Trade Liberalisation, Globalisation, and Employability Challenges

*Case of Indian Hand Tool Sector**

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The paper analyses India's hand tool manufacturing sector, in the aftermath of India's economic liberalisation and trade reforms. India's shift from licence raj to regional trade alliances and FTAs has reshaped production patterns and market access. Focusing on metrics like GVA, labor, and profitability, the study finds that while liberalization increased efficiency, heightened competition has limited profit growth. The paper underscores the need for investment in automation, workforce skills, and sustainable practices to enhance global competitiveness

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Abstract

The paper analyses India's hand tool manufacturing sector, in the aftermath of India's economic liberalisation and trade reforms. The changing landscape of India's engagement with external markets can be traced to three stages: the first being the removal of license raj, thereby creating a liberated private sector; second, the process of engagement with external sector multilateralism to regionalism; and lastly, increasing the engagements under the FTAs. All of these fundamentally altered the production and consumption patterns in India. India has undergone substantial unilateral macroeconomic and trade liberalisation since 2000 when it signed the WTO-led ITA. This has been felt across each economic agent operating within the otherwise closed economy. Since then, it has entered into an arrangement of FTAs with 19 partner countries, with an overwhelming emphasis on tariff reduction.

The study evaluates the evolution and growth of the Hand tool Manufacturing Sector concerning core variables such as gross value added (GVA), total inputs, labour, energy use, and profitability and seeks to understand how the sector adapted and evolved amidst the challenges of trade liberalisation.

The Hand tool manufacturing sector has significantly changed due to India's pursuit of FTAs with 19 other countries. As a result of liberalisation, there has been increased efficiency and access to foreign markets, but also increased competition, leading to limitations on profit growth while production growth has remained relatively stable. The paper also highlights the sector's movement toward efficiency in other respects, such as energy use, while recognising the expectations of continued difficulty with profitability and productivity issues. The paper emphasises the need for a long-term investment with recommendations for the manufacturing sector in continued investment into automation improvement, labour development, and sustainable practices to retain or improve competitiveness in the global economy.

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INTRODUCTION

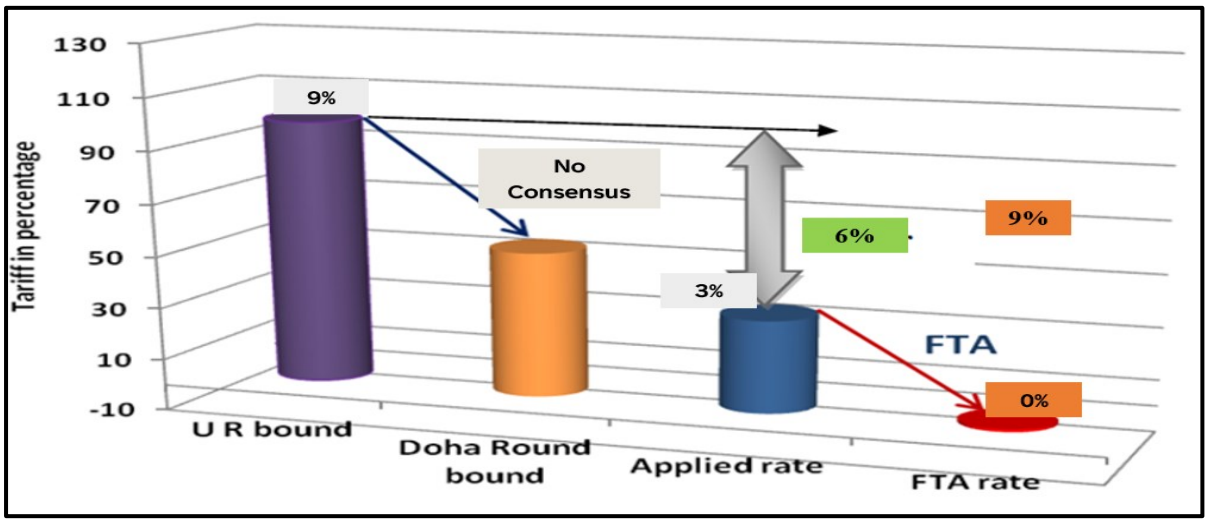
India has carried out substantial unilateral macroeconomic liberalisation since 1991. One of the fundamental changes was the removal of 'license raj', the impact of which has been felt across each economic agent operating within the otherwise closed economy. This opened up the economic agents to an increased role and function of the private sector, with the government/public sector taking a more prominent role of facilitator.

India's economic agents saw a **second transition** in their engagement with the external economy –a compulsion born out of the dominant role of the private sector. In the initial period of liberalisation, the policymakers felt that trade negotiation was better handled at the multilateral level. Hence, since 1995, the World Trade Organization (WTO) has been dominant due to the special and differential Treatment (S&DT) principle, which provided a differential binding commitment for developing countries like India. With the first formal negotiation round under the WTO from 2001 to 2004, the Doha Round (DR), later the Members negotiated various proposals under the committees until 2008, culminating in the 2008 Rev.3 texts on NAMA and AoA. With the stalemate of the DR since 2010, the trade negotiation at the multilateral process wanned India's took to the second-best engagement, following Bhagwati's belief that FTA "building blocks" for world free trade is the route adopted by most developed and integrated nations.

The fundamental premise is that both partners have assessed their strengths and weaknesses and come to a common ground concerning operations within the territory. India's efforts in the direction of FTAs, pivoted by a series of look-east policies regarding tariff elimination and reductions, initiated a **third transition**. This began a series of FTAs like the India-Sri Lanka Free Trade Agreement, India-Singapore CECA, India-Malaysia CECA, India ASEAN Agreement, India-Korea- CECA, and India-Japan CEPA, all mainly led to substantial tariff reduction on the part of India as most of these economies were already operating on lower average MFN rates. The Asia-Pacific Trade Agreement (APTA) was signed in 1975 as the United Nations Economic and Social Commission initiative for Asia and the Pacific (UN-ESCAP). This is the oldest preferential trade agreement among developing countries in the Asia-Pacific region. It aimed to promote economic development by reducing tariffs (using what is known as margin of preference) and other trade barriers among member countries, including

Bangladesh, China, India, Laos, South Korea, and Sri Lanka. [23] By 2024, India had signed 14 Free Trade Agreements (FTAs). These agreements include partnerships with various countries and regions mentioned above, as well as Mauritius, UAE, and Australia. The EFTA includes Iceland, Liechtenstein, Norway, and Switzerland, ensuring preferential ties with 94 countries. Efforts are focused on the EU, the UK, Oman, and Israel. India has six preferential trade agreements (PTAs) with other trading partners. An FTA leads to a process called "trade creation" and "trade diversion" across the sectors liberalised under the FTAs—trade diversion is a process that diverts trade away from more efficient suppliers towards less efficient ones. While "trade creation" implies that an FTA area creates trade that may not have otherwise existed, it can be related to those sectors with low imports or nil.

Figure 1: Tariff Negotiations under the WTO and FTA: Binding Commitment



Source: Authors.

