



ISID Institute for Studies in Industrial Development
An institution of Indian Council of Social Science Research (Ministry of Education)
Policy Research to Foster India's Industrial Transformation

National Conference

Towards Industrial Transformation of India:

Building an Inclusive, Sustainable, and Competitive Manufacturing Sector to Realize the 2047 Vision

New Delhi, 4-6 October 2023

Programme & Abstracts



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Tentative Programme

Day 1: 4 October 2023

10.00-10.30	Registration and Coffee	Location
10.30-11.15	1. Inaugural Session	Auditorium
11.30-13.00	2. High-Level Policy Roundtable on Industrial Strategy for Realizing the Vision@2047	Auditorium
14.00-15.30	3. Technical Sessions	
<p>3.1. FDI, Innovation and Spillovers</p> <p><i>Chair:</i> Prof Pulin Nayak, Formerly DSE & ISID Board</p> <p>Discussants: Prof Suma Athreye, IIT-Delhi/ ISID Dr Swati Verma, ISID</p> <ol style="list-style-type: none"> 1. <i>Analysis of Spillover Effects of Foreign Direct Investment in Indian Manufacturing Industries using Malmquist Index</i>, K.V. Bhanu Murthy, Delhi Technological University, Deepa Saran, Department of Business Economics, University of Delhi, & Meghna Malhotra, Hans Raj College, DU 2. <i>Relationship between Foreign Direct Investment, Political and Human capital factors: Implications on inequality and environment</i>, Pooja Sharma, Daulat Ram College, University of Delhi, Priya Bhalla, Motilal Nehru College, University of Delhi, and Sunita Gupta, Daulat Ram College, Delhi University 3. <i>Does Foreign Direct Investment in Research and Development stimulate</i> 	<p>3.2. Green Goods, Technology and Investment</p> <p><i>Chair:</i> Prof T C Anant, former Chief Statistician of India</p> <p>Discussants: Prof Yamini Gupt, Dept of Business Economics, DU-SDC. Prof Shahid Ahmad, JMI, New Delhi.</p> <ol style="list-style-type: none"> 1. <i>Decoupling between Industrial Growth and Carbon Emission: Evidence from India's Core Industries</i>, Nivaj Gogoi and Farah Hussain, Tezpur University. 2. <i>Estimating carbon emission intensity of energy-intensive firms: a firm-level analysis</i>, Muralli Kallummal, Aishwary Kant Gupta, Simran Khosla, Centre for WTO Studies, IIFT, New Delhi. 3. <i>Green Goods and Industrial and trade policy - Analysing International Trade in Green Goods: A Special Reference to the Case of India</i>, Saon Ray, ICRIER and Smita Miglani, IEG, New Delhi. 4. <i>Reviving the north-south divide framework in technology transfer: The</i> 	<p>3.3. MSMEs: Performance and Challenges</p> <p><i>Chair:</i> Prof Padmini Swaminathan, MIDS, Chennai</p> <p>Discussants: <i>Prof Dibyendu Maiti</i>, Delhi School of Economics. Dr Santosh Das, ISID</p> <ol style="list-style-type: none"> 1. <i>Challenges and Opportunities of Micro Small Medium Enterprises in India</i>, Satyam Bharti, Ministry of Labour and Employment, Govt. of India. 2. <i>Technical efficiency of MSMEs in India: Measurement and Determinants</i> Puja Priyadarsini Sahoo & K Narayanan, IIT Bombay, Mumbai. 3. <i>Do Domestic Firms require more Financial Access than Foreign-owned Firms? Evidence from MSMEs across Developing Countries</i>, Akhilesh K. Sharma, ISID; Durairaj Kumarasamy, Manav Rachna International Institute of Research and Studies, Faridabad; and Prakash Singh, Goa

<p><i>innovation output? A firm level analysis</i>, Ruchi Sharma and Ruchita Sharma, IIT, Indore</p> <p>4. <i>Foreign Direct Investment and Export Dynamics in India: Unveiling the role of brownfield and greenfield investments</i>, Anjali Sreekumar and M Padmaja, NIT, Trichy.</p> <p>5. <i>A Study of Internationalization Patterns in Indian Textile Born Global Firms</i> M. Srividhya and CT Vidya, CESS, Hyderabad.</p>	<p><i>case of green technology</i>, Rugmini Devi M and Jeffin Thomas Mammen, University of Kerala.</p> <p>5. <i>FDI and Environmental Degradation in BRICS Nations: With a focus on India</i>, Sovik Mukherjee, St. Xavier's University.</p>	<p>Institute of Management, Goa.</p> <p>4. <i>Credit Market Structures in India for Micro Enterprises: Issues and Challenges</i>, Dinesh Kumar, Centre for WTO Studies, IIFT, New Delhi and Ramaa Arun Kumar, ISID, New Delhi.</p> <p>5. <i>Decomposing the Caste Divide in Formal Credit for Unorganised Enterprises: Insights from Indian Enterprise Surveys</i>, K Vidyarani, & T Maheshkumar, CDS</p>
16.00-17.30	Plenary Session 4: Policy Roundtable on Sustainable and Green Industrialization: Challenges and Opportunities for India	Auditorium

