformation of the global, highly educated, high-skill labor force will be slower, with USA, EU and other HICs continuing the face a competitive challenge from a rising China. The projected labor force with graduate and above educational attainment is shown in ***Table 35*** and its structural change is shown in ***Figure 59.*** We start with the latter.

Figure 59: Change in Labor Force by Tertiary Education (in millions)



Source: Authors calculations based on World Bank UNESCO Institute of Statistics (UIS)
Note: MIC-5: Malaysia, Mexico, Thailand, Indonesia, Vietnam

Table 35: Projected Labor Force with Tertiary education (15-64 ages; in millions)

Country	2023	2035	2050
High Income Countries (HIC)			
USA	61.7	62.9	64.2

EU	55.1	51.9	46.4
Germany	12.4	10.9	10.1
Japan	15.2	13.8	11.3
UK	12.4	13.8	13.7
Korea, Rep.	9.2	7.9	5.9
Sub total	166.0	161.1	151.6
Russia [RF]	29.9	28.6	25.7
Middle Income Countries (MIC)			
China	55.9	157.1	139.0
India	75.0	131.9	177.4
MIC-5	36.1	67.4	78.2

Source: Authors calculations based on World Bank UNESCO Institute of Statistics (UIS)
Labor force with tertiary education projected through cross-country regression with PcGDP PPP (2021 intl $).
Note: MIC-5: Malaysia, Mexico, Thailand, Indonesia, Vietnam; Edu: Education
*Latest data for year **2020**: China, Japan, Mexico; **2021**: Russia; **2022**: Germany, Malaysia, Thailand, EU.*

The labor force with graduate education is also projected to decline in most HICs, except USA & UK, but the absolute decline is less than for secondary educated labor force for each country. Similarly, countries which saw an increase in secondary educated labor will also see an increase in tertiary educated labor, but at a slower pace. Taken together the tertiary educated labor force in the HICs declines by only 4.7 million during 2023-35, and by 11.6 million during 2035-50 (***Figure 59)***. The average for the HICs is about 2/5th and 3/5th of the reduction for secondary educated labor, with Russia and S Korea about 4/5th . HICs are therefore better placed to compete on High tech, high-skill manufacturing than on semi-skill labor intensive manufacturing.

China and the MIC 5 are projected to see an increase in the tertiary-educated labor force during 2023-50, but China will peak during this period and start declining. In 2023-35, India, China and MIC5's secondary educated labor force, increases by over 57 million, 101 million and 31 million respectively. In 2035-50 China's tertiary educated labor force is projected to decline by 18 million. The tertiary educated labor force in MIC5 (10.8 mi) and India (45.5 mi) will continue to grow during 2035-50, but at a slower pace (***Table 35).***

The tertiary labor force in HICs (including Russia) will decline from 2.6 times that of India in 2023 to 1.4 times in 2035 and to equal that of India's in 2050.[70] EU will halve from 0.8 (2023) to 0.4 in 2035 to 0.25 (2050) of India's, while USA will halve much more slowly from 0.8 (2023) to 0.5 (2035) to 0.4 (2050) of India's tertiary labor force. China's tertiary educated labor force will in contrast rise from 3/4th of Indias (2023) to 1.2 times in 2035, before falling back to a little over 3/4th of India's by 2050. MIC5's secondary educated labor force will however remain largely stable around ½ of India's before beginning to decline by mid-century. The competitive challenge posed by China in high educated, high-skill labor force in manufacturing and defense production will increase for the HICs in the next decade or two.

[70] If Russia is excluded the ratios are 2.2 (2023), 1.2(2035) and 1.0 (2050).

These changes suggest the comparative advantage of the HICs, USA, EU, UK, Japan and South Korea, in highly-skilled-labor intensive industries and manufacturing processes, will be increasingly challenged by China during the next 25 years. The MIC5, which have occupied certain niche areas, are likely to maintain their comparative advantage in these and related areas during the next 25 years. India's comparative advantage in high skilled manufacturing will rise slowly but steadily, with increasing expertise in engineering, defense production sectors, space, electronics and other areas.[71]

13.4 Product Specific Skills: Training by MNCs

Educational attainment (Primary, Secondary, Tertiary), accompanied by genuine learning, is the base on which the skills needed by the manufacturing sector (low, medium, high) are built. As discussed in Section **12.1**, the MNCs invest in firm-specific training that upgrades the skills of local workers to task specific skills need produce their high-quality products and also upgrades the skill set of supervisors and managers to ensure speed and timelines. Studies on the East and Southeast Asian countries have found that firm-based training lead to measurable effects on productivity and export performance (Ritchie, 2002). Multinationals normally train workers in product-specific skills through a mix of on-the-job training, in-house training centres, and partnerships with vocational schools (World Bank, 1997). Thorbecke (2023) explains that initially MNC factories 'import full production lines' and "provide technical assistance and advice" to local staff. Over time, trained workers gain experience and carry their know-how between firms.

This aspect has been brough-out very clearly in case of China which has created a massive concentration of the production in case of the mobile phones and other electronic devices. McGee (2026) notes in his book *'Apple in China'* that while it would be banal to say that Apple wouldn't be Apple today without China, what his findings reveal is that China wouldn't be China today without Apple. Apple estimates that since 2008, it has trained at least 28 million workers- more people than the entire population of California. In 1999, none of the Apple's products were made in mainland China; by 2009, virtually all were. This rapid consolidation reflects transfer of technology, and know-how so consequential as to constitute a geopolitical event like fall of the Berlin wall. The figures are even starker when we look at the employment generated by a single firm in China. While the demand from China's 1.4 billion people indirectly supports, across all industries, between 1 million to 2.6 million jobs in America, in contrast, Apple alone supports 5 million jobs in China- 3 million in manufacturing and another 1.8 million in app development.

Part V: Cooperative Industrial and Trade Policy

14. Policy to Build Competitive Supply Chain

Sections 6 to 8 detailed the increasing concentration of manufacturing production (MVA) and exports in one country. ***Section 9 and 10*** offered some challenges of transiting from threats to

[71] India is the only country in the World with two, hostile, nuclear armed neighbors, who have worked intimately with each other since 1975.

opportunities. ***Sections 11 to 13*** have outlined the opportunity for restructuring Global manufacturing. This section addresses the question of building competitive supply chains, which can compete with China Inc without crippling subsidies, and after a moderate learning period.

The global concentration of manufactured goods – both exports and production (value added) was at an all-time high in 2021 since the turn of this century (***Section 7.1***). Although the concentration has eased in 2024 since its peak, the values are still much higher than they were before 2020. In 2024, more than a quarter (27.7 per cent) of the total manufactured goods are produced in China. Even though China's share in the world for MVA has declined from its peak of one-third (as share of the world MVA) in 2021, it is still 60per cent more than the MVA of second ranked United States at 17.3 per cent (2024). A similar concentration also prevails for manufactured exports, with China's share of 18.5 per cent (in 2024), more than double the share of second ranked Germany (8 per cent).

China has consolidated its position in global manufacturing in the last-two decades (2004-24). It has contributed to more than two-fifths (42.2 per cent) of the increase in the global production (MVA) of manufactured goods. A quarter of the increase in World exports of the manufactured products has also come from China in last two decades. China's share of World low-tech exports is 25 per cent of World low tech exports, and of high-tech exports is 22 per cent. China has a share of close to a third (28 per cent) of World electronics and semi-conductor exports, which are largely classified as high-tech products.

We must start by recognizing that the concentration of manufacturing in China is now supported by tremendous scale & scope and dense network of suppliers, one of the best manufacturing ecosystems in the world. **T**he concentration of manufacturing and monopolization of many industries in China Inc, has however, created high risks and vulnerabilities in supply chains. A realization of these risks and the need to dilute this country risk has led many countries to diversify their production and supply chain and reduce dependence. This is referred to as the 'great reallocation' of the supply chain trade by Alfaro (2025).

There were broadly three stages in the development of China's manufacturing dominance. The first stage was to layout thr red carpet to export oriented MNCs/MNEs from every country in the World. This made it virtually costless for these MNCs to transfer their supply chains from the home country and other locations to China. The second stage was a carrot and stick policy for MNCs to do backward integration, by nurturing Chinese companies and transferring technology to them. The third Stage was to acquire technology by all available means, Reverse engineer and develop it, and make it available to all State and Provincial companies, virtually free of cost and risk. Appendix on "China's Socialist Market Economy," the system which made this strategy possible. The only way to create sustainable (without continuing subsidies) supply chains which can compete with China, is by using a modified version of this process, to create competitive supply chains in India. The main democratic modification is that instead of "stealing and reverse engineering HIC technology (sREAD), MNCs will work jointly with Indian companies to build competitive supply chains, and their respective home countries will

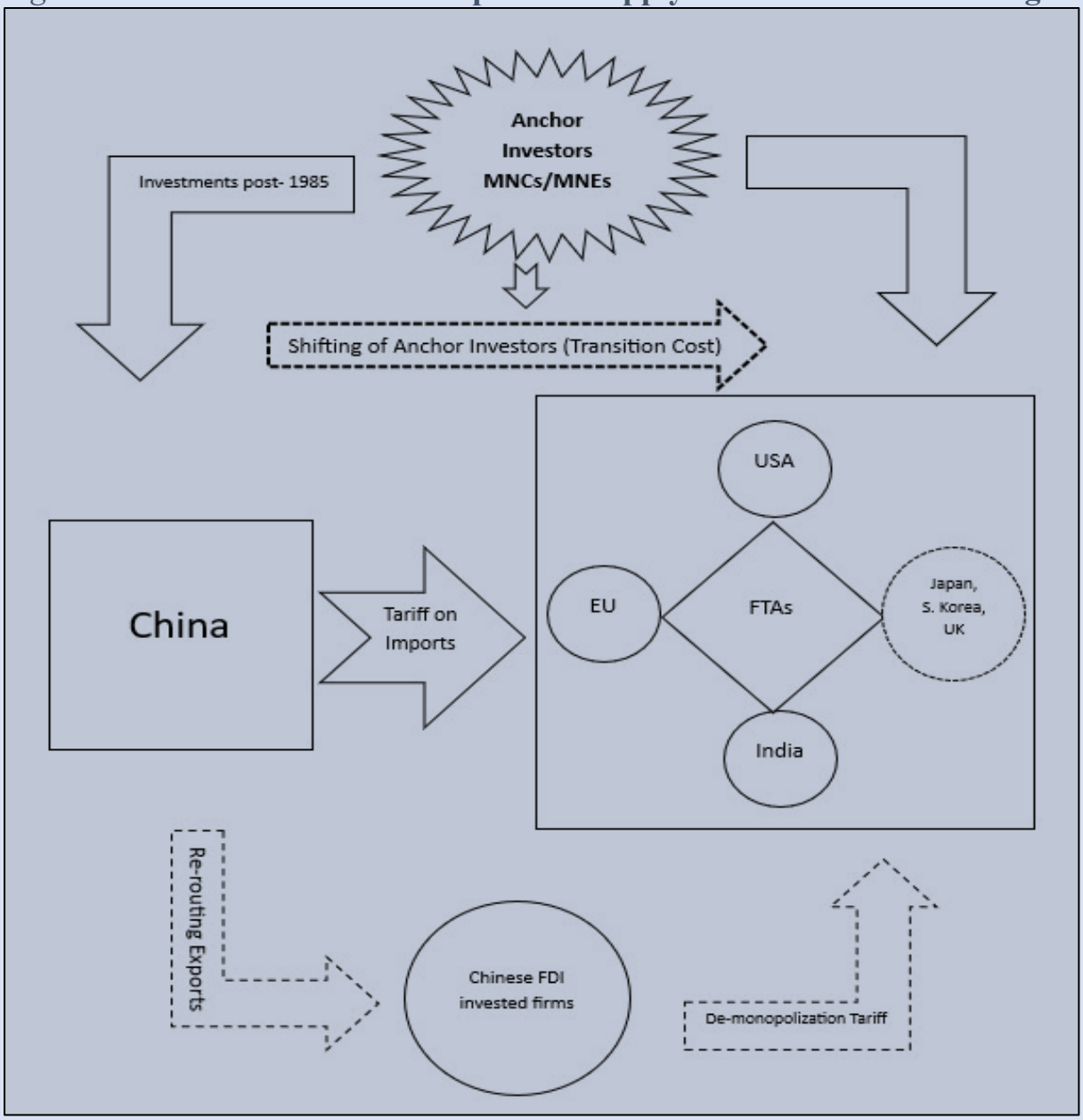
work with Indian Govt to support these joint ventures, and their development of relevant technology.[72]

14.1 Framework to Restore Competition in Manufacturing

The existing concentration of global manufacturing can be progressively rebalanced through the creation of a competitive and resilient global manufacturing supply chain. To effectively counterbalance China's systemic advantages, EU, India and EU (and other HICs) must pursue coordinated, strategic economic cooperation based on shared interest in stopping the further monopolization of World MVA and Exports. Building trusted supply chains which can compete with China, will be very costly for even the largest manufacturing countries, unless they cooperate to build size, scale and networks which can compete with China on a sustained basis. **Figure 60** presents a graphical framework for the development of such a competitive supply chain, grounded in partnerships among like-minded countries and anchored in shared democratic values.