The reduction or elimination under the WTO and FTAs are graphically explained in Figure 1. As of 2024, the binding tariff rate for each of the 165 members of the WTO will remain at nine percent - a binding commitment undertaken during the Uruguay Round Negotiations. However, the applied rate for the same product is three percent, and the member has a 6 percent tariff overhang (which is also the policy space) for the member to raise tariffs without any consultation process. If the same member signs an FTA, negotiates the tariff line, and eliminates it, the final tariff is zero percent. Although it is advantageous for any nation to engage in zero duty trade as there is no 'price impact' on the final sale of the good in the third market, the 'cost impacts' would remain on the product imposed by the quality requirement by the FTA partner. The impact of liberalisation under the FTAs is the most impactful, and it should be taken with

2 (n.d.). *The Doha Round*. World Trade Organisation. https://www.wto.org/english/tratop_e/dda_e/dda_e.htm

3 This trade agreement included China, wherein India offered a margin of preference across 3000 plus tariff lines with 100 percent, 50 per cent, 25 percent and so on.

care by creating appropriate mechanisms for tracking import surges and applying the remedial measures of fair trade as specified in the trade agreement. At the macro level, signing an FTA requires a considerable analytical understanding of the domestic economic, commercial, and social aspects; sometimes, a micro understanding of these variables becomes necessary. Tariffs and non-tariff measures (NTMs) affect a sector's market access. In 2015, Kallummal traced a growing number of NTMs in the form of standard and quality requirements across FTA partners like the ASEAN while the tariffs were either eliminated or reduced.[4]

Table 1: India's FTA and Tariff Elimination to Zero (Chapter 82 – Hand Tools)

S.N.	Free Trade Agreement	Tariff Reduction (Avg. MFN)/Base Rate -%	Tariffs – Elimination Schedule	Year (Zero Duty)
1	APTA - 1975	MOP	--	--
2	Sri Lanka - 2000	Not Part of NL	--	2008
3	Singapore - 2005	MOP	10%, 25%, 50%, 75% & 100%	2009
4	ASEAN -2010	10	NT-1/NT-2	2013/2016
5	Korea -2011	12.5	E-8	2018
6	Japan – 2011	10	B10	2021
7	Malaysia - 2011	10	NT-1/NT-2	2013/2016
8	DFTP**	MOP – 43 LDCs	EL	2008
9	Mauritius - 2021	N/A	N/A	N/A
10	Australia - 2022	10	EIL	2022
11	Nepal	--	--	--
12	Bangladesh	--	--	--
13	EFTA[@]	11	EIF; EIF&E5 4[$]: EIF&E7[#,]	2024/2028/2030

Note: @= Base Rate = BCD Rates (in %) unless otherwise specified) + AIDC (in %) + Health cess (in %) + SWS (in (%) unless otherwise specified); # = Switzerland, $=Norway; ** = DFTP a multilateral initiative under the WTO for LDCs.
Source: Authors.

Unlike India, most developed economies have mostly non-commercial data reported. Most manufacturing and service sector companies are registered in these economies, but the impact assessment of import surges is quicker and more effective—except for a policy decision. A second aspect of protecting existing production in the domestic market is ignored when a sector is largely informal. Situations of excessive import surges are ignored owing to a lack of institutional capability. As a consequence, appropriate fair-trade measures like trade remedies are not adopted. Francis (2020) provides a detailed account of the negative trade balance owing to the rise in imports under India's FTA partners.[5] Therefore, it calls for a relook at the existing channels of information flow when an import surge is observed in a sector—the differences between formal industries and those dominated by informality. In 2024, Kumar observed the world geolocation of increased imports in different Indian sectors, emphasising the dependence

[4] Kallummal, M. (2015). *Market Access in Goods Trade under the ASEAN-India FTA: NTMs Gaining Prominence* (-1st ed.). Routledge Publication. Chapter 6 of the Report by Research and Information Systems titled ASEAN-India Development and Cooperation Report 2015-16

[5] Francis, S. (2020). Impact of Preferential Trade Liberalisation on India's Manufacturing Sector Trade Performance: An Analysis of India's Major Trade Agreements. *ISID Working Papers*. https://isid.org.in/wp-content/uploads/2022/07/WP227.pdf

on foreign-made products. However, he did not observe the status of domestic production, mainly found in the hand tools manufacturing sector, which has experienced similar pressures[6].

These FTAs have had a mixed impact on the hand tool manufacturing sector. Tariff eliminations have created new market opportunities for Indian tools, but they have also increased competition from countries with more advanced manufacturing capabilities, such as China and South Korea. The Asia-Pacific Trade Agreement (APTA), signed in 1975, exemplifies India's long history of engaging with trade liberalisation tools for economic development. However, the import surges from potentially more efficient manufacturing countries have created hardships for India's domestic production, especially in labour-intensive industries.

This is especially significant in the hand tools manufacturing sector, which has relied historically on skill-based artisanship and craftsmanship. The tidal wave of cheaper imports of better quality has destroyed the cost competitiveness of the domestic industry. Further, the inverted duty structure in India imposes higher duties on raw materials than on finished goods, which puts domestic producers at an even further disadvantage, whereby the final finished goods invariably cost more than the imports. This, alongside declining production efficiency and increasing input costs, has forced manufacturers to either absorb costs or cut quality to compete.

Historically, the hand tools sector of India has primarily been labour-intensive, relying less on automation and technology and more on manual skills. Due to competing pressures and efficiency, the Labor-to-capital ratio within the industry has come down significantly from 25% in 2009 to 16% in 2022. This signals that the sector is slowly moving toward automation and mechanisation. However, this shift has left many workers either displaced or underemployed, reiterating the industry's employability challenges.

As technology continues to replace manual processes, the demand for semi-skilled labour has increased, and the reliance on unskilled manual labour has decreased. Technology will continue to supplant unskilled labour, causing considerable socio-economic challenges. Unskilled manual workers must upskill to be viable in automated production.

The following section briefly reviews the existing literature and introduces the sector, outlining its significance and evolution. The paper then describes the methodology used for data analysis and examines trends in the hand tools manufacturing industry. Finally, the conclusion explores

[66] Kumar, A.R. (2024). Import Surge in the Indian Manufacturing Sector during the Trade Liberalisation Phase. *Economic and Political Weekly*, (Vol. 59, Issue No. 25, 22 Jun, 2024.). https://isid.org.in/wp-content/uploads/2022/07/WP227.pdf

the prospects for India's hand tools industry, focusing on growth opportunities and global competitiveness.[7].

LITERATURE REVIEW

Mohapatra (2022) analyses the factors that impact export performance in manufacturing industries: capital- and labour-intensive. Studies conducted globally highlight how enhancing export performance is influenced by R&D intensity, FDI, exchange rates, and human capital. For example, studies show that FDI and R&D positively affect export activities in several nations, including China and Mexico. Concerning India, the focus is more on firm-specific factors, such as technological capabilities, foreign share, and industry size. Her analysis highlights a shift toward capital-intensive production even within labour-dominated industries, emphasising the role of technological upgrades and policy support in maintaining export competitiveness.

Sankaran, Abraham, and Joseph (2010) examine how trade liberalisation affects the manufacturing sector in India. The main findings show that, despite India's rapid economic expansion after liberalisation, this period was characterised by a decline in employment growth, even though output rose. Several factors are examined as potential causes of stagnant employment, including import competitiveness, labour market rigidity, and capital intensity. The study uses econometric analysis and industry-level data to assess the impact of trade reforms on labour demand. Results show that the growth of imports had a negative effect on employment since industries adopted labour-saving technologies in response to foreign competition.

Azam's (2012) study focuses on labour share dynamics, globalisation, technological advancement, and structural change in India, reflecting global trends of diminishing labour share. He describes increased pressure on India's labour share to trade liberalisation and foreign competition, especially in labour-intensive sectors. Advancements in automation and digitisation have declined labour's share and stagnated wages. McMillan et al. (2014) highlight that India's structural shift towards capital-intensive industries has lowered labour share, requesting policy reforms such as labour laws and social safety nets to address the increase in inequality (Freeman, 2015; Nagaraj, 2021) (Basu & Veeramani, 2021).

OECD's (2012) study analyses the critical contributing factors to the declining labour share of national income across OECD nations. It identifies the crucial forces behind reducing labour's role in production resulting from increased automation and capital intensity, specifically the spread of Information and Communication Technologies (ICT) and capital deepening. Because globalisation has made it more challenging for businesses in advanced economies to sustain

[7] We express our gratitude for the contributions made by Dr. Akanksha Pratik Sonker.

their competitiveness, labour share has reduced due to workers' declined bargaining power and the efficacy of collective bargaining.