Day 2: 5 October 2023

09.30-11.00	5. Technical Sessions	
<p>5.1. Trade, Technology, and Industrialisation</p> <p><i>Chair:</i> Prof Sachin Chaturvedi, DG-RIS, New Delhi</p> <p><i>Discussants</i> Prof Suma Athreye, IIT-Delhi/ISID Dr Satyaki Roy, ISID, New Delhi</p> <p>1. <i>Why is Labour Receiving a Declining Share of Income in India? Role of Trade, Technology, and Market Share Reallocation</i> C. Veeramani and Anwasha Basu, CDS, Trivandrum.</p> <p>2. <i>Productivity, Investment Slowdown and Misallocation: Evidence from Indian Manufacturing</i>, Sarthak Basu, Subash Sasidharan, IIT Madras.</p> <p>3. <i>Assessment of Possible Economic Alignment</i></p>	<p>5.2. Growth and Productivity in Indian Manufacturing</p> <p><i>Chair:</i> Prof K L Krishna, CDE/DSE</p> <p><i>Discussants</i> Dr S Krishnakumar, Sri Venkateshwara College, DU Dr R Rijesh, ISID, New Delhi</p> <p>1. <i>Trade Liberalisation and Productivity Growth in Indian Manufacturing Industry: Role of Resource Allocation and Catching-up</i>, M Parameswaran, CDS, Trivandrum.</p> <p>2. <i>Determinants of Productivity Growth of Industry and Services Sectors of the Indian Economy in the Wake of Climate Change</i>, Niti Khandelwal Garg, Kirori Mal College, University of</p>	<p>5.3. Towards Sustainability: Renewables, critical minerals and circular economy</p> <p><i>Chair:</i> Prof Amit Shovan Ray, JNU, New Delhi.</p> <p><i>Discussants</i> Prof Nitya Nanda, Director, CSD, New Delhi Dr Anjali Tandon, ISID, New Delhi</p> <p>1. <i>Circularity of Critical Raw Materials: A Step Towards India's Net-zero Targets 2070</i>, Anjali Singh and Thirumalai N C, Center for Study of Science, Technology and Policy (CSTEP).</p> <p>2. <i>Sustainability and Green Industrialization: A case of Indian Solar PV (Photovoltaic) Technological Innovation</i></p>

<p><i>between G20 Nations with Special focus on India, G7 and G12 Nations: A General Equilibrium Analysis</i>, Archana Srivastava, Somesh Kumar Mathur, Rachna Mathur & Prabir De, IIT Kanpur.</p> <p>4. <i>Understanding the Growth Dynamics of Investment and Rate of Profit in India's Organized Manufacturing Sector</i>, L.T. Abhinav Surya and P L Beena, CDS, Trivandrum.</p> <p>5. <i>Factor augmenting technology and elasticities of factor substitution in production structure: A study on Indian industries</i>, Swapan Chakraborty, St. Xavier's University, Kolkata.</p>	<p>Delhi and Pami Dua, Delhi School of Economics.</p> <p>3. <i>Bankruptcy Reform and its Implication on the Economy: Evidence from a Quasi-Natural Experiment</i>, Harish Kamal, IIM Calcutta, Kolkata.</p> <p>4. <i>Ease of Doing Business and Firm Productivity - Evidence from Indian Industries and States</i>, Neha Jain, Sugandha Huria and Geeta Tiwari, IIFT, New Delhi.</p> <p>5. <i>Output and Employment Growth Experiences of the Manufacturing Sector in India</i>, S. Geetha, St. Xaviers College, Palayamkottai.</p>	<p><i>System</i>, Akoijam Amitkumar Singh, University of Delhi.</p> <p>3. <i>A Global Assessment of Green Hydrogen Value Chain: Synthesizing Policy Learnings</i>, Jatin Mathur, IIT, Delhi & National Economic Forum.</p> <p>4. <i>Nudging Circular Economy in Indian Industry: An Evaluation using ICRIER 'Sampada' WSUT Model</i>, Amrita Goldar, Sajal Jain, Ritika Verma and Esha Agrawal, ICRIER, New Delhi.</p> <p>5. <i>Trends and patterns of ZED certified MSMEs: a sectoral and states level analysis</i>, Parag Gupta and S Subramanian, Christ University, Bengaluru.</p>
11.30-13.00	Plenary Session 6: Policy Roundtable on Leveraging Innovation and Industry 4.0 for India's Industrial Transformation	Auditorium
14.00-15.30	7. Technical Sessions	
<p>7.1. FDI, Trade and Global Value Chains</p> <p><i>Chair:</i> Prof Khan Masood Ahmad, JMI</p> <p><i>Discussants</i> Prof Aradhna Aggarwal, Copenhagen Business School. Dr M Zakariah Siddiqui, JMI</p> <p>1. <i>Revitalizing Global Value Chains through Sectoral Trade Agreements: Insights from CGE analysis for automobile industry</i>, Himanshu Jaiswal and A. Ganesh Kumar, IGIDR</p> <p>2. <i>The Impact of Foreign Direct Investment on Global Value Chain Participation in High</i></p>	<p>7.2. Industrial Structure and Employment Issues</p> <p><i>Chair:</i> Prof Ravi Srivastava, IHD</p> <p><i>Discussants</i> Prof Surajit Mazumdar, JNU, New Delhi. Prof Jayan Jose Thomas, IIT-Delhi.</p> <p>1. <i>Whither India's SHG-led Enterprises? Status and Bottlenecks of Developing NRLM SHGs into Business Enterprises</i>, Ruchira Bhattacharya, National Institute of Rural Development and Panchayati Raj-Delhi Branch.</p>	<p>7.3. Sectoral Dimensions of Manufacturing</p> <p><i>Chair:</i> Prof B.N. Goldar, Institute of Economic growth</p> <p><i>Discussants</i> Prof Somesh K Mathur, IIT Kanpur Dr Shailender K Hooda, ISID</p> <p>1. <i>Indian Pharmaceutical Industry: Trade and Competitiveness</i>, Anu & Devinder Singh Hooda, Indira Gandhi University, Haryana.</p> <p>2. <i>Investment Pattern and Sources of Finance in the Handloom and Powerloom Units in Uttar Pradesh</i>, Santosh Kumar, Ministry of</p>