[72] Subsidies are needed to offset the sunk costs of investment in existing Chinese supply chains and to weather the learning and teething trouble period. Support for R&D is needed to catch up to the China technology networks which will take over a decade to replicate.

Figure 60: **Framework for a Competitive Supply Chain in Manufacturing**



Source: Authors framework

MNCs/MNEs from USA, EU (Germany), Japan, and other High-Income countries played a critical role in making China a dominant player in manufacturing. These MNCs/MNEs must be incentivized jointly by their home and new host countries to shift their production units to the latter. India's FTA's/CEPA's with virtually all HICs are laying the basis for the shift of MNC/MNE supply chains to India. This will need to be complemented by capital subsidies to build scale, and subsidies to offset 'transition costs' (learning by doing, sunk costs), and tariff surcharges on imports from China.

The long-term strategic advantage gained by current and past subsidization of China's companies also needs to be offset by an additional, *'De-monopolization Tariff.'* which applies only to imports from China. It has been observed that China may be re-routing its exports through third countries, to bypass the additional/supplementary tariffs imposed by USA. To

address indirect imports from China, Chinese MNCs/MNEs based in countries having FTAs with China, could also be levied the additional tariff. It would by based on the share in final product, of intermediate inputs imported from China.

Incremental export growth will slow from the pace seen in 1990s and 2000s, as World Manufactured Exports/GDP has plateaued (***Figure 3)***. Growth of the manufacturing sector outside China will therefore be much more dependent on a shift in MNC/MNE supply chains from China to India and other middle-income countries. As these USA, German (EU) and Japanese enterprises have played a critical role in building China's export supply chains, they are critical to building efficient supply chains which can compete with China Inc.

The following sub-sections discuss each aspect of the framework to build a competitive supply chain for manufactured products. This includes partnerships of the countries with complementary comparative advantage in different dimensions, how to enable the effective implementation of this cooperation, besides the need to scale-up the manufacturing to compete with China.

14.2 Multinational Corporations as Anchor Investors

The MNCs which act as the 'anchor investors' invest in firm-based training which upgrades the skills of local workers and managers to enhance the know-hows and skill-sets specific to the products. That MNCs performing significant training of the local work force in the host economies is well documented (ILO, 1981; Lindsey, 1986; Ritchie, 2001b). The evidence suggests that the training performed by MNCs is greater than training offered by local firms (Gerschenberg, 1987). Abdullah (1994) argues that MNCs in Malaysia have been more proactive towards human capital and technological development than local firms. Tan and Batra (1995) come to a similar conclusion looking at training incidence in five developing countries, two of which (Indonesia and Malaysia) are in Southeast Asia. Sector-specific evidence across Southeast Asia, for example in the hard disk drive industry, supports this conclusion (McKendrick et al., 2000; Ritchie, 2001b). In addition to the importance of foreign ownership for training, several studies show that firms in Southeast Asia are more likely to train if they are large, involved in export manufacturing, utilize higher technology, and receive training remuneration, support, and incentives from the government (Tan, 2001; World Bank, 1997).

Noorbakhsh et al. (2001) found that levels of human-capital, defined as accumulated years of secondary and tertiary education, are significant determinants of FDI inflows. The human capital generated in India during the next two decades will be available to serve the demand of the MNCs in the manufacturing sector. Slaughter (2002) has argued that the evidence is strong that MNCs increase the demand for skilled workers, primarily through technology transfer from parent firms to overseas subsidiaries.

This aspect has been brough-out very clearly in case of China, which has achieved a high degree of concentration in the production and export of mobile phones and other electronic devices. McGee (2026) elaborates in *'Apple in China,'* that while it would be banal to say that Apple wouldn't be Apple today without China, what his findings reveal is that China wouldn't

be China today without Apple. Apple estimates that since 2008, it has trained at least 28 million workers- more people than the entire population of California. In 1999, none of Apple's products were made in mainland China; by 2009, virtually all were. This rapid consolidation reflects transfer of technology, and know-how so consequential as to constitute a geopolitical event like fall of the Berlin wall. The figures are even starker when we look at the employment generated by a single firm in China. While the demand from China's 1.4 billion people indirectly supports, across all industries, between 1 million to 2.6 million jobs in America, in contrast, Apple alone supports 5 million jobs in China- 3 million in manufacturing and another 1.8 million in app development.

Much of the economic literature on knowledge transfers adopts a neoclassical perspective. It suggests that knowledge diffusion is difficult to prevent because local employees, through working with and observing the technical and managerial practices of MNCs, gradually acquire these capabilities. After an initial period of learning, these workers may become sufficiently skilled to establish competing firms or to apply their knowledge in other related industries. This process generates positive externalities for the host economy, as the benefits of knowledge spillovers extend beyond the originating firm (Markusen, 1991). Furthermore, to the extent that the intellectual capital brought by MNCs becomes embedded in the host country's workforce, it contributes to an enduring enhancement of the country's human capital. In this way, the presence of MNCs can lead to a permanent transformation of the host country's factor endowment.

The import substitution industrialization strategy by India in the 1970s and early 1980s led-to development of niche product exports while but falling behind in exports of scalable manufactured goods. South Korea, Singapore, Malaysia, Thailand and China achieved much more in terms of the share the global exports of the manufactured goods as they could supply the international markets of the MNCs. MNCs have also played a very critical role in establishment of formal supply chains in these economies. Quality Supply Chains, that produce high-volume products in a limited and specified time-frame with a set 'corresponding quality' of the product, were established by MNCs.

MNCs can play a key role in enhancing India's *'economic catch-up'* to China in the manufacturing sector. *Economic catch-up* is defined as narrowing of a latecomer country's gap vis-à-vis a leading country (Fagerberg and Godinho 2005). One of the key aspects for catching up by the latecomer economy is how to integrate successfully within the global value chains (GVC), as one of the key factors of growth is getting connected to reliable 'international firms' pool of knowledge (Amsden, 1989; Chang & Hong, 2000) and acquire advanced foreign technologies from their suppliers and customers. Experience suggests that latecomer countries should first establish linkages with the already established MNEs by targeting those "least rare", "most reliable" and "most transferable resources". Then they should leverage on the knowledge from these linkages and develop their own capabilities (Mathews, 2002).

MNCs open opportunities for the Micro, Small and Medium Enterprises (MSMEs) and boost the start-up ecosystem of the host economies through the spill-over of the skills and knowledge to the local economy. Rasiah (1995) shows that in Malaysia up to 17.6 per cent of professionals

and 10.9 per cent of technicians and supervisors in local firms had prior experience in MNCs. In many cases the entrepreneurs who founded Malaysian technology firms also had their professional beginnings in foreign hi-tech MNCs. The same is true for many firms in Thailand, the Philippines, Singapore and Indonesia. Several studies have found that entrepreneurship has its roots in firms rather than universities and schools. That entrepreneurship plays such a pivotal role in technological upgrading underscores the importance of firm involvement in processes of human capital development (Ritchie, 2002).

MNCs also have existing demand in HICs which they are meeting from China. Compared to it, India's current demand for the same quality products is relatively low. Shifting a small Prt of this demand from China to India is therefore critical to raise effective demand above Minimum efficient scale and build a competitive production. India's large potential market and growth prospects then become an additional factor in attracting MNCs to India, compared to smaller countries (ipso facto). Apple's experience in India during 2022-25, shows how quickly competitive supply chains can be built by an MNE/MNC, willing to shift some demand and build contract manufacturing in India.

14.3 Relative Comparative Advantage: HICs & India

The concentration of manufacturing in China has created several risks and weaponized the trade, which was very apparent especially post-covid. China's success in scale-intensive manufacturing and exports was not accidental or purely market-driven. It was the outcome of a state-engineered system in which the effective cost of capital was relatively low, enabling China to dominate global markets in industries where scale and capital intensity are decisive. Its manufacturing patterns aligned closely with the principle of Minimum Efficient Scale (MES) and economies of scale. Because of the scale-factor, it has massive concentration even in specialized goods like the 'network products. Besides the scale, the socialist market system and the Party sector allowed it to maximize production through capital-intensive manufacturing, as the focus is not on the profits, but only 'growth'. The advantage built over decades can only be countered by combining the relative comparative advantage of EU and India or USA and India.

US and EU have a Comparative advantage in current demand for manufacturing, while India has Comparative advantage in growth of demand for manufactures. In **Figure 51** we saw that the USA is the largest market for manufactured products. China exceeded the EU in 2011 and Japan in 2007. However, since 2021, the demand has started to decline. India is the fifth largest market vis-à-vis other countries for the manufactured products. Its gap with Japan is closing fast, post which it will become the fourth largest market globally after USA and China. However, India needs assured access to the international 'demand' for manufacturing goods to reduce the risk involved in building manufacturing facilities at the scale necessary to compete with China. The MNCs already have well-established market demand in HICs which they can feed with their made in India products.