Ahsan and Mitra (2011) focus on how trade liberalisation increases competition, diminishes price-cost markups, and weakens workers' bargaining power by permitting businesses to substitute domestic labour with cheaper foreign alternatives. The effects of trade liberalisation rely on firm size, labour intensity, and market dynamics, leading to varied outcomes across industries.

HANDTOOL MANUFACTURING SECTOR

Hand tool manufacturing is among the oldest and most significant industries in the micro and small-scale sectors. States like Punjab, Rajasthan, and Maharashtra have become hubs of hand tool production due to the availability of skilled labour. The history of the hand tool industry dates back 600 years, with around 800 different types of tools being manufactured. This sector is poised for significant growth and transformation as the country continues to witness significant industrialisation and urbanisation.

Arun Kumar Garodia, Chairman of the Engineering Exports Promotion Council (EEPC), stated at an event: “Hand tools, often the unsung heroes behind manufacturing, are the linchpin for every industry, driving efficiency and precision. The raw material transformation in every sector relies on the craftsmanship enabled by these tools, making them indispensable contributors to the overall growth of industries,”. This reflects that the hand tools industry has a growing market with immense potential.

The demand for hand tools in India exhibits regional variations. Significant markets are metropolitan cities like Mumbai, Delhi, and Chennai. However, Tier-II and Tier-III cities are also growing their demand for these tools due to the government's focus on infrastructure development in these regions, which has led to increased industrial activities, driving the demand for tools.

The industrial hand tools sector is experiencing significant growth, driven by several key factors shaping the industry's landscape. One of the primary growth drivers is the increasing industrialisation in India, which has led to a rise in manufacturing activities. Initiatives like developing industrial corridors and the government's "Make in India" campaign have boosted demand for assembly, maintenance, and repair tools. Additionally, various government initiatives and policies aimed at promoting the manufacturing sector, such as ease of doing business, foreign investment incentives, and schemes like Pradhan Mantri Awas Yojana (PMAY) and the Smart Cities Mission, are further propelling the demand for hand tools, particularly in the construction sector. Rapid urbanisation is another significant factor, as the inflow of people into urban areas has triggered a surge in construction activities and infrastructure development, increasing the need for a wide range of tools for tasks such as

drilling, cutting, and fastening. Technological advancements in the sector have also improved tools' quality, performance, durability, and efficiency, enhancing the user experience and driving demand. Moreover, infrastructure development projects like the construction of roads, highways, airports, and intelligent cities contribute to the sector's growth with tools essential for tasks like concrete drilling, cutting, and finishing8.

However, despite these growth drivers, the Indian hand tools sector faces several challenges that hinder its full potential. One major constraint is competition from low-cost imports, particularly from China and other East Asian nations. This influx of inexpensive products puts pressure on the domestic market, impacting the growth prospects of local manufacturers.

Domestic players must focus on innovation, quality, and differentiation to maintain their market share in the face of rising competition from these imports. Moreover, high production costs present another significant challenge for the sector. The increasing cost of manufacturing operations makes it difficult for smaller players, who often have limited financial resources, to compete with larger companies. Additionally, counterfeit products made with inferior materials but sold at lower prices threaten established brands by increasing competition and affecting profit margins. These challenges underscore the importance of strategic innovation and quality enhancement for domestic manufacturers to thrive in a highly competitive global marketplace.

METHODOLOGY

In this paper, we created concordance between the National Industrial Classification (NIC) and the International Standard Industrial Classification (ISIC) to study the hand tool Manufacturing Sector under the NIC 2008 Classification. The dataset was extracted from the Annual Survey of Industries (ASI) from India Stat, which served as the basis for our analysis of the hand tool manufacturing sector. Precisely, we mapped the hand-tool industry to NIC code 2593 to ensure sectoral representation and conducted an extensive trend analysis based on important outputs, which included employment levels, total input, Gross Value Added (GVA), and factory operating activities across the period we witnessed from 2009 to 2022. The regression analysis was conducted using **R** to estimate the model parameters via Ordinary Least Squares (OLS), validating the reliability of the results

ANALYSIS

The study illuminated changes in labour and capital intensity and productivity, efficiency, and structural changes in the study area. In addition to the ASI data, the World Integrated Trade Solution (WIITS) provided trade data for 6 Harmonized System (HS) codes established to be salient to the hand tool manufacturing industry. The HS codes captured most of the sector's

[8] (n.d.). Future Prospects of the Industrial Hand & Power Tool Sector in India. Diversitech Global. https://www.diversitech-global.com/post/future-prospects-of-the-industrial-hand-power-tool-sector-in-india.

export and import activity, accounting for nearly 80% of trade transactions in the product area. This allowed for analysis of how different countries engage in global hand tool trading and provided a holistic view of the industry at a sector level together with data on trade. This paper wanted to capture the industry's performance, competitive position, and trends influencing domestic production and international trade, all through the integrated sector data representations.

COMPREHENSIVE DATA ANALYSIS OF THE HAND TOOL MANUFACTURING SECTOR

The total global trade of hand tools industry over the years 2009-22 reached an impressive $1689.73 billion, covering a diverse range of tools such as hand-operated spanners and wrenches, interchangeable sockets, drilling/threading/tapping tools, spades and shovels, forks, mattocks, and similar tools. This number indicates the industry's vast potential, which is driven by diverse applications across sectors such as construction, manufacturing, and even domestic usage.

As developing countries expand their industrial bases and developed nations invest in infrastructural renewal, the demand for reliable hand tools is further expected to increase. The enormous global trade value of $1,689.73 billion is more than just a reflection of the past - it highlights the vast untapped potential for future growth in the hand tools industry. This figure not only underscores a massive potential globally but also presents a significant opportunity for India. India can position itself as a global hub for hand tool manufacturing by leveraging its strengths in production capacity, technological advancements, and favourable government policies. If the country continues to invest in modernising its hand tools sector, it has the potential to become a dominant player in the global market for decades to come.

However, in recent years, the hand tool manufacturing sector has faced numerous challenges and transformations driven by labour intensity, capital investment patterns, production efficiency, and changing global market dynamics. In this section, the paper aims to delve into these dynamics by examining key variables, including Gross Value Added (GVA), total inputs, wages, employment, and factory operations. By evaluating these factors, we can understand the sector's productivity, efficiency, profitability, and reliance on labour versus capital.

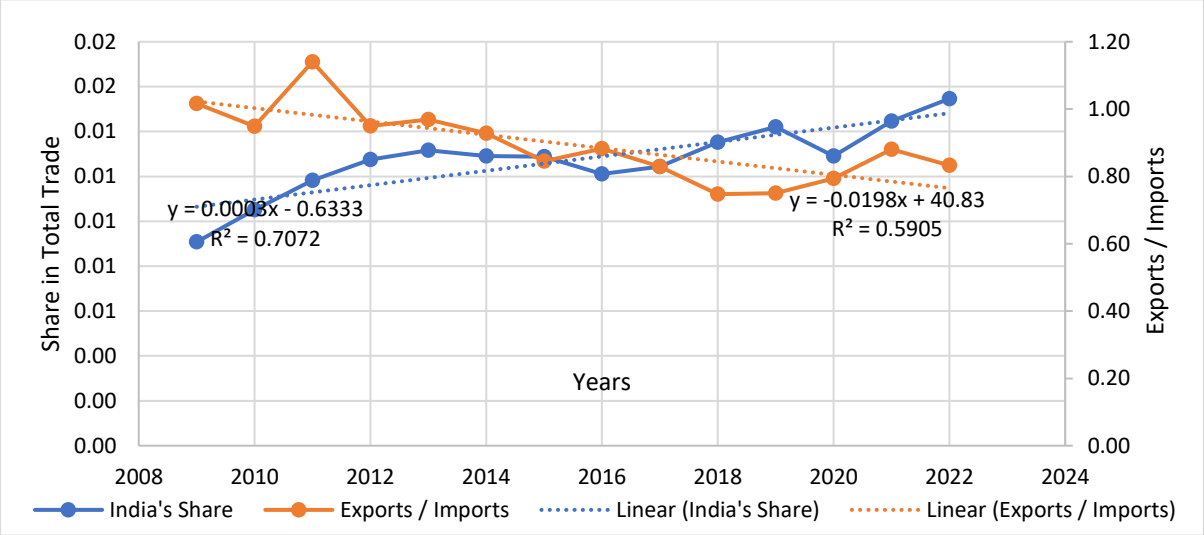
EXPORT-TO-IMPORT RATIO (X/M)

India's export-to-import ratio (X/M) reflects its role as a net importer of hand tools. A ratio of less than one throughout the period suggests that India imports more hand tools than it exports, evidenced by a trade deficit over the years except in 2011, where a surplus of $0.105 billion was recorded. The dip in the X/M ratio from 2016 onwards indicates a widening gap between exports and imports, which could be attributed to several factors, such as increased domestic

consumption, reliance on foreign manufacturers, and higher import volumes driven by infrastructure and industrial projects.