<p><i>Technology Industries: An Empirical Analysis of India and G20 Economies</i>, Melvin Vincent and Joseph T.J. Central University of Kerala, Kasaragod.</p> <p>3. <i>Do Foreign Trade Agreements Facilitate Global Value Chain Participation? Evidence from India</i>, Saon Ray, ICRIER, and Piyali Majumder, NCAER</p> <p>4. <i>Innovation Dynamics in Emerging Economies: An empirical study of global value chains and Indian manufacturing industries</i>, Rahul & Sakshi Sharma, Jawaharlal Nehru University.</p> <p>5. <i>Private and Social Welfare Implications of Buyer Power and Vertical Mergers in Supply Chain Competition</i>, Srishti Gupta, St. Stephens College, Delhi University.</p>	<p>2. <i>Scenario of Employment Creation under Pradhan Mantri Employment Generation Programme: A Zonal Study of India</i>, Kanchan Srivastava, University of Lucknow.</p> <p>3. <i>Trend and Pattern of Deindustrialisation of Sugar Industry in Bihar: A Regional Imbalance</i>, Aditi Central University of South Bihar, Gaya.</p> <p>4. <i>Effect of Enforcement of Labour Regulations on the Provision of On-The-Job Training by firms</i>, Sandeep Yadav, IGIDR, Mumbai</p>	<p>Commerce, Govt. of India, Seema Bhathla & Amaresh Dubey, CSRD, JNU, New Delhi.</p> <p>3. <i>India's Capital Goods Sector: An Evaluation of the Domestic Value Addition Performances</i>, Swathysree S.S., O P Jindal Global University.</p> <p>4. <i>Medical Devices industry in India- What India manufactures?</i> Saumaly Ghosh. JNU, New Delhi.</p> <p>5. <i>Impact of Closed Textile Mills on Indian Economy</i>, Ravindra Kumar, Deepika Devi, Sivasankar. V, Pondicherry University.</p>
16.00-17.30	Plenary 8: Policy Roundtable on FDI, Trade and India's Integration with GVCs	Auditorium

Day 3: 6 October 2023

9.00-10.30	9. Technical Sessions	
<p>9.1. Technology and Innovation</p> <p><i>Chair:</i> Prof Lakhwinder Singh, Punjabi University, Patiala</p> <p><i>Discussants</i> Prof Aparna Sawhney, JNU Dr K Seenaiyah, ISID</p> <p>1. <i>Innovation System, Value Added Trap and Developing Economies: Examining a Traditional Manufacturing Cluster from India</i>, Swati Mehta, Guru</p>	<p>9.2. OFDI, Government Support and Firm Performance</p> <p><i>Chair:</i> Prof Manmohan Agarwal, ISID</p> <p><i>Discussants</i> Dr Reji K Joseph, ISID Dr Isha Chawla, ISID</p> <p>1. <i>COVID-19, Government Support and Firm Productivity: A Tale of Two Industries</i>, Vinish Kathuria and Rajesh Raj Natarajan, IIT, Bombay</p>	<p>9.3. Meeting of the Core Group on extended network on industrial development</p>

<p>Nanak Dev University, Amritsar.</p> <p>2. ICT Adoption and Factor Productivity of Manufacturing Firms in India, Vikash Gautam and Niharika, Koan Advisory Group, New Delhi.</p> <p>3. Does Import Competition Spur Firms' Innovation Behavior: Evidence From Indian Manufacturing, Hariom, Ruchi Sharma, IIT Indore.</p> <p>4. Zombie Firms and their impact on Innovation: An Industry-level Empirical Analysis of the Indian Economy, Ranu Jain, IIFT, New Delhi.</p> <p>5. Does FDI Spillovers Generate Innovation? The Catalytical Role of R&D Intensity and Geographical Cluster, Pompi Chetia, IIT, Ropar</p>	<p>2. Economic Upgrading of Firms: A Study of the Indian Textile and Clothing Industry, Srijita Mitra and C.T. Vidya, Centre for Economic and Social Studies, Hyderabad.</p> <p>3. Impact of Termination of India's Bilateral Investment Treaties on Outward Foreign Direct Investment, Bishwanath Goldar, Institute of Economic Growth, Delhi, Yashobanta Parida, Flame University, Pune & Anindita Goldar, PGDAV College, University of Delhi.</p> <p>4. Outward FDI and Its Impact on The Parent Firm: A case of Indian manufacturing firms, Amal Krishnan and Padmaja M. NIT, Trichy</p> <p>5. Emerging Trends and Macroeconomic Determinants of Outward FDI from India- Some new facts and evidence, Pooja Khanna, Daulat Ram College, Delhi University.</p>	
11.00-12.00	Special Plenary Session <i>ISID Foundation Day Lecture</i>	Auditorium
12.00-13.30	Plenary 10: Plenary Session on Unlocking the Dynamism of MSMEs and Start-Ups for Industrial Transformation	Auditorium
14.15-15.45	11. Technical Sessions	
<p>11.1. Innovative activity and Leveraging Industry 4.0 for Competitiveness</p> <p><i>Chair:</i> Prof Vinish Kathuria, IIT-Bombay.</p> <p><i>Discussants</i> Dr Smitha Francis, NPEI, IIT Bombay. Dr Sanjay Kumar Malik, ISID</p> <p>1. Exploring the Moderating Role of Technological,</p>	<p>11.2. MSMEs in India: Employment, Digitalisation, Exports and R&D</p> <p><i>Chair:</i> Prof Atul Sood, JNU</p> <p><i>Discussants</i> Dr Sangeeta Ghosh, ISID Dr Akhilesh Sharma, ISID</p> <p>1. E-Commerce, and the Indian Retail and Manufacturing Sectors: An Empirical Analysis with a</p>	<p>11.3. Geography of Industrialisation and Balanced Regional Development</p> <p><i>Chair:</i> Professor R. Nagaraj, IGIDR</p> <p><i>Discussants</i> Dr M. Parameswaran, CDS, Trivandrum. Dr Ramaa Arun Kumar, ISID</p> <p>1. Impact of Agglomeration Economies on Plant</p>