US and EU have Comparative advantage in technology and risk capital. India, on the other hand, has Comparative advantage in Human Capital. As shown in ***Section 12.3,*** USA and EU (22 countries included) together account for more than three-fifths of the total outwards

investments in manufacturing sector (amongst the group of OECD countries and China). Japan and South Korea have combined share of around one-fifths of the manufacturing investments. This shows how HICs and in particular, the USA and EU have an overwhelming Comparative advantage in terms of the risk capital **(Table 36).** As a large majority of MNCs are headquartered in the USA, EU, Japan and S. Korea, FDIs from these countries bring not just 'risk capital' but also technology, skills and demand along with "risk capital".[73]

Table 36: Comparative Advantage in Risk Capital (2024)

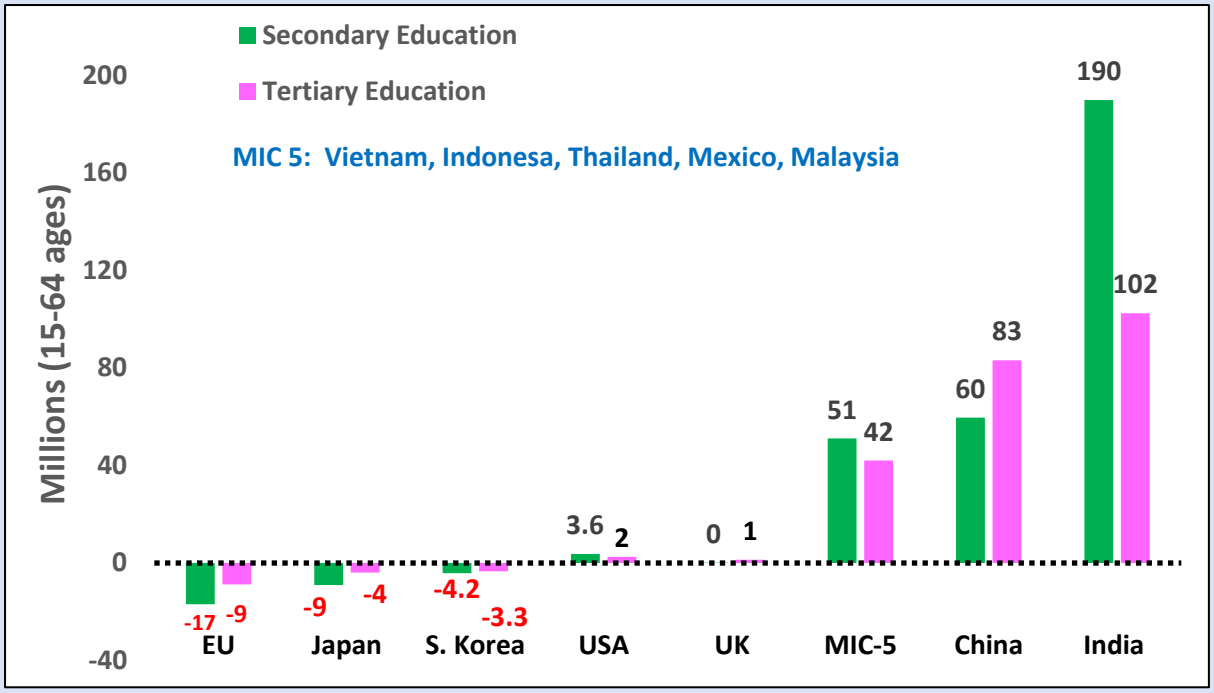
Economy	Manufacturing FDI ($ US Billion)	Share (per cent)
United States	118.5	34.2
EU-22	92.8	26.8
Japan	52.4	15.1
China	37.5	10.8
EFTA	29.2	8.4
Korea	13.6	3.9
Total OECD*	*346.7*	*100*

Note: EU22 refers to top 22 EU nations whose data have been provided by OECD. Pink denotes estimated values. Germany, Sweden and Spain latest available data is for year 2022; UK latest data is for the year 2018.
Source: OECD Direct Investment Statistics (Updated: Feb 09, 202)

India is projected to have a comparative advantage over HICs, in labor and human capital, based on education attainments of the labor force (). India's Human capital will soon be comparable to China and superior in semi-skilled labor critical to labor intensive manufacturing of high-quality MNC products ***(section 13 & Figure 61)***.

[73] With everything bundled together, MNC investment is not as risky as it would be for a domestic/host country company without assured demand.

Figure 61: **Projected Change in Labor Force by Education Level (2023-2050)**



Source: Authors calculations based on World Bank UNESCO Institute of Statistics (UIS)
Note: MIC-5: Malaysia, Mexico, Thailand, Indonesia, Vietnam

India's Human capital will also increase its advantage over potential competitors, the MIC-5 (Malaysia, Mexico, Thailand, Vietnam, Indonesia). In case of the secondary education attainment, India is projected to add another 190 million workforce which would be more than thrice the China and 3.5 times the combined group of middle-income countries (MIC-5). India is projected to have an edge over all these countries even for the workforce with tertiary education.

Campbell and Doshi (2025) argue that size alone does not confer competitive strength, scale does. Their work highlights that great manufacturing powers are distinguished not merely by their economic or demographic magnitude, but by their ability to convert that size into efficiency, productivity, and technological depth. States capable of harnessing scale through large internal markets, diversified resource bases, and deep talent pools can drive down costs, accelerate innovation, and sustain long-term strategic advantage. Against this backdrop, the only cost-effective way to break this monopoly and to create competitive supply chain is to combine the Comparative advantages of the United States - European Union and India.

For India and its developed-country partners, the central challenge is therefore not simply to expand production, but to scale it up in a manner that matches China's systemic advantages. Neither India nor individual advanced economies can achieve this independently. But together—through coordinated investment, integrated supply chains, technology sharing, and harmonized standards—they can aggregate market size, talent, innovation capacity, and capital at a scale comparable to China's. The imperative, then, is to build a collaborative manufacturing ecosystem that is large, efficient, and resilient enough to counter excessive concentration. Scaling-up through partnerships is not just an economic choice; it is a strategic necessity for ensuring balanced, secure, and competitive global manufacturing.

Table 37 summarizes the current situation with respect to the threat of Chinese monopoly in manufacturing (columns 9 & 10) and the opportunity for combining the comparative advantage of the USA and EU (columns 2 to 5) with the comparative advantage of India (columns 6 to 8). The total demand for manufactured goods and the demand for manufactured goods from the rest of the world (ie imports) is shown in columns 2 & 3. Supply side has capital & technology aspect and Human capital aspects. Columns 5 shows total Gross Capital formation in each economy (investment potential) while column 4 shows FDI outflows, which effectively bundle capital with technology, skills, and management. Columns 6, 7 and 8 show the labor force with primary, secondary and tertiary education, respectively, which determines the availability and cost of low, semi-skilled and skilled workers, supervisors and managers needed for manufactured goods production, sale and export.

The extent of the threat is evident from the fact that only the combination of EU and USA (India-USA-EU) has an MVA's which is higher than that of China (column 9, **Table 37)**. The EU's exports and net exports (column 10) exceed those of China's, because they include intra-EU trade, but if we compare large exporters in EU such as Germany, they are no patch on China, as discussed in earlier sections.

Table 37**: Possibility for jointly competing with China – current position**

	Manufacturing (US $ Bil.)			GCF Total	Total Labor Force (Mil.)			Manuf Threat	
1	2	3	4	5	6	7	8	9	10
Economies	**Demand**	**Imports**	**FDI Outflo**	US $ bil	**Primary**	**Secondary**	**Tertiary**	**MVA**	**Net export**
USA	4396	2633	65	6309	7	91	62	2913	-3247
EU*	2083	4812	79	5086	52	101	55	2722	3369
China	2676	1275	26	7693	466	175	56	4661	585
India	519	326	7	1292	157	116	75	490	-222
India-UK-EFTA		1128	39	2378	175	156	109	1397	996
India-E Asia		1362	90	3455	170	163	99	1870	991
India-EU	2602	5138	86	6378	209	217	130	3213	3147
India-US	4915	2959	72	7601	164	207	137	3404	-3469
India-US-EU	6998	7771	151	12687	216	308	192	6126	-100

Notes: *(1) Export, Imports, VA data for the year 2024; Japan RoK VA is available for 2023;* (2) Net Exports= *Manufactures Exports - Manufactures Imports; Data for 2024, US $ Billions;* (3) Manufacturing *FDI* outflows *is calculated as* average for five years 2019-23 *to balance-out large y-o-y fluctuation;* (4) *Labor force is for 15-64 age& year 2023,* Primary, Secondary & Tertiary refers *to* labor force with education attainment at primary, *upper secondary & post-secondary*; figures in *millions;* (5) *EFTA: European Free Trade Association (Iceland, Norway, Switzerland);* (6)*EU FDI outflows is for 21 EU countries. India-E Asia= India, Japan, S Korea. Australia (NZ)*
Source: Authors calculations based on World Development Indicators (exports, imports, VA); OECD Investment Statistics (Manufacturing FDI) and on World Bank UNESCO Institute of Statistics (labor force by education; China and India. DI Outflows calculated from CEIC.

There is, however, a promising opportunity for restructuring the Global manufacturing system. The USA total demand for manufactured goods is higher than that of China (column 2), while both USA and EU import more than China (column 3). The latter is more relevant for joint ventures in India. From the supply side, factor availability of the HICs (capital & technology) and India (labor & skills), complement each other. The USA and EU have lower Gross fixed investment than China (column 5) but provide more FDI to the World than China (column 4). The latter is more relevant for joint ventures in India and India-USA together have a total Gross Capital Formation (GFC) only 1per cent less than China's GFC (**Table 37)**.

On the Human capital side, India has larger tertiary educated, skilled labor force than China, but has two-third of the secondary educated labor force and one third the workers with primary education. Both India-EU combination and the India-EU combination have a larger secondary educated labor force. Over the next decade, however India's human capital will match or exceed that of China. Therefore combining the Manufacturing demand, capital and technology of USA or EU with the labor force and Human capital of India, results in an economic combination which can compete with China's entrenched manufacturing eco-system (**Table 37)**.

Comparing the aggregates produced by India's FTAs with different countries/economies, the India-UK-EFTA combination produces numbers which exceed those of China in FDI going to manufacturing sector and size of Tertiary educated labor force. The India-E Asia (Japan, S Korea, Australia) combination exceeds China in both these and in manufactured imports which support FDI in supply chains. India-EU FTA will exceed China in all these three indicators plus in secondary educated labor force. A potential India-USA FTA would exceed China in all four indicators plus overall manufacturing demand. If the EU was put into this mix, its GFC and MVA would exceed that of China (**Table 37)**.

Changes during the last ten years give some idea of the likely changes in future. These show that USA's incremental MVA and Exports are less than China's incremental values even though USA's absolute values are higher than China's in 2024. This means that the India-USA FTA may not exceed China's MVA and manufactured exports if the situation is not reversed (***Table 38***).

Table 38: Change in MVA, Trade and GCF during last decade (US$ bil)

Economies	Change in manufacturing (US$ Bil)				Change	Values (US4 bil) in 2024				
	MVA	Exports	Imports	Net exports	GCF	MVA	Exports	Imports	Net exports	GCF
USA	903	154	876	-722	2628	2913	1149	2633	-3247	6309
EU	420	1147	1185	-38	1040	2722	5452	4812	3369	5086
China	1477	1059	156	903	2745	4661	3261	1275	585	7693
India	183	95	138	-43	593	490	297	326	-222	1292
India-UK-EFTA	221	152	213	-61	787	1397	1515	1128	996	2378
India-E Asia	345	178	316	-138	573	1870	1510	1362	991	3455
India-EU	603	1242	1323	-81	1633	3213	5749	5138	3147	6378
India-USA	1087	249	1014	-765	3221	3404	1446	2959	-3469	7601
India-US-EU	1507	1396	2199	-803	4261	6126	6898	7771	-100	12687

EUs net exports are larger than China's in absolute value but lower on incremental basis, suggesting China will likely overtake EU soon. In this case the net exports of the India-EU FTA may fall below those of China in future (***Table 38***). The incremental manufactured imports of India-UK-EFTA and India-East Asia are however higher than those of China, though the absolute values of China are larger than the former in 2024 (***Table 38***). This suggests that these two combinations will soon become a better market for manufactured exports of ASEAN than China, completely overturning the argument for India joining RCEP.