The increasing deficit underscores the country's reliance on imported hand tools despite attempts to bolster domestic production. This presents an opportunity for India to enhance domestic manufacturing and reduce import dependency, mainly through initiatives such as "Make in India."

Figure 2: India's Share and Export to Import Ratio (2008 to 2023)



The trendline for X/M shows a negative slope, with an R^2 value of 0.5905, indicating a moderate correlation. This implies that India's reliance on imports has slightly increased, highlighting a potential area for policy intervention to boost exports and reduce import dependency.

GLOBAL TRENDS IN THE HANDTOOL MANUFACTURING SECTOR

The total global trade for hand tools industry increased from $92.41 billion in 2009 to $161.12 in 2022. This steady growth highlights the increasing demand for these tools in the market driven by factors such as industrial growth and expanding infrastructure projects, increased construction and manufacturing activities and the need for maintenance services.

Global exports and imports show a similar trend of consistent growth over the years reaching a peak in 2021 before slightly declining in 2022. Exports reached $84.79 billion in 2021, with imports at $80.80 billion, while in 2022, those numbers grew to $83.14 billion and $77.97 billion, respectively. The data reflects the overall growth of the hand tools market over the years, with slight dips in certain periods like 2015-2016 and 2020, possibly due to global economic conditions, including the COVID-19 pandemic.

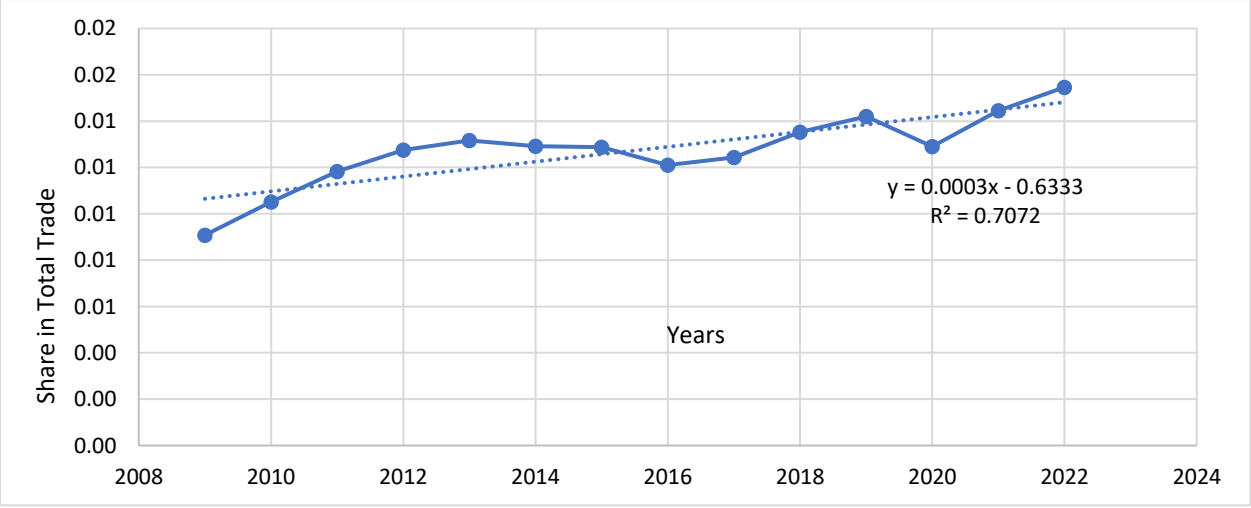
However, despite being such a large market with immense growth potential, only a few countries account for 80% of the global trade. In terms of exports, China dominates the market, capturing 21% of total exports, followed by European Union with 12.8% share and Germany with 12.5%. Other key exporters include United States, Japan, Korea, Netherlands, Italy, Switzerland, Poland, France, Sweden, United Kingdom and Singapore. These countries drive the global market, focusing on advanced manufacturing techniques and industrial automation.

On the import side, the global hand tools market is dominated by the United States, which accounts for 14.11% of total imports, given its vast industrial base and construction needs. Other major importers include the European Union, Germany, China, France, Canada, Mexico, the Netherlands, the United Kingdom, the Russian Federation, Italy, Japan, Poland, Thailand, Spain, Singapore, Belgium, Switzerland, Austria, India, Australia, Korea, the Czech Republic, and Brazil.

INDIA'S ROLE IN THE GLOBAL HAND TOOLS MARKET

India remains a relatively small player in the global hand tools trade compared to larger economies. However, it has been steadily growing its market share with its current share at 1.29%. India's exports of hand tools grew from $0.42 billion in 2009 to $1.13 billion in 2022, reflecting an average export value of about $0.83 billion. On the import side, India's hand tools imports grew from $0.41 billion in 2009 to $1.36 billion in 2022, with an average of $0.95 billion. This steady growth indicates the strengthening of India's industrial sector and its increasing integration into global value chains. However, the country's share remains relatively modest compared to other major players in the market, underscoring the need for further development in India's export capabilities in the hand tools industry.

Figure 3: India's Hand tool Industry (% -shares in Global Trade)



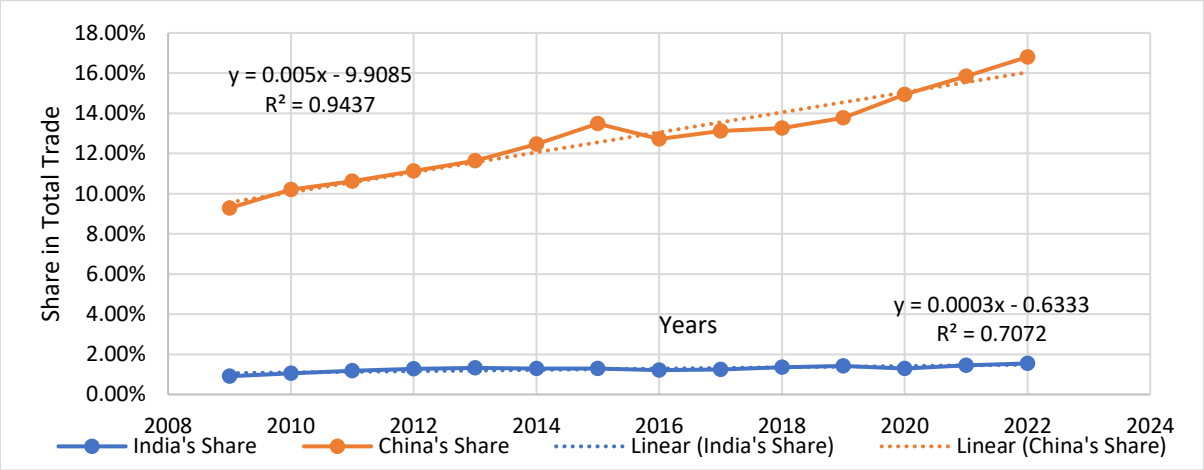
The trendline for India's share shows a positive slope, indicating continued growth, with an R^2 value of 0.7072, reflecting a reasonably strong correlation.