<p><i>Organizational, and Environmental Factors on the Sustainability Applications of Industry 4.0: A Multi-level Analysis</i>, Narender Kumar, JNU, New Delhi and Winnie Sharma, Amity University, Noida.</p> <p>2. <i>Determinants of ICT adoption in case of Indian manufacturing sector</i>, Subal Dutta and Badri Narayan Rath, IIT, Hyderabad.</p> <p>3. <i>Family Firms, Innovation and Complementarity of Product Market Competition</i>, Sukhdeep Singh, Institute of Economic Growth, New Delhi & Indrani Chakraborty, IDSK, Kolkata.</p> <p>4. <i>STI path formation challenge and industrial development: Lessons from India</i>, Dinesh Abrol, TRCSS, JNU, New Delhi.</p> <p>5. <i>Public Sector Funding of R&D and Productivity Growth in India</i>, Megha Chamoli, Amey Pathak and Ruchi Sharma, IIT, Indore.</p>	<p><i>Special Focus on Organised Sector MSMEs</i>, Nibha Bharti; Sugandha Huria; Ashley Jose & Kanika Pathania, IIFT, New Delhi.</p> <p>2. <i>R&D and IT intensity leveraging MSMEs Performance in India: A way to Industrial Transformation</i>, Barkha Dhingra, Maharshi Dayanand University (MDU); Tanu Kathuria, UNDP, India; Ruhee Mittal, RD Institute of Advanced Studies, New Delhi; and Mahender Yadav, MDU</p> <p>3. <i>Digitalization and Exports: A Case of Indian Organized Sector Manufacturing MSMEs</i>, Sugandha Huria, Neha Jain, Kriti Sharma & Ashley Jose, IIFT</p> <p>4. <i>Employment Status of Women in the Power Loom Sector: A case study of Varanasi</i>, Uttar Pradesh, Nandani Yadav & Priyabrata Sahoo, BHU</p> <p>5. <i>Unfolding Challenges of the Informal Economy: Migration, Agglomeration, and Duality</i>, Pooja Sharma, Daulat Ram College, Mahua Paul, ISID, & Anjan Chakrabarti, University of North Bengal, Darjeeling.</p>	<p><i>Productivity - Evidence from Indian Manufacturing Sector</i>, Piyali Majumder, NCAER and Aparna Sawhney, JNU New Delhi.</p> <p>2. <i>Manufacturing Productivity in Indian States: The Role Infrastructure, Agglomeration, and Exports</i>, Mahua Paul, Smruti Ranjan Sahoo, ISID, New Delhi.</p> <p>3. <i>Pattern and determinants of the growth in the size of the manufacturing sector since the 1980s: Inter-state analysis</i>, Sakshi Arora, Amity University, Mohali & Amrita Shergill, Punjab University.</p> <p>4. <i>Geographical concentration of Indian manufacturing industry: study of agglomeration and co-agglomeration pattern</i>, Pritam Datta, NIPFP, New Delhi.</p> <p>5. <i>Geographical Dispersal of Manufacturing Industry in India</i>, Ashish Andhale, MIT-World Peace University, Pune & Sharadini Rath, Indian School of Political Economy, Pune.</p>	
16.00-17.00	12. Valedictory Session		Auditorium
17.00	Closing		

3.1. FDI, Innovation and Spillovers

Analysis of Spillover Effects of Foreign Direct Investment in Indian Manufacturing Industries using Malmquist Index

K V Bhanu Murthy

Delhi Technological University

Deepa Saran

Former Associate Professor, Department of Business Economics, South Campus, University of Delhi.

Meghna Malhotra

Hans Raj College, University of Delhi

This paper studies disembodied technological progress of foreign firms and domestic firms in Indian manufacturing firms during the period 2000-01 to 2018-19. Also, empirical tests are conducted to find out whether there are technological spillovers from the foreign firms to domestic firms and to analyse whether dynamic gains are in favour of foreign firms or domestic firms over the two decades. For this purpose, Malmquist index is used to compare the Total Factor Productivity of foreign firms with domestic firms. The empirical results from Malmquist index show foreign firms are performing better than domestic firms in most of the manufacturing industries under study during this period. Technological spillovers from the foreign firms to domestic firms were found in 7 out of 13 industries under study as indicated by the negative rate of CAGR of Malmquist Index. The growth analysis of Malmquist Index has helped us in understanding broad trends in the dynamics of spillover effects.