The severity of the potential challenge and the need for these combinations, is heightened if look at projections for 2035. By the year 2035, China will occupy close to a third of the world share in value added and one-fifths of the share in exports. This can be corrected only with the combination of India's human capital and FDI by MNEs from USA and EU, which bundle Market demand from home country (imports), technology and capital. By 2035, while India will alone have more labor than China with education attainment of the primary level. The combined India-EU and India-USA secondary educated labor force will be larger than that of China's secondary educated labor force. Similarly, India-EU's and India-USA's tertiary educated, high skilled human capital, will have Comparative advantage over China. However, only the combination of India-US-EU will have an MVA and manufactured exports, which exceeds that of China by 2035 **(Table 39).**

The projections of GDP and manufacturing VA and manufactured imports suggest that India will play a progressively bigger role in incremental World GDP, MVA and manufactured imports, exceeding that of China for the latter two , and closing the gap with the former. The incremental picture is very different from the level picture given above.

Table 39: **Projected MVA, Exports, and Educated Labor Force for 2035**

Economies	Manufacturing World Share (per cent)		Total Labor Force by Education (in Million)		
	Value Added	Exports	Primary	Secondary	Tertiary
United States	17.1	6.3	8	92	63
European Union	15.4	30.7	52	95	52
China	29.6	20.6	259	274	157
India	5.4	1.7	342	248	132
India-EU	20.8	32.4	394	342	184
India-US	22.5	8.0	350	340	195
India-US-EU	37.9	38.7	402	435	247

Note: The projection of Manufacturing Exports and Value Added are based on post tariff (2018) effects. The labor force projections for primary, secondary and tertiary are defined as the education attainment at level of primary, post-secondary and bachelors respectively.
Source: Authors calculations based on World Development Indicators (exports, imports, VA); OECD Investment Statistics (Manufacturing FDI) and on World Bank UNESCO Institute of Statistics (labor force by education; China and India FDI Outflows calculated from CEIC.

14.4 FTAs & CEPAs for Building Trusted Supply Chains

Competing against the manufacturing system built by the CCP, in terms of scale, scope speed and flexibility, including future technology, requires an 'integration' of the manufacturing ecosystems of either the EU & India, or those of USA & India, or both. The cost-effective way to do it is to have a traditional 'zero-zero FTA' for manufacture goods, minerals and agricultural raw materials (like cotton). These FTAs/CEPA's must be designed to promote and incentivize development of trusted supply/value chains within the three economies, based on their relative comparative advantage. Ideally this requires two tariff changes;

(1) Zero tariffs on all value added in the three economies (cumulative VA). These would be covered by FTAs
(2) Higher tariffs on value added in China (direct/indirect import), to offset cumulative subsidies & potential dumping.

These could be covered under a broader CEPA/CETTA which includes elements of industrial policy.

Free Trade Agreements (FTAs) and Comprehensive Economic Partnership agreements (CEPAs) play a pivotal role in enhancing manufacturing performance by reducing trade costs, promoting specialization, and facilitating investment and technology transfer. In his influential study, Krishna (2012) argues that PTAs can foster trade-creation effects, reallocating resources into more productive sectors and enabling countries to integrate more deeply into global value chains. Empirical research supports this, demonstrating that FTAs increase imports of intermediate goods and boost firms' participation in cross-border production networks; for example, Lopez González (2012) finds that FTAs raise intermediate imports used in exports by up to 65per cent, thereby strengthening vertical specialization.

India has established a network of FTAs/CEPAs with many HIC to attract MNEs/MNCs, drive industrial upgrade and global value-chain integration. These include Japan, South Korea, Australia, and EFTA states (**Table 40}**. The primary focus of these FTAs is on manufacturing sector.

The India–Japan CEPA (2011) eliminates duties on nearly all major industrial goods, it has facilitated the inflow of advanced Japanese machinery while supporting India's exports of engineering products. High levels of tariff liberalization—covering around 90per cent of Japan's tariff lines and 97per cent of India's —have helped deepen manufacturing value chains and foster complementary specializations between the two countries but falls short because of the relatively high Parochialism index. The India–South Korea CEPA (2010) similarly reinforces industrial integration in sectors such as steel, chemicals, and electronics. Preferential access supports Indian engineering and chemical exports, while Korean firms—especially in automotive and electronics—use India as a competitive production base, strengthening India's linkages in capital goods and expanding Korea's manufacturing footprint. The relatively high parochialism index explains that the FTA has also fallen short.

India's FTA with Australia, the ECTA (2022), further broadens this engagement. The elimination of tariffs on processed minerals, machinery, and industrial inputs lowers production costs for Indian manufacturers, while granting Australian firms preferential entry into a large consumer market. Early post-agreement evidence shows growth in India's engineering, textile, and pharmaceutical exports to Australia.

Table 40: **India's Free Trade Agreements (FTAs) Landscape**

FTA Partner(s)	Income Level	Agreement Name	Date Signed	Entry into Force
Sri Lanka	MIC	India–Sri Lanka FTA	28-Dec-98	01-Mar-00
SAARC	LICs, MIC	South Asian Free Trade Area (SAFTA)	04-Jan-04	01-Jan-06
Thailand	MIC	India–Thailand FTA (Early Harvest)	09-Oct-03	01-Sep-04
Singapore	HIC	India–Singapore CECA	29-Jun-05	01-Aug-05
South Korea	HIC	India–South Korea CEPA	07-Aug-09	01-Jan-10
ASEAN	LICs, MICs	India-ASEAN Trade in Goods	13-Aug-09	01-Jan-10
Japan	HIC	India–Japan CEPA	16-Feb-11	01-Aug-11
Malaysia	MIC	India–Malaysia CECA	27-Oct-10	01-Jul-11
Mauritius	HIC	India–Mauritius CECPA	22-Feb-21	01-Apr-21
UAE	HIC	India–UAE CEPA	18-Feb-22	01-May-22
Australia	HIC	India–Australia ECTA	02-Apr-22	29-Dec-22
UK	HIC	India–UK CETA	24-Jul-25	
EFTA	HICs	India–EFTA TEPA	10-Mar-24	01-Oct-25
Oman	HIC	India-Oman CEPA	18-Dec-25	
New Zealand	HIC	India- New Zealand FTA	22-Dec-25	
EU	HICs	India-EU FTA *(Mother of all deals)*	FTA signed on 27-Jan-26	
USA	HIC	India-USA Bilateral Trade Agreement	MoU (for FTA negotiation) signed in February, 2025	

Source: Authors compilations from Ministry of Commerce, Government of India

The India–EFTA TEPA (2025) marks a particularly strategic development as India's first FTA with a bloc of developed European economies. Beyond tariff cuts, it includes a US$100-billion investment commitment over 15 years and aims to generate one million jobs, signaling a strong industrial-policy orientation. Its provisions on rules of origin, customs facilitation, and regulatory cooperation are designed to enable cross-border production networks in sectors such as precision manufacturing, renewable energy, engineering, and pharmaceuticals.

There is a distinct change in 'strategy' for FTAs during the last decade with attention shifting from Middle income countries who are potential competitors of India to HICs whose economies are potentially complementary to India (**Table 40).** Many if not most of the latter have preferential or zero duty access to the markets of the former. The only way to level the market access, is by having preferential or zero duty access. Earlier India FTAs were with groups like SAARC and ASEAN whose members were mostly LICs and middle-income countries. Since 2021, India has concluded seven FTAs with the High-Income Countries (HICs) or High-Income Economies like the EFTA, and the on-going discussions with EU. and USA. This change in strategy indicates India's intent to take a leap in its manufacturing prowess with the capital, technology and supply-chain integration brough-by the anchor investors from the HICs and combine it with the human capital of the India to steer a competitive advantage in manufacturing to make the global production competitive.

14.5 National Security: Communicate, Compute & Control (3Cs)

We have so far discussed the economic aspects of the monopolization of the manufacturing process. There are broader issues of national security- that includes domestic and global security- which involves China's penetration of the systems of different countries and pose a security threat in terms of the 3C devices.

Section 6.3 detailed how China's high-tech segment exports were led majorly by the group of electronics and semi-conductor products. This E&SC was the dominant segment even in the medium-tech exports. A distinct characteristic of the products included under the E&SC category is the ability of these products to communicate, compute and control (3Cs). While these 3Cs held a share of close to 27 per cent in the high-tech segment, its share in the constituent of the medium-tech products was around 20 per cent. It is in this context that the 3Cs hold a lot of significance. China has complete dominance within all these three categories of products and poses a huge challenge to the world economy and manufacturing. Not only this, it also poses a massive national security challenge.

These 3Cs can also be mapped onto a group of network products. These include Communicate (Telecommunication), Compute (Automatic Data Processing) and Control (Electrical Equipment). While the share of the total network products exports is close to 25 per cent in 2024, it is led by these 3C products which include Telecommunication devices (at 42.5 per cent), Automatic data processing machines (at 40.3 per cent) and electrical machinery (at 28 per cent). China has developed all these categories of products in a very systematic and deliberate manner. While we are highlighting the electrical equipment, it is crucial to note that not the entire electrical machinery poses a security risk, but it is only the motherboards and semiconductor chips which control the machinery and equipment.

The supply chain dependency on China undermines the technology sovereignty from another geopolitical direction as well. In this context, what constitutes an area of concern with respect to 3C is 'Cellular Internet of Things Modules (CIM)'. These enable smart devices (think fridges or cars) to talk to each other. China controls 70 per cent of the market in this segment. The raises serious concerns over the safety of our CIM sovereignty.

14.6 Industrial Policy

Industrial policy integrates Fiscal measures (income tax exemptions, PLI subsidies), trade (NTB) and tariff policy, financial & credit policy, R&D policy, startup support policy and an education(learning) and skilling policy (CSR). It also integrates sectoral policy such as for Electronics and semi-conductors, Energy, Solar power and EVs (Time of day pricing), Rare earth metals and magnets (extraction for tailing of major minerals & waste), AI, Quantum and DNA based Medicine-pharma, Dual-use intermediate goods and defense-industrial complex. In India and other Federal nations, it would also try and integrate critical elements of State policies into the national industrial policy. "Atman Nirbhar Bharat" could be a unifying goal for an Indian industrial policy (IIP), by integrating all the above-mentioned elements into an integrated framework. There has to be an institutional structure for monitoring implementation, making course corrections, and reviewing & reformulating entire policy at designated intervals.

The top five producers of manufactured goods in terms of manufacturing value added (MVA) after China, i.e. USA, Germany (EU), Japan, India and South Korea, need a Dualistic trade policy: A special one for countries with manufacturing monopoly (e.g. China Inc), and a conventional free trade policy within the WTO framework, for the Rest of the World. The conventional policy has a place for free trade agreements (FTAs), and these should be aimed at economies with complimentary comparative advantage, which can halt & reverse the MVA manufactured export monopoly. The three elements of the Dualistic trade policy are therefore,

(1) A normal tariff structure for Rest of The World (ex-China & HIC-India FTAs), to which WTO rules apply fully. Generally this involves either a uniform tariff on all imports (5-10per cent), or a three-tariff structure with a low uniform tariff on all intermediate inputs and capital goods (5per cent say), a lower or zero tariff on selected raw materials (0-2per cent) and higher tariffs on final consumer goods (10per cent plus).