INDIA VS. CHINA: COMPARATIVE ANALYSIS

China remains the undisputed leader in the global hand tools industry, with an export-to-import (X/M) ratio consistently above 1, ranging from 3 to 6, reflecting its massive trade surplus. In 2022, China exported $24.08 billion in hand tools while importing only $2.98 billion, highlighting its dominance in this sector. This success is driven by its advanced manufacturing capabilities, cost-efficient production methods, and a strong focus on global trade.

On the other hand, India, despite being a significant player, is still catching up with China. India's X/M ratio has consistently been below 1, indicating it remains a net importer of hand tools. In 2022, India's imports stood at $1.36 billion, reflecting its strong demand for hand tools, driven by large-scale infrastructure and construction projects. India's share in total trade over the years 2009-22 is just 1.29%, while that of China is 13.01%, highlighting India's potential for growth if it focuses on scaling up exports.

Figure 4: Hand tool Sectors: India's X/M ratio versus China's X/M ratios (2008 to 2023)



China's trendline slows upward, indicating a strong growth trajectory in global hand tools exports. In contrast, India's trendline has flattened, suggesting stagnation in its trade performance.

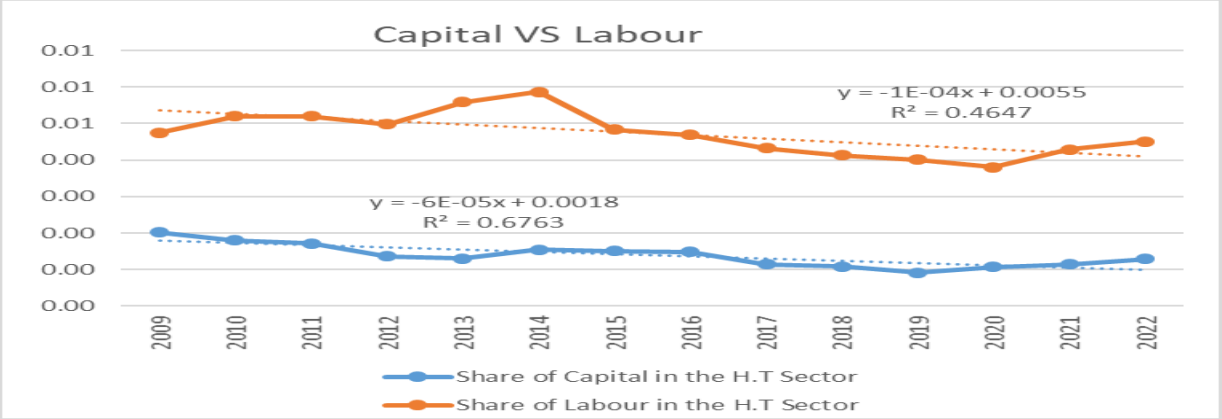
THE CAPITAL-LABOR DYNAMIC IN THE SECTOR

In India, the manufacturing of hand tools has not undergone much automation, and the industry continues to employ several labour forces, with the labour share remaining higher than capital. Nevertheless, in the long run, the labour income share decreases, implying organisational changes within the sector. Such change can result from outsourcing, whereby many firms

outsource labour-intensive processes, or a slow but steady technological development, increasing automation.

One can also point out that the main change in these indicators over the indicated period is a slight increase in the share of employees' income, including wages for labour. This period coincides with the phase of the post-industrial recovery. Thus, it means many factories had to employ labour while attempting production. This may be due to cyclical employment or reluctance to invest in fixed capital during some period of economic cycles. The sharp decline of the labour share and conscious growth of the capital share is illustrated clearly in the following graph, which shows that after dominating for many decades, labour gradually retreats to efficiency improvements or restructuring.

Figure 5: Share of Capital and Labour Ratios in Hand tool Sector



However, the fact that capital share has remained relatively constant means that the sector has changed little regarding capital intensity and automation. This is because the industry still relies heavily on manual work, corresponding to its conventional operating methods.

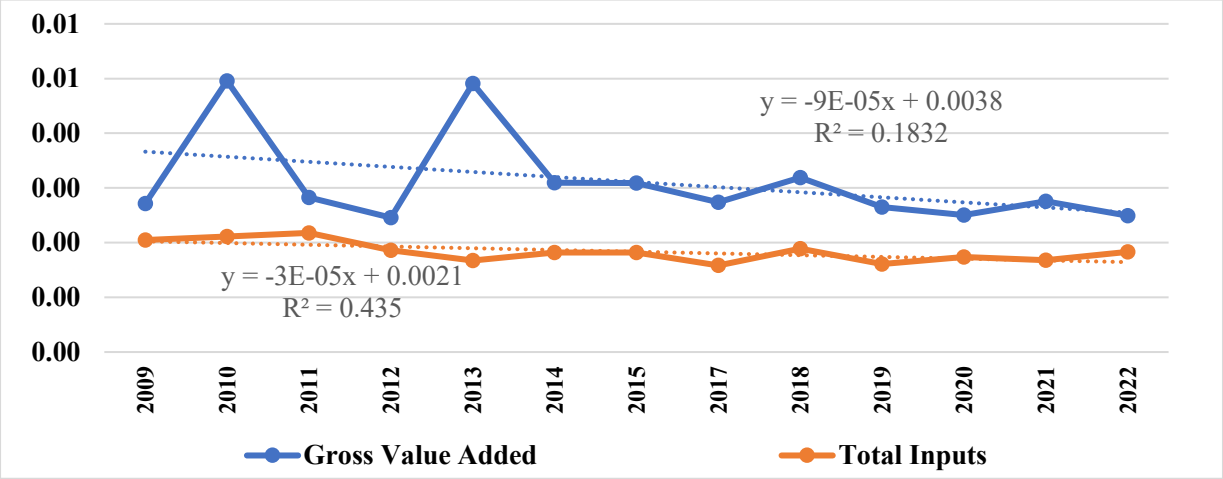
GROSS VALUE ADDED (GVA) VS. TOTAL INPUTS: AN INDICATOR FOR PRODUCTIVITY

The critical relationship between gross value added, and total inputs indicates efficiencies in hand tool manufacturing. The chart shows that the significant peaks in 2011 and 2014 might have occurred due to consumer demand increases or limited effects from potential production method changes. The recent reductions in gross value-added figures over the last few years, beginning in 2015, suggest that potential productivity, or worker productivity, has likely declined.

Correspondingly, reasonably consistent stability in total inputs suggests that the industry has seen no real investment in capital or resources, which may aim to improve efficiencies. In other words, the sector appears to be stuck in cycles of limited investments, most of which have been in labour inputs but with no technological innovation to support improvements in productivity,

per se. The recent disruptions in gross value-added outcomes could be related to dynamics it cannot control, such as changes in demand or challenges faced in improving supply chains.

Figure 6: Hand tool Sector: Gross Value-Added and Total Inputs

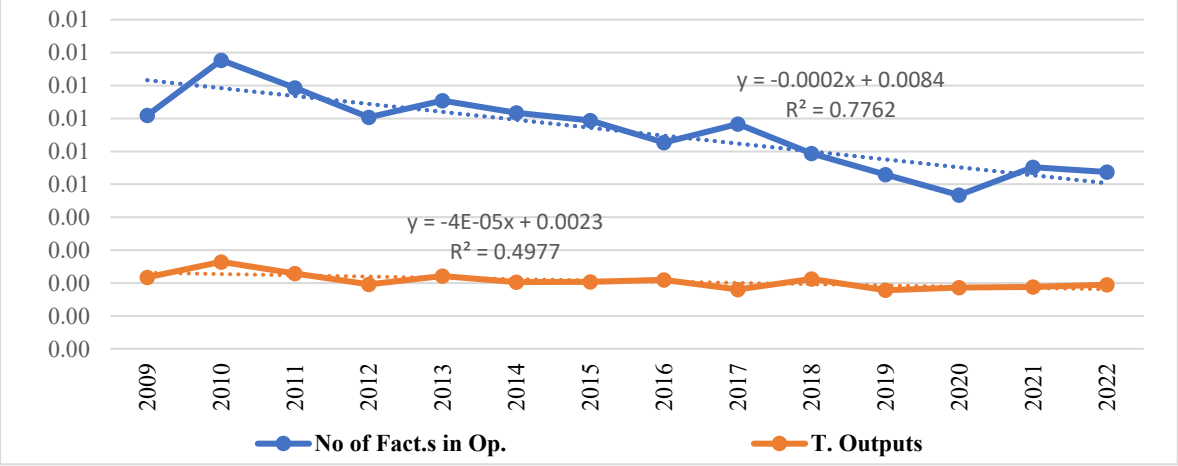


The gross value added and total inputs graph indicate that substantial growth, or value creation, is quite susceptible to shifting from outside the sector. The sector's lack of capital expenditures limits its hope for continued growth in gross value added.