Relationship between Foreign Direct Investment, Political and Human Capital Factors: Implications on Inequality and Environment

Pooja Sharma

Daulat Ram College, University of Delhi

Priya Bhalla

Motilal Nehru College (E), Delhi

Sunita Gupta

Daulat Ram College, University of Delhi

Foreign Direct investment is a crucial aspect of economic growth and development. India is the ninth-largest recipient of foreign direct investment (FDI) and will continue to attract foreign investors even after the pandemic. Several factors are responsible for determining the potential to attract foreign investment. This study aims at analyzing the political and human capital factors that influence FDI in India. In addition, the study examines the relationship between FDI, inequality, and carbon emissions (environment). To achieve these objectives, the study deploys Principal Component Analysis for analyzing the political and human capital factors. political participation, government effectiveness, political Stability, regulatory law, rule of Law, labour laws, and control of corruption are the selected indicators for constructing a political index, reflecting a conducive environment for foreign investors. While health indicators such as infant mortality, immunization status, and life expectancy at birth and other socioeconomic indicators such as gross enrolment ratio and number of beds are considered for constructing the human capital index. To examine the relationship between FDI and the variables such as inequality, environment, and political and human capital factors, the Granger causality test is performed. Results reveal that inequality, political factors and human capital granger causes FDI, while FDI granger causes carbon emission. Policies and reforms must be formulated to promote and improve the correlations between human capital, political factors and FDI, resulting in significant correlation. A policy framework is recommended that will enhance political factors and human capital factors that will significantly contribute to attracting FDI.

Do Foreign Direct Investment in Research and Development stimulate innovation output? A firm level analysis

Ruchi Sharma and Ruchita Sharma

Indian Institute of Technology, Indore

This paper estimates the effect of Foreign Direct Investment in Research and development (FDI in R&D) on innovation output i.e., patenting, commitments made voluntarily by investee to explore the area and enhance the innovation output. Patents have been gaining popularity in recent years thanks to the highly visible benefits of companies such as Google and Apple. Extant literature discusses the importance of FDI to host and home countries and strategic spillovers effects over the years. Patent as an innovation output gain importance with the growing market competition, but we know very little about the impact of R&D investment on such motives. The empirical analysis is based on secondary data on over 298 FDI in R&D firms provided by principal scientific advisory in year 2020 from across all industrial sectors, between 2010 and 2020. We implement recent advances in conditional difference-in-differences estimators for staggered, dynamic event study settings to account for unobserved endogenous selection into a FDI in R&D. We build the matched control group of non-FDI in R&D using PSM technique on similarity measures of the industry, size, and age from CMIE prowess database analyzing individual firm's annual report. The results suggest that FDI in R&D spur innovation output, as reflected by increased patents published by firms. The effect is positive and effectively significant after controlling firm level characteristics such as ownership, location, human capital, exports, size of firms, particular industry level effect. The results also found the impact of firm characteristics on innovation output. The results bear implications for discussions about the role of defining and attracting FDI in R&D on innovation output.

Foreign Direct Investment And Export Dynamics In India: Unveiling The Role Of Brownfield And Greenfield Investments

Anjali Sreekumar & M Padmaja

National Institute of Technology, Tiruchirapalli

This article analyses the impact of Foreign Direct Investment (on exports in India during the period 1991-2019). It also includes a refined sub sample analysis connecting Greenfield Investments and Brownfield Investments with exports from 2003-2019. The Autoregressive distributed lag (ARDL) model is being employed to test the relationship among the variables aiming to establish a long run relationship. The findings indicate the existence of a stable and long run substituting relationship between aggregate inflows of FDI and aggregate exports. However, when comparing the types of FDI, it is observed that only greenfield investment has a significant impact on export performance, while brownfield investment does not exhibit a similar influence. These findings have important implications for analysts and policymakers in formulating policies that encourage FDI inflows and promote exports. Understanding the variation in types of FDI and their effects on exports is crucial for developing effective strategies.

A Study Of Internationalization Patterns In Indian Textile Born Global Firms

M Srividhya & C T Vidya

Centre for Economic and Social Studies, Hyderabad

This study explores the intricate relationship between internationalization and performance of Born Global (BG) firms operating within the Indian textile sector. This study conducts an in-depth analysis of this association, both in the short and long terms, and provides critical insights. Employing a three-stage model and drawing upon M-curve theory, this study investigates how internationalization influences firm performance. In the initial stage, characterized by limited international exposure among BG firms, our research affirms the presence of an inverted U-shaped relationship between internationalization efforts and firm performance. However, as these firms progress through various stages of internationalization, a subsequent decline in performance

is observed, confirming the M-curve pattern. Moreover, our study identifies several pivotal variables that contribute positively to a firm's success during the internationalization process. These include firm size, age, slack resource and investment in research and development (R&D). These findings emphasize the paramount importance of gathering information and developing firm-specific capabilities during the internationalization journey. BG firms are encouraged to seek valuable market insights and bolster their ability to adapt to foreign market conditions. In conclusion, this study underscores the significance of possessing adequate resources, expertise, financial stability, and innovation capabilities for the successful internationalization of Indian textile-borne global firms.