(2) A zero-zero tariff structure for manufactured goods, minerals and selected agricultural raw materials (e.g. cotton) in FTAs between India and HICs (EU, USA, Japan, S. Korea, UK, EFTA, Australia, New Zealand, Canada), with complementary economies in terms of relative comparative advantage. The principle is to have zero tariffs on cumulative value added in the partner economies, so that MNCs/MNEs can optimize their Value/Supply chains over the partner economies. NTBs would also minimized or eliminated on the same set of goods, between the partner economies. This will facilitate and incentivize MNEs/MNCs to shift labor & semi-skill intensive *segments* of their supply/value chains to India, and technology & capital-intensive segments of supply/value to HIC partner. The consequent reduction in cost will improve their ability to compete with monopolies.

(3) A monopoly surcharge of 15per cent to 30per cent on manufactured goods imported from China. The principle behind this is to tariff all value added exported, directly or indirectly from China, to offset past or present subsidies and NTBs used to develop monopoly. Thus a 30per cent tariff on a good with 50per cent (25per cent) MVA in China, would mean a 60per cent (120per cent) tariff on MVA. The monopoly surcharge is justified by national security threat from concentration of manufacturing in one country, and use of the national security exempts the surcharge from MFN rules. The WTO case is even stronger if all FTA partners justify country manufacturing monopoly as threat to National security.

Tariffs are also needed to offset dumping, given that in China's Socialist market economy, State & party companies keep investing as capacity utilization falls, the reverse of Private firm behavior in democratic market economies. A common tariff surcharge on monopoly imports by FTA partner economies will facilitate creation of competitive MNC/MNE supply chains.

NTBs should be part of a broader CEPA agreement which covers strategic issues. NTBs could be used selectively in the case of strategic goods like rare earth metals & magnets, batteries & EVs and 3C electronics and semiconductors. A joint action plan between the FTA partners would facilitate quicker development of competitive technology, by assuring a large enough demand to amortize R&D expenditure and build above minimum efficient scale (MES).

There should be common understanding that CEPA partner countries, that each may subsidize certain industries which are particularly relevant to, or important for, it. Subsidies cannot be given for everything. Subsidies such as India's PLI scheme or its successors should be carefully designed to focus on industries in which raising scale is important for competitiveness.

15. Conclusion

The Peoples Republic of China, a Socialist Market economy, with Chinee characteristics, is determined to dominate World Manufacturing. This economy is very different from the "Centralized Socialist Economy" of the USSR, as well as the "State Capitalist" economies of East Asia (Japan, Singapore, South Korea, Taiwan); It's domestic economic goals are closely related to, (a) Its domestic political goals, (b) its Geo-economic goals, and (c) Its Geopolitical goals. It has been pursuing these goals, through a strategy of asymmetric dependence on the USA led Western economies, by Maximizing manufactured exports, minimizing manufactured imports (ELISID), maximizing informal flows of technology and indigenous R&D (sREAD). As a result of these policies it was well on its way by 2021 to producing half the World's Manufacturing Value added, one-third of World Manufactured Exports, and a massive surplus of Net manufactured exports (exports-imports). The concentration and near monopoly of manufactured goods at the 2 digit to 6-digit, in China poses great risk to all large manufacturing economies, and a geo-economic, geo-political and National Security challenge for all of them.

China has used the indulgences shown by High Income Developed Economies of America, Europe and Asia towards its direct and indirect subsidies, to build a manufacturing system which combines, scale, scope, quality and interlinked & overlapping supply networks. This system is a virtual, highly efficient monopoly built in two phases; "Catchup Phase" before WTO entry (1980-99), and "Quest for Dominance phase" post WTO entry (2000 to date). The effective near-monopoly built by China over half a century, will be very difficult and costly for USA or EU (with next largest MVA & manufactured exports)), to challenge on their own. They need to combine their comparative advantage, with a trustworthy democratic market economy whose strengths complement their own.

The High-Income economies of USA, EU, Japan and S Korea will have declining worker-population ratios, declining share of World labor force and declining or stagnant educated labor force. India's labor force will be increasing in all categories: primary educated-low skill, secondary educated-semi-skilled and Tertiary educated, high-skilled. With China's labor force declining, India will become, directly or indirectly, the largest supplier of Human Capital to the World, during the current quarter century. Even if China uses AI and robotics to substitute for its declining young labor force, blended Human capital-AI systems will remain a source of comparative advantage, as will the large and growing demand for consumer goods from India's labor force.

These and other HICs are still the largest source of FDI in manufacturing sector and home to 95per cent of the Worlds Multinational Enterprises/Companies (MNEs/MNCs) whose cross-border trade has been responsible for 50per cent-60per cent of the increase in World exports in the 21st century. The HICs are also the largest Importers of manufactured goods, which is

critical for establishing new supply chains which can compete with China's established supply chains. MNE/MNC FDI comes uniquely bundled with low-cost long-term capital, technology, skilling and export demand, which reduces the risk of establishing new export quality production lines in MICs from scratch.

Taking incremental share of World GDP as a measure of overall increase in demand for goods and services, shows that India's has been the second largest contributor to increase in World Demand for many decades. India's share of incremental World GDP was a little less than half of China's during the last decade, about 10per cent more than USA's and 50per cent more than European Unions (EUs). India's share in World increase in GDP is projected to be higher than that of China in the next decade, more than double that of USA and more than triple that of EU. This provides a unique opportunity for HIC FDI investors, to combine the advantages of HIC current demand with expected growth of India demand.

China's Imports of manufactured imports which rose to become the second highest in absolute value are now far lower than those of USA or EU, and just above those of Germany. In incremental terms (2014-24) they are less than a fifth of USA's and below those of Germany, Netherlands, and Mexico and only 1.1 times India's. As incremental demand for manufactured imports is critical to development of new supply chains in Middle Income countries, this shows the rapid decline in importance of China as a driver of MVA growth. Relating manufactured demand to GDP projections, Indian demand for manufactures will progressively become a greater driver of manufactured exports of the Rest of the World (ex-China), than China. China's restrictions on frontier Technology developed by it, and the restrictions on capital goods and intermediate goods over which it has a near-monopoly, will make China an even less attractive trade an investment partner for all countries except its ASEAN neighbors.

There is therefore a great opportunity for combining the relative comparative advantage of India and HICs like EU, Japan, South Korea, UK and USA, to develop manufacturing supply chains which can compete with China on a sustained and sustainable basis. This may involve subsidies for building minimum efficient scale quickly, compensation for sunk costs in China, and facilitation of learning by doing & building supply networks. It also requires temporary tariff protection and selective NTBs to protect against direct or indirect (though Chinese companies in third countries) dumping, to undermine infant competitors. The most important policy tool will, however, be bilateral FTAs and CEPAs between India on one side and USA and EU on the other, which provide a risk-free environment for MNEs/MNCs head quartered in USA and EU. These MNCs have demonstrated in East and Southeast Asia that they can efficiently combine the comparative advantage of their home and host countries, to build supply chains which can compete on a sustained basis.

16. Appendix: China's Socialist Market Economy

16.1 Introduction

Mao Tsedung's version of Socialism, which he termed, "*Socialism with Chinese Characteristics*" prevailed from 1947-2007. One of its distinctive features was to build a much ore decentralized party structure, with contrasted sharply with Lenin-Stalin centralized

soviet Communist party. This decentralized structure proved critical in the success of subsequent reforms. Mao;s socialism however, followed the Marx-Engels-Lenin model in 100per cent ownership of the "Means of (industrial) Production," vested in the party (not the Government) and comprehensive party control over the "Commanding Heights of the Economy (Infrastructure, Heavy Industry & Banking). Mao's economy was characterized by multiple goals, which changed with his perception of internal and external developments.

Deng Xiaoping introduced economic liberalization in 1978-79, with the objective of Catching up with the Western advanced economy, in agriculture, manufacturing, Technology and Defense. The period from 1979 to 2000, was therefore a period of Transition to a *Socialist Market Economy.* The initial stage was the system proposed by Oskar Lange and elaborated by Abba Lerner, in which all the "means of production" were 100per cent owned and controlled by the Communist Party, but prices mimicked markets. Deng and China's innovation was to first move to a Dual pricing system, closely resembling India's price decontrol in the 1970s, and then to prices determined completely by demand and supply in the market. Provincial Town and Village Enterprises (TVEs) were also given more freedom to mange their production, trade and investment, though the means of production, their assets were still 100per cent owned by the provincial party. This progressively evolving system was termed a *Socialist Market Economy with Chinese Characteristics.*

The primary goal of the Communist Party of China (CCP) under the new political system was Growth Maximization, as this would generate the Per capita GDP to close the gap with the High-Income countries, but also the financial resources to invest in Infrastructure, Technology and Defense to catch up with the advanced countries. This required co-operation with capitalist countries to access their markets for Export, to import many sophisticated capital goods, intermediates, parts and component which were not available from the USSR/Russia, and for technology and scientific knowledge. The focus gradually shifted from catchup economic growth (1980-1999) to economic dominance to catch up in frontier technology (2000-08), and thereafter to technological dominance and catch up in defense production (2009+).

16.2 Socialist Economy with Chinese Characteristics

Communist China, under Mao Tsedung unequivocally adopted some of the key features of the Communist system, termed "Socialism" by Marx-Engels-Lenin. This included the nationalization of all land and mineral resources and all assets (machinery, equipment, buildings) used in the production of any good, agriculture, manufactured, constructed factories. Mao and his party also accepted Lenin's concept of the "Commanding Heights of the Economy," which Lenin introduced along with his new economic policy (NEP). Mao, however, differed in one fundamental way from Lenin-Stalin. He did not believe that a large agrarian Asian economy could be run like the USSR with its highly centralized party structure and highly centralized planning. So he built a much more decentralized party structure with provincial parties, leadership & party secretary. The policy and programs came from the top and had to be followed, but the details were left to the provincial party, within the limits of the party philosophy and strategy. It was a failure of this system of decentralization, which Mao

perceived had gone rogue on him, which led to the Cultural revolution" to purge the party of bad elements who were not following the philosophy and goals as defined by him.

This decentralized party structure, set up by Mao and his Long March associates, was later used by Deng Xiaoping to liberalize the economy. Effectively, after 1978, the economic goals & directions and broad approach, was still set by the top leadership, but the provincial party leadership had flexibility on how to implement it. Some bold part chiefs even experimented on the border of parties philosophical red lines and got away with crossing red lines if they were successful. In Marxist theory, the distinction between *productive* and *unproductive* labor is crucial. Marx defined productive labor as that which directly produces surplus value under capitalist relations of production ie labor which contributes to the expansion of capital. This meant that industrial workers, agricultural laborers, and those engaged in manufacturing were considered part of the "productive forces." Those engaged in personal services were as *unproductive labor* because they did not generate surplus value.

The phrase "commanding heights of the economy" was coined by Vladimir Lenin, in 1921, when he allowed limited private enterprise agriculture and small trade. It referred to strategic sectors such as heavy industry, banking, transportation, and foreign trade—that the state must control to direct national development. It became a central concept in Marxist–Leninist economic planning.

Mao's communist party didn't immediately nationalize all productive assets on coming to power. Foreign owned enterprises were nationalized without compensation in 1949. "Bureaucratic capitalists" (large enterprises) were merged with the State enterprises, with owners operating as managers, during 1949 to 1952.All major banks were under State control by 1952. By 1955-56 all private industry and commerce were absorbed into State-controlled enterprise, with owners compensated with fixed interest payments and nominal managerial roles, will Agriculture, handicrafts and small industry & commerce were grouped into cooperatives. Independent private ownership was abolished by 1956, ie all productive assets including industrial capital, land and natural resources were legally owned & controlled by the Party.