TRENDS IN EFFICIENCY: OPERATIONAL FACTORIES VS. TOTAL OUTPUT

The shrinking number of active factories has the most significant impact on the hand tools production industry. The graph shows that the number of factories experienced a sharp decline in a downward trend, starting in 2011 and progressing forward to 2022. As such, of this sharp decline, the total output became stable in the hand tools production industry, indicating a trend of consolidating, restructuring, and maximising operational plant use.

Figure 7: Hand tool Sector: Operational Factories and Total Outputs



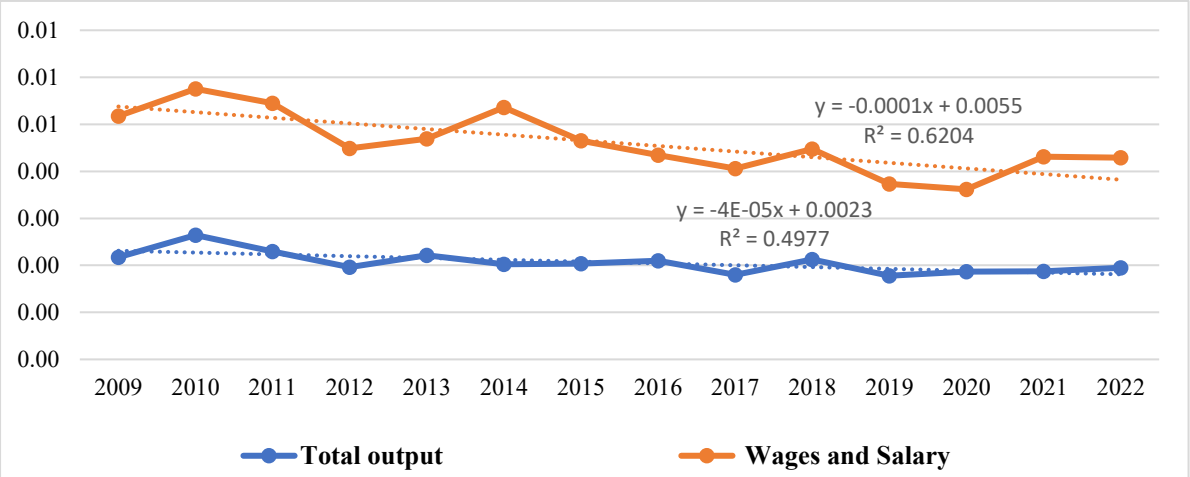
This shift indicates that the combinations of existing factories have been capable of assimilating increased size of production or reorganising their production processes and flows in such a manner as to prevent a loss of total output as the number of operational plants becomes smaller over time. The difference between these two trend lines is a measure of the degree of overall improvement in operational efficiency in the industry. It is anticipated that operational facilities have initiated technological advancement, amended operational production procedures to increase production, and better-managed employees in the workplace who are replacing the loss of less productive plants that were ultimately shuttered.

Total output experiencing a decline, in conjunction with a factory contracting price, is in line with the adaptability of the hand tool manufacturers. The factories that are still producing likely have improved operational efficiencies and enhanced more effective production employment strategies to maintain current total production output at a high rate without adding additional employees within or establishing new plants.

TOTAL OUTPUT VS. WAGES AND SALARY: DECOUPLING OF LABOR COSTS FROM PRODUCTION

One of the prominent findings highlighted by the graph is a relatively apparent decoupling of total output from wages and salaries. The graph indicates that total output has remained roughly flat, while wages and salaries have consistently declined, especially from 2010 to 2016. This implies that the sector has maintained some production level while reducing labour costs, possibly resulting from increased productivity, a shift to lower-paid labour, or even informal labour practices.

Figure 8: Hand tools Sector: Total Output and Wages and Salaries



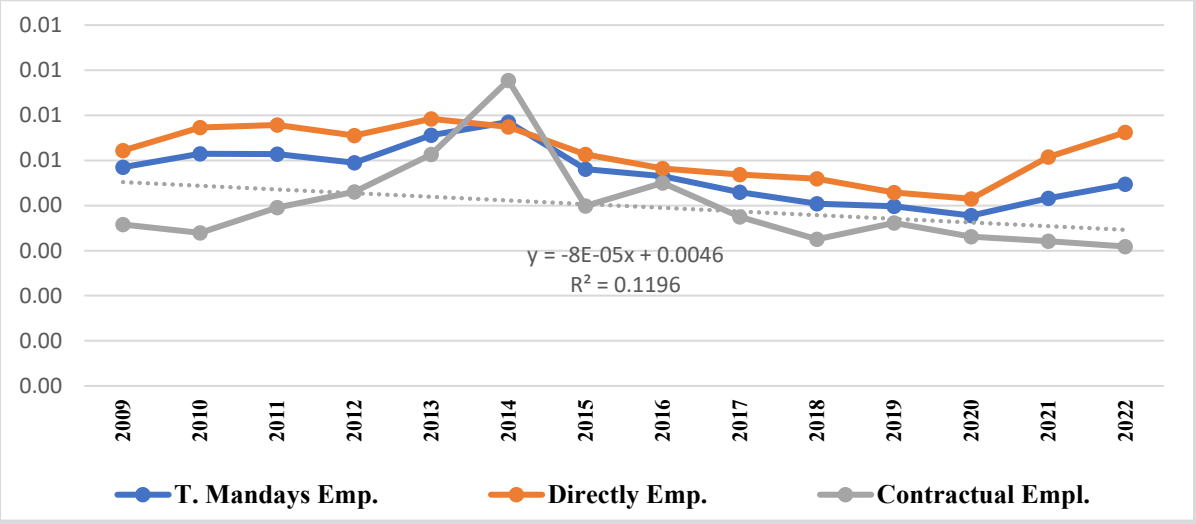
The decline in real wages and accurate wage rates, along with a plateau or decline in total output, captures a cost-cutting dynamic where more output is generated per unit of labour in real terms. Lower overall wages imply the sector may rely increasingly on non-permanent or contracted labour, which provides flexibility in labour arrangements but reduces wage costs for

the sector. Alternatively, it could indicate that factories generate productivity and output using better management practices or incremental mechanisation, reducing the pre-existing wage bill without adding upfront labour costs. Where the data shows stagnation in wage rates, the descriptions of how the sector maintained total output demonstrate how it has maintained production levels while reducing one of its highest costs: labour.

LABOUR MANDAYS AND CONTRACTUALISATION: SHIFTING EMPLOYMENT DYNAMICS

Within the hand tool manufacturing industry, employment has shifted dramatically. The graph of Total Mandays Engaged and Directly Engaged and Casual Workers shows a pivotal change from 2013 to 2014, during which contracted workers reached a high. This dependency on contractual labour was to meet short-term demand and manage ongoing costs.