3.2. Green Goods, Technology and Investment

Decoupling between Industrial Growth and Carbon Emission: Evidence from India's Core Industries

Nivaj Gogoi & Farah Hussain

Tezpur University Tezpur, Assam

India is a developing country where industrialization contributes a prominent portion towards its economic growth. However, the modern society is not concerned with one's economic aspects alone. The issues global warming and climate change have started demanding the industries to operate sustainably and minimize their environmental ill-effects to the possible extent. However, in the initial stages of economic and industrial growth, they are expected to impose a minimum level of environmental stress. The Government of India has recognized eight industries as the core industries of the country due to their high significance towards India's economic growth. The eight industries are - coal, crude oil, natural gas, cement, fertilizers, electricity, steel and refinery products. At the same time, studies have established these industries as a few of the most polluting industries across the globe. The Government of India has also recognized most of these core industries as 'Red Industries', which includes the list of the highest level of polluting industries. In such instances, the matter of industrial sustainability has become crucial and sensitive for protecting the environment as India is still in its growth phase. Therefore, this study attempts to analyze the extent of environmental degradation effects that have occurred due to the growth of the core industries. The study employs Tapio's Decoupling approach to explore the same in respect of each of the core industries. Additionally, a new Decoupling Score (DS) methodology has been introduced that incorporates the ability to represent the polluting levels of the industries. The study considers the Index of Core Industries (ICI) to represent the performance and growth level of the core industries, which is published by the Government of India. To measure the degradation level of the industries, their carbon dioxide (CO₂) emission levels has been considered. CO₂ is the most dominant greenhouse gas whose threatening effects on the environment are already established. In the past, most studies have used this variable to estimate the environmental degradation level of any industry or country. Depending on the availability, at least 14 years of data has been considered for each industry from 2005 as this year onwards, the natural gas and fertilizers industries were listed among the Indian core industries. The study will have crucial policy implication for the industrial and environmental regulations of India. The DS approach will help identify the high-polluting core industries, indicating the need for strict monitoring and controlling of their emission levels. The results of the study indicate that crude oil and electricity are the most polluting and cleanest core industries, respectively. Advanced technologies, efficient management system, environment-friendly energy sources, etc. are a few of the ways through which India can potentially reduce the environmental degradation levels of the industries. The Government, financial sector and the industries themselves have to act responsibly to build a green industrial atmosphere in the country.

Estimating Carbon Emission Intensity of Energy-Intensive Firm: A Firm-Level Analysis

Murali Kallummal, Aishwary Kant Gupta & Simran Khosla

Indian Institute of Foreign Trade

The European Union (EU) has notified to the World Trade Organisation (WTO) about its national measure, which is also a strategic intention to institute a comprehensive 'Carbon Border Adjustment Mechanism' to address the "green-house-gasses" (GHGs) emission and the related "climate-change" challenges. The mechanism is so designed to address the challenges posed by carbon emissions and therefore it has the potential to target the energy-intensive sectors - both at the primary level and secondary levels. The EU regulation known as CBAM has the potential for heralding a pivotal moment in international trade regulation. The EU's proposed framework particularly targets eight industries with substantial energy demands, including Iron & Steel, aluminium, cement, electricity, fertiliser, and hydrogen. Notably, the potential implications of carbon taxation resonate distinctly within the Indian economic landscape, with certain sectors like iron and steel as well as aluminium, standing out due to their pronounced export orientation. The objective of this paper is to compute carbon emission intensity across the firms belonging to two sectors namely iron and steel, and aluminium for the period 2000 to 2022. With the primary objective of quantifying the price and cost impacts at the macro and micro levels. The preliminary finding suggests a decline in the average carbon emission intensity of firms across both industries as they have declined during the period of study.

Analysing International Trade in Green Goods: A Special Reference to the Case of India

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We examine the implications of environmental stringency in the exports of India. We use the Combined List of Environmental Goods (CLEG) of 248 items by the OECD. The paper uses gravity model to analyse the exports of green goods from India. Variables such as GDP for economic size and distance between India its and trade partners as a proxy for trade costs, and control variables, such existence of regional trade agreement (RTA) have been used. Along with this a variable of environmental stringency (EPS) has been used. Though India's trade in environmental goods is small, the implications of this paper are important for our trade policy in exports of environmental goods.

Reviving The North-South Divide Framework In Technology Transfer: The Case Of Green Technology

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The global disparity between developed and developing countries is most obvious and burgeoning in the technology sector. One important means to close this divide, as deliberated in various agreements, is technology transfer. However, the literature on technology transfer has moved away from the framework of the North-South divide to focusing on the innovation framework, which argues for developing innovative capacities in the recipient countries to make technology transfer the most effective. While the innovation framework is useful, it is also important to understand how the global technology divide and the imbalance created by it impact technology transfer. This study explores this divide and its impact on technology transfer, especially for developing countries. This is analysed through the case study of green technology, which has recurrently become an important discussion point in climate change and related agreements beginning from Rio 1992. The paper concludes that despite 30 years of debates and discussions held at the multilateral level and bilateral levels regarding the extent of technology transfer, intellectual property rights and technology costs, the technology divide is burgeoning and

is heavily skewed in favour of developed countries. What is required is a rethinking on developing new principles for international cooperation which will reduce the North-South inequalities.