Mao's party structure emphasized decentralization and mass participation through "democratic centralism," while Stalin's system was highly centralized, bureaucratic, and dominated by the state apparatus. Mao sought to mobilize peasants and local cadres. In practice, this meant local cadres and mass organizations had more space for initiative, especially in the 1950s. Mao developed the **"**mass line**"**: leaders must learn from the masses, synthesize their ideas, and return them as policies. These constituted the unique features of Mao's "Socialism with Chinese characteristics."

16.3 Socialist Market Economy with Chinese Characteristics

From 1978, Deng Xiaoping introduced reforms that kept socialist ownership of all productive assets including banks and financial institutions but allowed market incentives. Product markets were created by permitting enterprises to sell part of their output at market prices. In agriculture, the Household Responsibility System gave farmers the right to keep

and sell surplus produce. Fiscal and enterprise reforms in the early 1980s increased local incentives to promote growth. Provincial Governments could retain profits of Provincial enterprises and Urban land sales, after paying relevant taxes, encouraging investment, job creation and local development. Managers of state and collective enterprises gained more freedom to run their units efficiently within the broader Party goals.

Deng Xiaoping's "Reform and Opening," and the "Four Modernizations (Agriculture, Industry, S&T and defense)," was approved by the CCP Central Committee in Dec 1978, leading to the Household Responsibility System (1979–84), in which peasants' families could contract to sell surplus produce (over collective obligations) in markets. Special Economic Zones (SEZs): Shenzhen, Zhuhai, Shantou, and Xiamen were established in 1980 and expanded to major coastal cities in 1984. SEZs allowed foreign investment, flexible policies, and market-oriented practices. From 1984 to 1989, State-owned enterprises (SOEs) gained autonomy in production, pricing, and profits, and there was heightened emphasis on research, education, and modernization of defense industries.

16.3.1 Town and Village Industries: Party Sector

TVEs emerged as successors to commune-run brigade industries after the dissolution of collective farming. They were owned collectively by townships, villages or local communities, but operated by the local or provincial party appointed managers. Their formal legal status was left ambiguous, so that foreign observers would (eventually) think of them as private firms in democratic market economies. They were, however, clearly subject to to provincial and local government directions (Perkins (1988, 1994)). Jean C. Oi termed it Local State Corporatism, in which local governments acted like corporate managers, providing protection, credit, and infrastructure in exchange for revenue from TVEs. The Provincial CCP still owned and controlled the dispensation of the assets and "profits". Unlike State-owned enterprises (SOEs), however, TVEs could not rely on bailouts from the National (State) banks. Unlike the private sector, in a Democratic market economy, there was no question of dividends to private individuals, the revenue needs of the Provincial/local party government, were met by labeling it local/provincial tax. They had to either hold 100per cent of their after-tax profits in Provincial banks or reinvest them to meet the growth maximization goals of the Communist Party of China.

Weitzman and Xu (1994), argued that TVEs are better described as "vaguely defined cooperatives" — organizations whose ownership was so imprecisely specified that conventional property-rights theory could not fully account for their success; on their reading, TVE efficiency rested less on clearly assigned party ownership than on a "cooperative culture" of reciprocal trust among officials, managers and worker-residents that substituted for formal contracts and well-defined titles. Chang and Wang (1994) reached a related conclusion, attributing TVE performance to community-based, reputation-driven governance under township-village government (TVG) control rather than to hierarchical party direction as such, while cautioning that nominal ownership was assigned to citizens partly to guarantee that benefits would be retained locally. It should be kept in mind that the TVEs evolved from a system of communal farming, directed & managed by the local communist party with land

legally owned by the communist party. Any autonomy given to managers was a delegation of production and trading decisions to the managers, within the broader framework

Prasad (2009) notes that retained earnings became the dominant source of investment financing in China. Limited public provision of health care, pensions, and social security compelled households to save heavily for precautionary reasons, even when deposit rates were low. At the same time, government consumption remained restrained, further boosting aggregate savings (Lardy, 2008). Consequently, national savings rose from around 35 percent of GDP in the early reform period to nearly 50 percent by the 2000s, one of the highest levels ever observed internationally (Prasad, 2009).

TVEs evolved from Small-scale, labor-intensive industries like brickmaking, textiles, food processing (1980-83), into light manufacturing, machinery, and electronics & began exporting through coastal Special Economic Zones (1984-86). Many TVEs consolidated and grew rapidly during 1982-89, to become large enterprises, competing with SOEs and becoming intermediate goods suppliers to foreign invested enterprises in coastal Jiangsu, Zhejiang and Guangdong. They were sometimes provided credit by the provincial banks but otherwise had to depend on local, informal finance. Jefferson and Rawski (1994) note that TVE exports shot up from US$3.9 billion in 1985 to $12.5 billion by 1990 – over 20 per cent of China's exports by 1990.The TVEs employed 90 million workers and produced 40-50per cent of industrial output by 1990. These TVE enterprises, particularly the large ones, constituted the "Party Sector," during the 1990s, but are wrongly labelled by most China experts as the "private sector".

16.3.2 Commanding Height: Banking & Credit System

A fundamental feature of China's, "Socialist market economy" is the CCP control of the "commanding heights of the economy."[74] China's economic model functions less like a conventional nation-state and more like its Maoist Communist party, with all critical decisions and plans approved by the National leadership, but implemented by provincial party-govts, with a great deal of autonomy and flexibility. This flexibility must be exercised without violating any fundamental tenet of the Communist party (as defined by current leadership). One of these tenets is that every Chinese company is part of CCP led China Inc, when dealing with external economies and companies (Virmani (2005, 2006)).

In early 1980s the Banking system, a critical Commanding Height of the economy, was modernized, by converting Peoples Bank of China into a Central Bank focusing on monetary policy and financial stability and its lending function transferred to five newly created, State-owned banks: The Industrial and Commercial Bank of China (ICBC) for commercial banking. China Construction Bank (CCB) for infrastructure and construction, Bank of Communications (BoCom) for transport and communications, Bank of China (BoC) for foreign exchange and foreign trade, and Agricultural Bank of China (ABC) for rural finance. These gained more autonomy in lending and profit retention during the 1990s. Three new "Policy banks" (China

[74] The phrase originated with Vladimir Lenin, who used it in 1922 to describe key strategic industries—such as heavy manufacturing, transport, and state-backed finance—that the socialist government needed to control even while allowing small private markets under the New Economic Policy (NEP).

Development Bank, Export-Import Bank, Agricultural Development Bank) were established in 1994 to separate lending for policy dictated, high risk Investment from commercial banking. Even after listing of ICBC, CCB and BoC, and sale of shares in the 2000s, there was no question of diluting the Party/Govts control of the Banks.

Urban Credit Cooperatives (UCC)s controlled by Provincial or Municipal Governments, emerged in the late 1980s to serve small urban business and individuals, and dominated local finance. Some of were merged to form City Commercial Banks (CCBs) in the 1990s. They were owned and controlled by municipal governments, sometimes with provincial stakes, and focused on financing local enterprises, infrastructure, and housing. Prominent examples are the Bank of Beijing, Bank of Shanghai and Bank of Guangzhou. This dual system allowed China to combine centralized control with local financial autonomy, supporting both national strategy and grassroots development. From 2000s onward, many city commercial banks grew large, some partnering with foreign investors. They remain under local government influence, though regulated nationally by the PBoC and CBRC (now NFRA).

Financial repression: Deposit rates are capped, with the one-year loan prime rate at 3**per cent** and five-year mortgage-linked rates at 3.5per cent (2026). Despite this financial repression, Household savings rate equaled 118per cent of GDP in 2025, because alternative investment opportunities are limited. Consequently, 80per cent of surveyed households prefer saving overspending, reflecting insecurity about jobs, pensions, and the property market, even with falling deposit rates. China's official loan prime rate (LPR) is around 3.1per cent (1-year) and 3.6per cent (5-year), and SOEs and provincial Party companies pay a spread of 0.5per cent to 2per cent over LPR. Private firms, despite paying spreads of 3per cent to + 6per cent over LPR, are subject to CCP/Govt defined quotas, ie the loans are only given for specific purpose which is either part of a National plan or is necessary for achieving a Govt goal. The share formally allocated to private firms is 25per cent-30per cent, and has remained unchanged over decades.

China's financial repression, under which household savings were mobilized at artificially low deposit rates and redirected to industry through state-owned banks. Real deposit rates were frequently negative, implicitly taxing households and transferring resources to producers (Prasad, 2007). Since alternative financial instruments were limited, household savings were effectively locked into the banking system. State banks then allocated this pool of cheap capital according to government priorities rather than commercial risk, leading to an abundance of low-cost finance for industrial expansion (Lardy, 2008).

16.4 Growth Maximization Policy: ELISID and READ

Economists Oskar Lange and Abba Lerner, developed in the 1930s a theoretical model for allocating resources efficiently, in a socialist market. The core idea was that A socialist economy could mimic market efficiency by combining central planning with price signals. The State owns the means of production. A central planning board sets prices for goods and factors of production. Enterprises respond to these prices as if they were in a market, adjusting supply and demand. If shortages or surpluses occur, planners adjust prices iteratively until equilibrium is reached. China initially experimented with a *dual-track system*: planned quotas coexisted

with market pricing. SOEs remained state-owned but gained autonomy to respond to market signals. Prices were adjusted administratively, echoing Lange's iterative price-setting. Till 1992 China's SME resembled the Lange-Lerner system, though TVEs operated outside this system.

The 14th National Party congress in 1992, approved a modification of what it called the "***Socialist Market Economy,"*** *with Chinese characteristics*. Before Deng XioPing's Southern tour (1992), most industrial goods had dual prices: one set by the state, another by the market. After 1992 the government accelerated price liberalization, allowing supply and demand to determine prices for nearly all manufactured goods. By mid-1990s, over 90per cent of consumer and producer goods were sold at market prices. State-owned enterprises (SOEs) gained the right to decide production, sales, and investment without direct state quotas, SOEs were still expected to implement the growth maximization, technology upgradation and other goals and plans. More importantly, Foreign invested enterprises, TVEs and small private firms got the formal right to compete with SOEs, Many SOEs were therefore corporatized, and some were privatized or closed if unprofitable.

On paper this ended the monopoly of SOEs in all sectors, but it remained firmly ensconced in, (1) Banking & finance with Central state banks in control and local banks under tight regulation. (2) Energy (oil, coal, electricity), with SOEs like CNPC, Sinopec, and State Grid maintained dominance, (3) Telecommunications, with China Telecom and China Mobile (SOEs) remaining dominant, despite new entrants, (4) Transport & logistics, with Railways, airlines, and shipping remaining under State control. (5) Defense & aerospace Entirely state-owned, with no real private competition. (6) Heavy industry (steel, petrochemicals, shipbuilding): SOEs remained the backbone, though some private firms emerged later.

Among the factors and instruments which ensured this, despite legal freedom of entry, were, (a) Capital intensity: Sectors requiring huge investment (energy, steel, telecom) stayed under SOE control, (b) Strategic importance: Commanding heights (finance, defense, transport) were deliberately protected. (c) Policy bias: SOEs received preferential loans and subsidies in strategic sectors, crowding out private competition.

SOE monopoly ended in consumer facing, labor intensive industries, in which above factors were not significant and market flexibility was critical: (1) Light manufacturing: Textiles, garments, footwear, toys, consumer electronics. (2) Small-scale machinery & electronics. (3) Food processing & beverages. (4) Construction & real estate: Local collectives and private developers became major players. (5) Agricultural processing: Flour mills, meatpacking, and other rural industries shifted to TVEs and private firms. (6) Retail & wholesale trade: Markets and private shops replaced state stores.