Figure 9: Employment Situation in the Hand tools sector



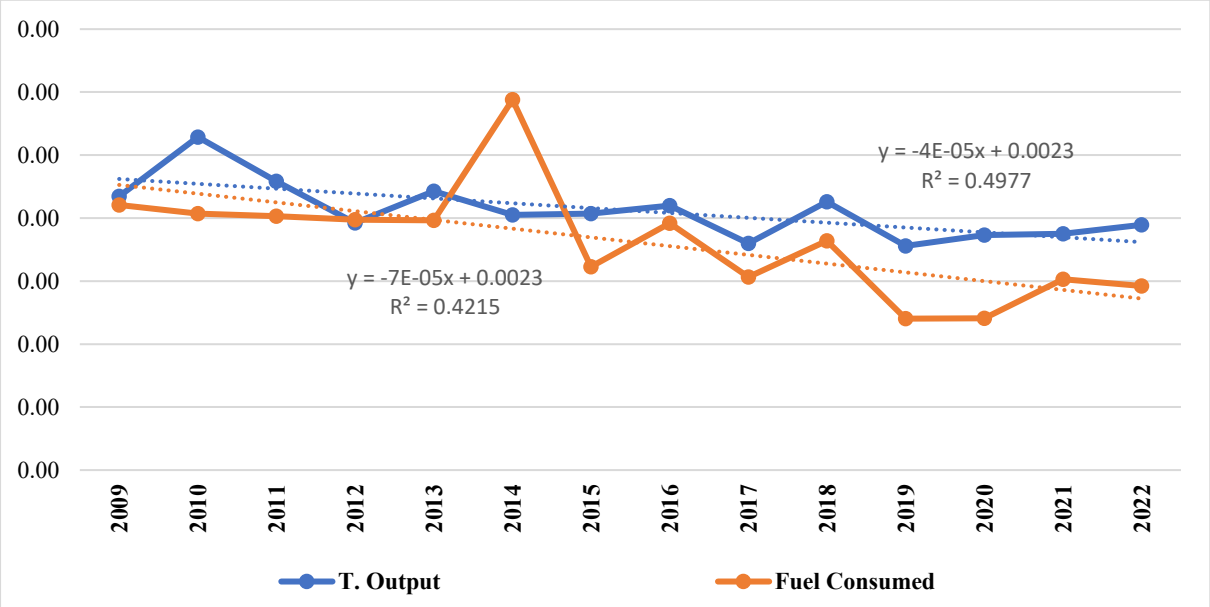
After 2015, direct employment and total person-days engaged dropped dramatically, indicating that overall utilisation declined. The dramatic drop suggests that employment reduction was an industry response to rising costs or declining demand, with an even higher propensity to cut contracted workers. The impact of contractor reduction was evident in the reduction of contract labour in the sector post-2015. These two changes indicate a structural change in the approach to managing labour in this sector, where contractors became less relevant, partly due to the stabilisation of costs and demand.

A year later, in 2021-2022, we see growth in both directly engaged and increased total person-days engaged as the enterprise re-engaged casual workers as demand increased. Again, the graph shows no changes in contract labour utilisation in this segment. As the enterprise has returned to increased output, it suggests a possible longer-term movement away from depending on informal labour and more toward regularised employment streams. In balance, the change would reflect some stability desired to move away from variability and fluctuations in employment levels.

ASSESSING ENERGY EFFICIENCY: FUEL CONSUMPTION RELATIVE TO TOTAL OUTPUT

An essential aspect of understanding operational efficiencies within the sector involves fuel consumption. After 2014, we see a marked decrease in fuel consumption when measured against total output, indicating that fuel consumption has levelled off or decreased in context to output. This decrease in fuel usage indicates improvements in energy efficiencies across the industry. This indicates that resources have been allocated to employing more energy-efficient technologies or preferences, reducing fuel consumption throughout production shifts.

Figure 10: Hand tool Sector's: Total Output and Fuel Consumption

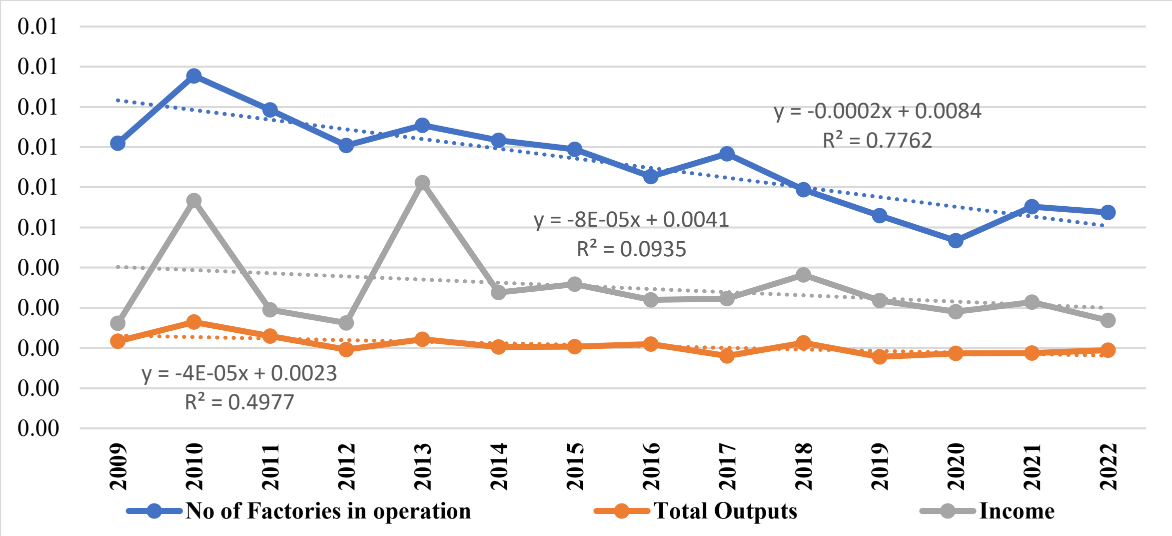


The significant downward trend from 2014 onward clearly demonstrates that efficiencies have been achieved regarding fuel production inputs relative to output; the sector's optimisation of energy efficiencies to maintain output levels without the need for additional fuel is critical for long-term contexts pursuing sustainability. Increased energy efficiencies can significantly affect overall production profitability. When the decline in fuel consumption rates coincides with a consistent production level, it suggests the sector can execute profitable cost savings with continued production output stressors.

STABILITY OF INCOME & PROFITABILITY: GROWTH TRADE-OFF ON INCOMES AFTER 2014

The graph shows that income fluctuated between 2010 and 2018 due to external market factors. Income spiked from 2010 to 2013, but after 2014, income levels dropped and became more stable.

Figure 11: Hand tool Sector: Overall Assessment



This stable period suggests that while productivity remained steady, the sector struggled to turn it into higher profits, likely focusing more on investor interests. Even though output remained consistent and fuel consumption became more efficient after 2014, earlier market conditions, such as input costs and pricing challenges, affected profitability. The lower income levels also impacted labour efficiency as the sector streamlined operations. Overall, while efficiency gains, especially in fuel usage, helped reduce operational costs, profitability still faced challenges, with no significant growth after the high-income years of 2010-2013.

EMPIRICAL EVIDENCE: COBB-DOUGLAS PRODUCTION ANALYSIS

The empirical evidence from the regression model (Table 2) supports the observation that capital is a critical driver of output growth, with diminishing returns to labor inputs. The study used output as a depended variable and number of workers, fixed capital and factories are independent variables are considered for regression analysis. We have used Cobb-Douglas production function. The study used Annual Survey of Industry data, and hand tool industry data classified under NIC is used for analysis.