FDI and Environmental Degradation in BRICS Nations: With a focus on India

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Countries make investments in foreign countries and benefit from the gains accruing from such investment efforts, thanks to the advent of globalization. It is common knowledge that foreign direct investments promote economic growth in the host countries. Foreign direct investment (FDI) can have a significant positive impact on the host nation, but it also comes with costs. One such expense is the effluents that are released into the environment as a result of the operations of foreign enterprises and industries in the host country. The objective of this study is to investigate the effect of FDI on environmental degradation (through CO₂ emissions) of the BRICS countries. The data used in this study has been primarily sourced from the World Development Indicators (WDI) published by The World Bank Group and available statistical databases for the respective countries concerned in the post-reform era for a span of 30 years from 1992-2022. The paper applies the autoregressive distributed lag (ARDL) model, panel cointegration and Dynamic OLS (DOLS) method for this analysis correcting the endogeneity problems and serial correlations. The findings reveal that FDI has a significant impact on the environmental degradation in BRICS countries controlling for country-specific fixed effects. The novelty in the paper is the evidence for “ ” shape of the Environmental Kuznets Curve (EKC), for the whole sample of BRICS nations, however at an individual level, there is no evidence for the existence of the EKC hypothesis in India and Russia while for China, Brazil, and South Africa, the inverted U type exists for the period under consideration. Also, Dumitrescu-Hurlin causality finds a bi-directional causality between FDI and environmental degradation. Theoretically, the effect of FDI on the environment can be either negative or positive. The literature is dominated with this adverse view of FDI on the environment i.e., rising part of the EKC. But, as discussed, the paper finds evidence of FDI contributing to a cleaner environment. Focusing on India, this claim is verified by finding evidence for the existence of a significant positive relationship between FDI inflows and the number of green patents filed in the 24 sectors as given in Patestate.com: CSIR database leading to reduced energy consumption through the use of new renewables.

3.3. MSMEs: Performance and Challenges

Challenges and Opportunities of Micro Small Medium Enterprises in India

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MSMEs are the engine that fuels global innovation, employment, and economic advancement. Despite their significant contributions, MSMEs face a number of challenges that may stymie their growth. These obstacles, which include limited access to funding and market constraints, as well as technological limits and regulatory barriers, may impede their potential to thrive. The study shows that no of skilled workers, firms registration, firms modernization, environment monitor, and type of enterprise have positive impact on the firm's output. On the other, MSMEs face several challenges comprising to accessing the credit, infrastructure, and informality. To solve these issues, a combination of enabling laws, capacity-building programmes, financial accessibility, and opportunities for skill development is required. Governments, business associations, banking institutions, and academic institutions may all help MSMEs overcome these obstacles and thrive in today's competitive business environment.

Technical efficiency of MSMEs in India: measurement and analysis of Determinants

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Micro, small and medium enterprise (MSME) sector is the backbone of the Indian economy and technical efficiency is a key indicator of firm performance. However, understanding the determinants of technical efficiency in these enterprises is essential for ensuring their sustainable growth. This study sheds light on the complex dynamics of technical efficiency and offers insights for policymakers and practitioners seeking to enhance the performance of MSMEs operating in the Indian manufacturing sector. Technical efficiency is measured using data envelopment analysis (DEA) and firm-specific characteristics are analyzed to investigate the determinants of technical efficiency. The results reveal compelling evidence of age, size, market concentration, debt capital, vertical integration, R&D, export and import orientation significantly affecting a firm's technical efficiency. In terms of ownership structure, private and domestic firms demonstrate superior performance compared to their counterparts. The analysis of firm location reveals interesting patterns as well. Moreover, high technology firms exhibit lower level of technical efficiency in comparison to low technology firms. Lastly, micro enterprises seem to be technically more efficient than small and medium firms. Thus, micro enterprises are not inherently inefficient.

Do Domestic Firms require more Financial Access than Foreign-owned Firms? Evidence from MSMEs across Developing Countries

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Limited accessibility to formal financing sources inhibits Micro, Small and Medium Enterprises (MSMEs) from investing in their operations, technology upgradation, and expansion of their market presence. Further increasing competitiveness due to globalisation and the 4th industrial revolution fuels the problem, making it difficult for MSMEs to survive. Unlike foreign-owned firms, financial accessibility is crucial for the sustained growth of capital-starved domestic firms. Given the lack of evidence, the study attempts to examine the impact of access to finance on the performance of MSMEs, particularly between domestic and foreign-owned firms. Using the World Bank Enterprise Survey (WBES) database and addressing the endogeneity issues, the study finds that access to finance significantly increases MSMEs' performance, particularly for domestic-owned firms, compared to foreign-owned firms. The study reiterates that developing countries must prioritise credit policy to improve domestic firms' competitiveness while addressing the financial constraints of MSMEs.

Credit Market Structures in India for Micro Enterprises: Issues and Challenges

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This study attempts to explore credit market structures in nine cities, Hyderabad, Telangana; Jaipur, Rajasthan; Kochi, Kerala; Ludhiana, Punjab; Mumbai, Maharashtra; Sehore, Madhya Pradesh; Surat, Gujarat; Tezpur, Assam; and Varanasi, Uttar Pradesh, using Enterprise Surveys of Micro firms (ESM), World Bank, which was collected between December 2021 and March 2022. From the empirical analysis, we found that micro firms, which have financial requirement, are largely dependent on informal sources, like friend, moneylender etc. for financing their day-to-day operations while reliance on formal sources, like banks, microfinance institutions are found to be

comparatively less. We found that about 37 per cent enterprises had sourced their funds from informal sources while about 18 per cent from formal sources. Further, we noted that only 20% of the micro-enterprises applied for credit or loans from formal sources while 80% did not apply for loan. Out of these 80%, almost half has had not any requirement for the loan; 16% found the application procedure complex; for 18%, the rate of interest was unfavourable; and the collateral requirement was a major issue for 8%. Therefore, for further improving the role of the formal sector in credit delivery, there is a need to simplify the application procedure for credit or loan requirements, exploring new channels for increasing awareness of government schemes among enterprises, and favourable interest rates, and minimize the role of collateral or collateral free credit, particular for the enterpriser having small requirement of loan. The awareness among the enterprises regarding government schemes found to be significantly low as only 14% of micro-enterprises reported to have benefited from government-sponsored schemes such as Pradhan Mantri Garib Kalyan Yojna (58% of 14%), Mudra (21%) and Emergency Credit line Guarantee scheme (12%). Furthermore, from binary logistic regression analysis, we found that education of the enterpriser, female owner, experience of the manager, size of the enterprise and age plays critical role in sourcing credit from formal sources i.e., banks and microfinance institutions.