China experts in the English-speaking West believe that the role of the Private sector, in manufacturing production, exports and investment has increased tremendously. Virmani (2005, 2006, 2021, 2024) disagrees: Much of the so called "Private corporate sector" is what he terms the "Party Sector," which has evolved from provincial TVEs to become corporate manufacturing champions of Provincial Party Govts, managed by "Party Capitalists." These are, with few exceptions, successors of the TVEs, whose assets still belong to the provincial

governments. The exceptions include the legacy food and textile sectors, and the post-2000 digital economy, including online education & trade. The "party capitalists" who manage "party sector" companies must follow the broad directives of the CCP & their provincial party and have no right to sell these assets or transfer them without party permission. Many of the genuine anti-corruption cases relate to Party Capitalists who ignored this dictum, and used party owned assets for their own personal wealth creation, including in foreign countries.

Naughton and Tsai (2015) describe post-2000s China as a case of "state capitalism," in which strategic sectors remain state-owned while most of the economy is marketized and globally integrated. McNally (2012) proposed "Sino-capitalism" to capture the hybridization of party-state coordination with genuine entrepreneurial dynamism, while Nölke, ten Brink, Claar and May (2015) coined "state-permeated capitalism" to stress the state's pervasive, if often indirect, presence inside nominally private firms. Growth Maximization through High Reinvestment

Virmani (2005, 2006) hypothesized that China's Socialist Market Economy, could sustain its unprecedent growth rate (average 10per cent) for 25yrs or more because of a single goal which could be followed all levels of Government and all Government/Party companies, namely growth maximization. [75] This had two foundational policy pillars (1) *Export-led, import substituting, Infrastructure driven* (ELISID) policy, which has been in place from the late 1980s to early 1990s, and, (2) *Reverse Engineer and Develop* (sREAD) policy, which has been in place since the late 1990s to the early 2000s. The actual details of these policies has however, evolved, given opportunities and constraints of the external environment and domestic economic conditions. For instance every global slowdown of world imports has resulted in an acceleration of Import substation, while saturation of transport infrastructure led to greater emphasis on urban infrastructure and real estate development. Similarly, READ policy initially (1980-1990) focused on forced transfer of technology from existing foreign enterprises. Exhaustion of opportunities resulted in increasing emphasis on technological espionage in developed countries, companies, research institutions and start-ups. This was complemented in the 2000s with greater emphasis on building institutional capacity for high tech reverse engineering and development.

In following this goal the CCP's decentralized structure provided scope flexibility and experimentation in how the goal was to be implemented. Similarly State and party affiliated countries could maximize growth through 100per cent reinvestment of profits. The growth maximizing strategy in a Socialist Market economy could thus replicate the efficiency aspects of a profit maximizing firms in a capitalist economy**.** Virmani's hypothesis of a *growth-maximizing strategy* is reinforced by Naughton's regional competition model and Oi's local state corporatism. The evidence shows that reinvestment was not accidental: it was structurally embedded in China's political economy, with every level of the party-state incentivized to maximize growth. This explains China's sustained 10per cent growth: profits were directed into investment rather than consumption & Social welfare (health & education subsidies), creating compounding industrial expansion.

[75] See also recent papers**,** Valdiglesias (2026), *Frontiers in Political Science,* Fang, Li & Lu (2025), *NBER Working Paper: Decoding China's Industrial Policies,* de Soyres et al. (2026), *Federal Reserve Board FEDS Notes.*

Growth maximization through reinvestment was supported by China's Communist party's institutional incentives. The deliberate alignment of incentives: local cadres, SOEs, and TVEs reinvested profits aggressively to maximize output, exports, and infrastructure, creating a nationwide growth machine. Local governments were evaluated on growth, industrial output, employment creation, and export performance, rather than profitability or capital efficiency. As a result, both local officials and SOE managers prioritized scale expansion. Lardy (2008) argues that this system created "soft budget constraints," under which firms expected continued access to credit regardless of performance. Consequently, capital accumulation became excessive but sustained.

Bhalla (2012) analyzed China's economy from a macroeconomic perspective. He was among the first to write about China's mercantilism, and to estimate its impact on GDP growth.[76] Naughton (1995, 2018) emphasized the "regional competition" model, where provinces and local governments competed for growth, reinvesting heavily in industry and infrastructure. He showed how decentralization allowed TVEs and local SOEs to channel profits into expansion rather than consumption. Oi (1992, 1995) developed the concept of "local state corporatism": local governments acted like corporate managers, reinvesting revenues from TVEs and SOEs into further industrial growth. He demonstrated how this system aligned local officials' incentives with national growth goals. Huang (2008), highlighted the role of TVEs in the 1980s and early 1990s, reinvesting profits into rural industrialization. He argued that reinvestment rates were extraordinarily high because consumption was suppressed and capital was recycled into production. Lardy (2014) documented that 70per cent of investment by all non-financial corporations during the 2000s was reinvested profits, and is still above 60per cent, despite increase in credit. He argued that in SOEs, preferential credit was an important source of investment finance, besides retained earnings. Reinvestment continued in upstream sectors (energy, steel, telecoms, even when profitability was modest and declining. Xi Li, Xuewen Liu, Zhikun Lu, Yong Wang (2024–2026) showed that China had a vertical economic structure, in which upstream SOEs monopolized capital-intensive sectors, while downstream private/TVE firms competed. They found that SOE profitability was sustained by downstream productivity growth and export expansion, reinforcing reinvestment cycles.

Growth Maximization based purely on domestic demand cannot sustain double digit growth rates for quarter century. China's development strategy, since 2008, therefore placed manufacturing exports at the core of its growth-story (Lardy, 1992). China laid out the red-carpet for the MNEs-anchor investors in the 1990s and 2000s, with fully developed industrial infrastructure and connectivity, leading to a boom in their exports and the development of supply chains. After the Global Financial Crisis, economic growth of developed countries and their imports slowed, with consequent effects on China's export led economy. China therefore shifted infrastructure investment to urban infrastructure tand Real estate and put greater emphasis on import substitution.

[76] Chapter 10 of the book. The final proofs of this book were ready by 2010, but because of changes at the top of PIIE publication was delayed till 2012.

The NIEs (Singapore, Soth Korea, Taiwan, Hong Kong) and NICs (Malaysia, Thailand, Philippines, Indonesia), replaced their Import substituting strategies by Export led strategy, within a *State Capitalist economy*. China's CCP directed, *socialist market economy*, could however, adopt an export led, strategy, without abandoning its import substituting strategy. The absence of democratic transparency in a socialist economy makes it relatively easy to hide the non-tariff barriers and policies need to push import substitutions. The CCP's power to give guidance and (direct or indirect) orders to reduce specific imports, categories of imports, or imports from specific countries, is enormous and unchallenged. After 2000, it also included purchases of foreign companies from which these imports were being sourced. These applied not only to SOE's and TVE, but also to (supposedly) private enterprises, and to some extent, foreign-invested enterprises. Kee and Tang (2009) showed that between 2000–2007, China's domestic content in exports rose from 65per cent to 70per cent, as firms substituted imported materials with domestic ones. The Global financial crises, a severe setback to globalization and manufactured export opportunities, led to another thrust for import substitution.

Another key element of the strategy for growth maximization was investment in transport, energy(electricity) and industrial infrastructure. The cut back in social expenditure after the opening and reform (1978-79), also freed up funds for the huge infrastructure thrust. In many countries, development of infrastructure either followed excess demand in the form of over-ccrowding/congestion or rationing or merely kept pace with demand. Givin China's high saving rate, absolute control of the Banking system & bank deposit rates, China could build Infrastructure well ahead of demand. They could also build industrial infrastructure in months, rather than years, to attract foreign investment.

By the middle of the 2000s, so much transport and energy infrastructure had been built, taht there were reports of people travelling on four/eight lane highways in interior provinces, where they did not encounter another automobile, over many kilometers. When the Global financial Crises occurred in 2008, reduced export demand, the social return to public goods infrastructure, including industrial infrastructure, decline dramatically. The Government adapted, by changing the focus to Urban infrastructure, real estate and housing, leading to massive credit fueled boom. This boom flagged in 2015-16 and finally ended during the Pandemic (2020-21).

These two elements, namely the drive for net manufactured exports (export-imports) and the massive expenditure on Public goods infrastructure, were termed the "Export led, Import substituting, Investment driven (ELSID)" model of economic growth, by Virmani (2005, 2006).

Pettis (2013), in Avoiding the Fall, argues that financially repressed deposit rates and directed bank lending amount to an implicit transfer of resources from households to producers, that this transfer pushed investment in many sectors well past the point of positive marginal return, and that China faces an eventual and potentially painful rebalancing toward household consumption, for which he lays out several alternative adjustment paths. The World Bank and the Development Research Center of China's State Council reached a related, more policy-

oriented conclusion in their joint report China 2030: Building a Modern, Harmonious, and Creative High-Income Society (2013),

Lardy (2019), in a sequel to his earlier Markets over Mao (2014), argues that since roughly 2008 China has undergone a partial reversal often described in Chinese policy discourse as guo jin min tui ("the state advances, the private sector retreats"): preferential credit, regulatory forbearance and consolidation have increasingly favored state-owned and state-affiliated firms over private ones, at some cost to aggregate productivity growth. This likely represents a shift from growth-maximizing Party Sector model toward a different hierarchy of priorities — political control, national security, and the 2021 "common prosperity" campaign.

16.4.1 R&D System: sREAD to Technology Leader

The R&D system in China's Socialist Market Economy is a Dualistic one: A formal and informal. During the 1980s the informal part was quite large and acted independently. As the Socialist Market economy evolved, so did the R&D system, with an expansion of the formal system and greater links between the two. The informal system's share declined as China's economy developed and transited from LIC (1980-late 1990s) to LMIC (~2000) to UMIC (2010). After summarizing the formal we look at the informal, which has been characterized by Virmani (2021) as sREAD (spy/steal, Reverse Engineer and Develop).

Formal Research was concentrated in state academies such as the Chinese Academy of Sciences and sectoral institutes under Central ministries. The government issued directives that R&D outputs should be "propagated" into production, especially in state-owned enterprises (SOEs) and later TVEs. Key programs included the Spark Program (1986), focused on diffusing agricultural and rural technologies to TVEs and farmers, the Torch Program (1988) for commercialization of high-tech research, by creating incubators and "high-tech zones," and the 863 Program (1986) targeting strategic technologies (biotech, IT, space, lasers, automation, energy). *973 Program* (1997) supported basic research with direct links to industrial application. *Indigenous Innovation Policy* (mid-2000s): Promoted domestic patents and reduced reliance on foreign tech.

Ministries and provincial governments directed institutes to supply technologies to designated SOEs (e.g. Machinery research institutes providing designs directly to state factories). R&D institutes signed contracts with enterprises to transfer patents, prototypes, or processes. This created revenue streams for institutes and gave enterprises access to innovation. Provincial and county governments acted as brokers, pushing R&D results into TVEs. Spark Program projects often involved provincial science bureaus matching local firms with research outputs.

Reports from U.S. and European intelligence agencies in the 1980s–90s noted Chinese efforts to acquire defense and dual-use technologies (aerospace, nuclear, telecom). Espionage often targeted diaspora scientists, academic exchanges, and joint research projects. Foreign-invested enterprises (FIEs) were required to form joint ventures with Chinese partners. Access to the Chinese market was conditional on sharing designs, processes, and training. For instance, Automotive JVs (Volkswagen, GM) had to transfer production know-how to local SOEs. China imported machinery and consumer goods, then dismantled and copied them. This was

especially common in electronics, telecom equipment, and military hardware. TVEs and SOEs both benefited, producing cheaper domestic versions of foreign products. Bu 2000, China had absorbed basic industrial technologies, built up domestic manufacturing capacity, and reduced dependence on imports. However, much of the innovation was still imitative rather than original.