To obtain the objective of the study is to investigate the factors influenced manufacturing output (i.e., workers, fixed capital and number of factories). Literature suggests that production functions are widely used in both theoretical and empirical studies. In empirical studies this production is used as benchmark. The Cobb Douglas function is mathematically specified as where, Q = Output, L= Labour, K= capital and in order to accommodate three-variables the equation follows:

$$Q = A * L^{\alpha} * K^{\beta} * F^{\gamma} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where A= Constant term, Q = Total output (e.g., production value or revenue), L = Labor input (e.g., no of persons employed), K = Fixed Capital input, F = Operational factories

(number of active factories) A = Total factor productivity and (α, β, γ) = Elasticities of output with respect to labor, capital, and operational factories

As we know that the given equation is non-linear in nature for the Cobb-Douglas function, we apply a log-transformation to linearize the model. This transformation yields the following form suitable for linear estimation:

$\ln Q = a_0 + a_1 \ln L + a_2 \ln K + a_3 \ln M + u_t$.....(2)

where $a_0 = \text{Constant term}, a_1, a_2, a_3$ are the coefficient representing the elasticities α, β, γ for each input and $u_t$denotes the error term in the model.

Solving Equations (1) and (2) to further estimate these parameters, we employ **Ordinary Least Squares (OLS) regression**, which helps determine the values of a_1, a_2, a_3 and their values reflect the elasticities α, β, γ which enables us to find each input's relative importance in influencing the output. *(See table 3)*

Furthermore, the Durbin-Watson test is applied to the regression residuals in order to check for the presence of autocorrelation, as serial correlation can be used to detect either time-series effects or model misspecification. The Durbin-Watson statistic will indicate whether there is positive or negative correlation in the residuals which lends support to the validity of the assumptions made in our modelling process *(See table 2)*

TABLE 2: Model Summary Table

Dependent Variable	**log(Output)**
Model Type	**Ordinary Least Squares (OLS)**
R-squared	0.842
F-statistic	17.78
Number of Observations	14
Probability (F-statistic)	0.000247
Degrees of Freedom (Residuals)	10
Log-Likelihood	10.995
Degrees of Freedom (Model)	3
Akaike Information Criterion (AIC)	-13.99
Durbin-Watson Statistic	1.885

R-squared *shows a good fit, with the model explaining 84% of the variance in output.*
The Durbin-Watson statistic = 1.885, which is close to 2, suggesting that the residuals are mostly independent.

TABLE 3: Statistical Results[9]

Variable	Coefficient	Std. Error	t-Statistic	P-value[10]
(Intercept)	-1.8064	4.323	-0.418	0.685
log(Capital)	0.7344	0.235	3.129	0.011*
log(Labour)	1.0207	0.573	1.782	0.105**
log(Factories)	-0.6701	0.367	-1.825	0.098

***** The coefficient of 0.7344 is statistically significant (p = 0.011) with a 95% confidence interval of [0.211, 1.257].
** The coefficient of 1.0207 is not statistically significant (p = 0.105), with a 95% confidence interval of [-0.256, 2.297]

To elucidate the relationship between capital, labour, and production in the Indian hand tool sector, a Cobb-Douglas production function was estimated with data on fixed capital, labour input, and working factories. The capital elasticity **(α = 0.73)** exerted a statistically relevant effect on output and could be interpreted in the following way: a 1% increase in fixed capital gave rise to a 0.734% increase in production. The elasticity of labour **(β=1.021)** again suggesting a key role for labour inputs, has, however, not been given tor statistical significance. Interestingly, number of operational factories had a negative elasticity of **-0.67**, giving suggestive evidence that the industry may be undergoing consolidation, with the consequent potential increases in operational efficiencies with fewer factories.

Thus, the result complements those making claims that the hand tool industry is gradually moving towards capital-intensive production while at the same time trying to realize efficiency gains through factory consolidation. Negative elasticity of operational factories does provide reinforcement to the restructuring trend, indicating that fewer and productive factories might still be able to sustain the output levels. This fortifies the assertion that efficiency gains that are important to the survival of the sector would happen in the wake of global competition.

CONCLUSION: FUTURE PROSPECTS FOR INDIA'S HAND TOOLS SECTOR

The Indian hand tool manufacturing sector has been quite resilient and dynamic in facing globalization and domestic market challenges. As revealed in the analysis, the sector has not faced setbacks while optimizing labor and energy costs, although overall output was near steady. Still, these adaptations have introduced trade-offs, particularly in labor practices. The

[9] ***For code see the Technical Note.***

[10] *denote the probability of observing the results if the null hypothesis were true, where* ***"***" ($p \leq 0.001$)*** *represents* ***a 0.1%*** *significance level, indicating a 99.9% confidence in the results, with* ***lower p-values showing higher confidence in the predictors' effect on output.***

shift from regular employment to contractual attitude provides flexibility, yet it has brought about issues of employment, wages, and sustainability. Insistence on energy efficiency, particularly in terms of fuel consumptions and cutting tools, has identified the unending problems of low profitability. The operational efficiencies gained between 2010 and 2014 could not lead to sustained revenue growth. Initial income gains were followed by volatility, triggered by the inability of manufacturing to calibrate itself with market sensitivities such as price fluctuations and rising input costs.

By contrast, the sector is looking forward to advantages or opportunities in global trading now. The growth of trade deficit, however, has put a question mark on maintaining confidence for the domestic production of hand tools in order to reduce reliance on imports. The key to achieving global competitiveness is further investment in automation and state-of-the-art technologies. Otherwise, India would fall behind, progressively faced by increasing competition from countries aided by advance manufacturing capabilities, such as China, backed by partnerships from original equipment manufacturers in Europe and North America.

In conclusion, the hand tools sector of India is now seeing quite good prospects, with the rising demand from abroad. Sectors should come forward to tackle structural inefficiencies, modernize labor practices, and encourage capital investment toward sustainable development. Skyrocketing trade imbalances and growing competitiveness calls for tools like Make in India to help meet this challenge and strengthen India's hand tool sector. Government initiative such as the PLI scheme, with its projected labor input, is seen as an opportunity to offset the pressures found in this ongoing research project. The sector's success in motion toward future will depend on its embrace of the need for smart investment in technology and on its ability to move away from a cycle of answering labor input needs towards a more modern approach of productive systems. Only with these transformations can the sector achieve long-term growth and profitability.

TECHNICAL NOTE

 # R code

```
# Assign column names
colnames(data) <- c("Year", "Factories", "Fixed_Capital", "Fuels_Consumed",
                    "Total_Inputs", "Total_Output", "Labour")
# Convert relevant columns to numeric
data <- data.frame(lapply(data, as.numeric))
# Create log-transformed variables
data$log_Output <- log(data$Total_Output)
data$log_Capital <- log(data$Fixed_Capital)
data$log_Labour <- log(data$Labour)
data$log_Factories <- log(data$Factories)
# Run the linear regression
model <- lm(log_Output ~ log_Capital + log_Labour + log_Factories, data = data)
# Display the summary of the model
summary(model)
```

 # Output

```
Call:
lm(formula = log_Output ~ log_Capital + log_Labour + log_Factories, data = data)
Residuals:
     Min       1Q   Median       3Q      Max
-0.09761 -0.04174 -0.00638  0.03068  0.10547
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)    -1.8064     4.3230   -0.418   0.685
log_Capital     0.7344     0.2350   3.129   0.011 *
log_Labour      1.0207     0.5730   1.782   0.105
log_Factories  -0.6701     0.3670  -1.825   0.098 .
---
Signif. Codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘’ 1
Residual standard error: 0.05872 on 10 degrees of freedom
Multiple R-squared:  0.842,    Adjusted R-squared:  0.795
F-statistic: 17.78 on 3 and 10 DF, p-value: 0.0002466
```

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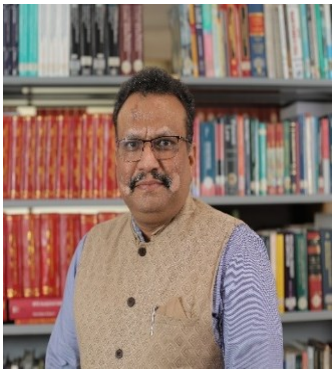

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