After WTO entry (2001) China gained access to global markets but continued to use joint venture rules to extract technology. The Chinese Communist Party (CCP) dictated the rules even for the leading MNCs, as per McGee's *'Apple in China (2025)*. Independent think-tank work, including firm-level survey research from organizations such as the Center for Strategic and International Studies and the Information Technology and Innovation Foundation, has reached broadly similar conclusions using data gathered directly from foreign investors operating in China, providing an evidentiary base for claims the article makes more briefly.

FIEs often complained of "compulsory tech sharing" as the price of market access. Espionage intensified, as U.S. indictments and reports (FBI, DoD) highlighted cyber-espionage campaigns targeting aerospace, defense, and IT firms. The Office of the U.S. Trade Representative's Section 301 Report (2018, updated November 2018) formally found that China's technology-transfer regime relied on joint-venture mandates, discriminatory administrative licensing, and state-directed investment in and acquisition of foreign companies to secure technology transfer, in addition to cyber-enabled intellectual-property theft; these findings became the legal basis for the Section 301 tariffs imposed in 2018. Cyber theft became a major tool for acquiring proprietary designs and R&D data. China moved from copying consumer goods to replicating *complex systems* (fighter jets, high-speed trains, telecom networks). For instance, high-speed rail technology was acquired from Siemens, Kawasaki, and Alstom, then indigenized, while the domestically produced J-11 fighter was based on the Russian Su-27. By mid 2000s. China began patenting and branding its own versions of foreign technologies. Firms like Huawei and ZTE emerged as global players, blending imported know-how with domestic R&D. By 2015 China had moved from imitation to innovation in several sectors (telecom, rail, renewable energy).

16.5 Summary

As Virmani (2005, 2006) noted, at the start of the market reform, 100per cent of the productive assets of the economy were owned and controlled by Communist Party of China. This combination of Party ownership of productive assets (including financial) and markets for production and exchange of goods and services, was the practical implementation of what Osker Lange theoretically designed as the "socialist market economy", which was further elaborated on by Aba Lerner, and therefore came to be referred to as the Lange-Lerner model of SME. As per Virmani TVEs evolved to constitute the party sector of the economy, in which the owner was private on paper, but he or she had to follow the directive of the party in terms of goals (growth maximization and 100per cent reinvestment of profits) and thrust industries to promote, exports etc..[77] A brief history of TVEs is critical to understanding this critical

[77] One test of this hypothesis is that violation of the party directives, could invite charges of corruption & misue of (party) funds.

difference between the Private sector in Democratic Market economy and in Socialist Market Economy.

Township and Village Enterprises (TVEs) were market-oriented public enterprises controlled by local rural governments (townships and villages) and community members. Though TVEs were publicly owned by local communities rather than private individuals, local municipal leaders acted like board directors. Fiscal decentralization allowed local governments to retain a large share of TVE tax revenues, giving village officials a strong direct incentive to promote business growth. By the early 1990s, TVEs accounted for nearly a third of China's total GDP and over 40per cent of its total industrial output. Following Deng Xiaoping's 1992 *Southern Tour*, TVE expansion surged further as China embraced a full-fledged market economy. TVEs also began producing low-cost export goods for international markets. Macroeconomic overheating in the mid-1990s led the central government to restrict bank lending, exposing TVEs' heavy debt burdens. In response, China launched sweeping ownership reforms under the policy banner of *"Grasp the Large, Let Go of the Small"* (*Gua Da Fang Xiao*), On paper, under Restructuring (*Gaizhi*)**,** Township and village governments (TVGs) systematically privatized, sold, or converted TVEs into joint-stock corporations, limited liability companies, or private businesses.

According to Virmani, however, these became Party Sector enterprises, in which (on paper) shares were held by Party capitalists, including family & friends of party leaders, who directed the enterprise with a great deal of freedom, but who had to follow the directives of Provincial party, including with respect to enterprise goals (growth maximization and maximum reinvestment of profits).

During the 1980s and 1990s, China adopted an export- and foreign investment–driven growth strategy. Special Economic Zones were set up to attract foreign investors, and policies were designed to support exports. The CCP used indirect subsidies such as cheap land, low-cost labor and easy credit to draw in global manufacturers. By 1992, China officially described its model as a "***socialist market economy with Chinese characteristics***." China's dominance in manufactured exports can be attributed to a carefully designed and executed industrial and foreign investment strategy that transformed the country into a global manufacturing hub. A central aspect of China's success was its unique combination of state control and market competition. From the mid-1980s through the early 1990s, China pursued an "Export-led, Import-substituting, Infrastructure-driven" (ELISID) strategy. This involved a concerted national effort to attract multinational enterprises (MNEs) and foreign investors by rapidly developing industrial infrastructure, especially in the Eastern provinces. These regions were equipped with world-class facilities and connectivity in record time. Once export growth took off in the late 1990s and early 2000s, policy shifted toward import substitution. After the Financial crisis of 2008 investment shifted from infrastructure to Urban real estate and housing expansion. Post-WTO accession in 2001, China adopted a "steal/spy *Reverse Engineer and Develop"* (sREAD) policy[78], which utilized central technology institutes for reverse

[78] The s refers to systems used to pressure FDI invested enterprises to disgorge their technology to domestic companies and PRCs comprehensive commercial intelligence network in developed countries and in cyber space.

engineering global technologies. These were then adapted and scaled through provincial-level competition, often led by state-backed firms with close ties to the Communist Party. China's socialist market economy enabled provincial enterprises to compete fiercely while benefiting from centrally acquired technologies —a model that proved remarkably effective.

Public or private company monopolies often suffer from inefficiencies, with former subject to agency problems, poor incentive structures and soft budget constraints, leading to lack of innovation. In a socialist market economy, domestic companies can act as a monolith (China Inc) outside the country if directed by the Party, but are allowed, even encouraged to compete intensively within the country with respect to cost, quality and efficiency environment. While initial political and administrative commitment can drive early success, sustaining efficiency over time requires competition. China's approach of blending broad state direction and red lines, with competitive dynamics among Province supported entities seems to escape many of the pitfalls of typical public monopolies.

Even as markets expanded, the socialist foundations remained strong. Land was owned by the state, labor mobility was restricted by the household registration or hukou system, and capital was mainly controlled by state-owned and party-controlled banks and corporate enterprises. Most domestic assets continued to be held by the State or Party, while the production, domestic trade and export of goods operated in competitive markets.

Appendix Tables (for Sections 8.1 & 13.1)

Table A1: Major Producers Share of Manufactured Imports from China (per cent)

	World	USA	EU	Japan	Germany	India	S. Korea	Mexico	Italy	France	UK	Russia
2000	7.5	10.0	10.3	20.1	4.6	4.1	9.2	1.7	3.5	3.9	5.3	3.7
2001	8.1	11.0	11.5	23.2	4.5	5.5	11.4	2.6	3.7	4.0	6.0	5.3
2002	9.1	13.6	13.5	25.9	5.1	7.4	13.5	4.0	4.2	4.3	6.6	6.8
2003	10.0	15.7	16.1	28.5	6.3	8.4	14.8	6.1	4.8	5.2	7.0	7.5
2004	10.9	17.5	17.8	30.3	7.5	10.2	16.9	8.0	5.5	5.9	7.5	8.1
2005	12.4	19.8	20.0	32.7	8.4	12.6	19.6	8.9	6.4	7.1	8.9	9.1
2006	13.3	21.1	21.9	33.1	9.0	16.0	22.6	10.8	7.2	7.5	9.1	11.6
2007	14.0	22.5	24.2	33.9	9.8	21.2	25.4	11.5	8.2	8.2	10.5	14.8
2008	14.7	23.4	26.0	35.1	10.2	17.9	28.0	13.6	9.2	8.9	12.0	15.7
2009	15.8	26.0	27.4	37.7	11.3	21.0	25.3	16.4	9.6	10.1	12.5	17.5
2010	16.9	26.4	29.2	38.2	12.9	22.5	26.1	17.9	11.5	10.8	14.0	21.8
2011	16.8	25.7	28.5	39.6	12.1	23.2	28.2	18.2	11.0	10.9	13.4	20.0
2012	17.7	25.9	28.2	39.8	12.1	23.8	27.8	18.4	10.5	11.1	12.5	18.9
2013	17.9	26.3	27.8	40.2	11.6	25.0	28.0	19.1	9.9	11.1	12.6	19.7
2014	18.3	26.3	28.6	39.9	11.8	27.8	29.2	19.8	10.4	11.5	12.6	20.7
2015	19.2	26.5	29.2	38.4	12.6	29.8	30.4	20.5	10.5	11.7	12.9	22.7
2016	18.8	25.8	29.0	37.2	12.6	30.0	29.8	21.0	9.9	11.2	12.8	25.4
2017	19.0	26.6	28.9	36.8	12.7	29.8	29.8	20.8	9.6	11.4	12.5	24.9
2018	18.9	26.4	29.1	35.6	12.5	27.3	30.9	21.6	9.9	11.5	12.8	25.1
2019	18.7	22.4	29.7	35.4	12.7	26.4	32.3	21.7	10.1	11.7	13.5	25.5
2020	19.4	22.7	30.0	36.9	14.4	28.3	32.4	22.5	11.5	8.8	17.4	28.8
2021	20.1	22.5	31.5	36.3	15.4	29.9	33.6	24.6	11.1	8.7	19.2	30.0
2022	20.3	21.1	32.9	35.5	17.3	28.8	34.5	24.7	13.4	8.9	20.7	
2023	19.0	17.2	29.5	36.4	15.0	35.8	34.4	22.3	11.3	7.6	18.4	
2024	18.6	16.5	29.9	34.8	15.7	36.2	33.7	23.9	12.1	13.6	18.8	

Table A2: Global Share of Youth Population

Country Name	Youth Population				Change (mil)	
	as World Share (per cent)		as selected countries share			
	2020	2050	2020	2050	2020-1990	2050-2020
1	2	3	4	5	6	7
High Income Countries (HIC)						
United States	3.5	3.2	6.6	8.3	7.2	-1.7
European Union	3.9	3.5	7.2	7.7	-15.7	-8.5
Germany	0.7	0.6	1.3	1.5	-2.4	-1.2
Japan	1.0	0.8	1.8	1.7	-7.0	-3.5
United Kingdom	0.6	0.7	1.2	1.6	-0.5	0.0
Middle Income Countries (MIC)						
China	13.1	12.3	24.7	16.1	-86.1	-80.5
India	21.0	17.6	39.5	43.1	92.4	-41.7
Other MICs					**11.8**	**-10.9**
Malaysia	0.5	0.4	0.9	1.0	2.5	-0.9
Mexico	1.8	1.6	3.4	3.7	4.4	-3.3
Thailand	0.8	0.6	1.5	1.2	-2.3	-3.6
Indonesia	3.6	3.4	6.8	8.4	6.7	-2.3
Viet Nam	1.1	1.2	2.0	2.5	0.4	-0.8
Other HICs						
South Korea	0.5	0.3	0.9	0.6	-2.9	-3.1
Russia [RF]	1.2	1.4	2.2	2.7	-5.6	-0.4
Sub-total	53.2	47.6	100.0	100.0		

Source: Authors Calculations based on WDI & UN World Population Prospects (2024 Rev)

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