Decomposing the Caste Divide in Formal Credit for Unorganised Enterprises: Insights from Indian Enterprise Surveys

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Globally, access to credit remains a significant policy issue. The present study examines the under-researched question of how caste influences access to formal credit for unorganised enterprises, with the objective of identifying potential barriers to their access over time. Using the nationally represented enterprises surveys on unincorporated non-agricultural enterprises (2010-11 and 2015-16), we estimate and decompose the credit differentials of unorganised enterprises owned by different castes groups in India. In this context, it analyses access to credit difference across caste groups and decompose the caste divide in formal credit market using the Blinder Oaxaca decomposition method. By employing probit and linear regression, we find a significant differential in formal credit between FC and other caste groups (SC/ST and OBC) both in terms of access and the amount of credit received over time. The mean decomposition results also find a significant credit differential between the FC and the other lower castes in India. This gap is largely explained by the endowment effects than the coefficients effects. The results revealed that about 85.11% of this gap between FC vs SC/ST and 84.62% between FC vs OBC in 2010-11 and 87.87% for FC vs SC/ST and 84.90% between FC vs OBC in 2015-16 was explained by the predictors included in our decomposition analysis. Among the overall explained effects, the predictors like registration, accounts maintained, workers, labour productivity and capital productivity are positively significant contributors towards the credit gap during 2010-11 to 2015-16. The remaining predictors are insignificant in our model. On the other hand, among the total unexplained effects, about 13.67% goes as unexplained between FC vs SC/ST, 16.26 between FC vs OBC in 2010-11 and about 11.51 % between FC vs SC/ST and 13.95% between FC vs OBC remains unexplained in 2015-16. It is apparent that the share of unexplained effects declined over time. In other words, it indicates that the share of discrimination going through by the SC/ST and OBC owned enterprises have declined over time. But the positive and significant effects of unexplained parts shows that they are remained more disadvantaged groups and experiencing discrimination when compared with the forward caste in India. Despite the declining gap and improvement in over the years, the considerable share of unexplained effects presumed that the lower castes are still facing persistent discrimination in the Indian credit market. The findings from this study imply that the affirmative action initiatives in India have yielded limited effects on enhancing credit market accessibility for entrepreneurs belonging to socially marginalized groups. In light of these results, policymakers are urged to address this pressing issue by introducing

targeted programs and regulatory incentives. Such measures would aim to stimulate increased lending from financial institutions to these disadvantaged groups, thereby fostering greater inclusivity and opportunities for advancement.

5.1. Trade, Technology, and Industrialisation

Why is Labour Receiving a Declining Share of Income in India? Role of Trade, Technology, and Market Share Reallocation

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This paper empirically analyses the trends and determinants of labor share – share of income accruing to labor - at the aggregate, industry and firm levels in India. The economy-wide labor share in India declined steadily during the period 1980-2006, before recovering slightly in the subsequent years. Standard shift-share decomposition exercise reveals that both ‘within’ and ‘between’ industry factors have played a role in driving the changes in aggregate labor share. However, the usual ‘within industry’ suspects like technological progress or exposure to international trade do not play any role in the decline of labour share. The ‘within industry’ decline is mainly driven by two sectors: real estate and construction, neither of which is particularly susceptible to the forces of technological change or trade. The ‘between industry’ component of labor share decline, on the other hand, is driven by the idiosyncratic nature of India’s structural transformation that has favoured the high skilled services and the capital-intensive manufacturing sectors, bypassing the traditional labour-intensive sectors. Using industry and firm level panel data, we econometrically investigate the factors that determine labor share. In particular, we analyze the role of import competition, technology related factors and intra-industry market share reallocation. We find that intra-industry market share reallocations towards capital and skill intensive firms tend to reduce labor share. The market share reallocation variable consistently show high negative coefficient with statistical significance across specifications. We use novel instrumental variables to identify the causal effect of import competition on labor share. The results show that import competition and participation in global value chains exert a positive effect on labor share. Labor share tend to decrease with an increase in R&D intensity. Overall, the results confirm that inter-industry as well as intra-industry resource reallocation toward capital and skill intensive industries and firms – an anomaly for a labor abundant country – explain much of the decline in labor share. In the Indian context, we do not find strong evidence in support of the hypotheses that new technologies and exposure to international trade lead to a decline in labor share.

Productivity, Investment Slowdown and Misallocation: Evidence from Indian Manufacturing

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Prior to the Global Financial Crisis (GFC), between 2003-2008, Indian Economy experienced an average growth rate of around 9 percent. Part of this high GDP growth rate was driven by high levels of investment in both manufacturing. However, it is widely argued that post-GFC, aggregate investment and productivity growth portrayed a declining trend. Using rich firm-level data of more than 12,725 firms over 2003-2015, this study attempts to identify factors responsible for the slowdown in gross investment and productivity post-GFC in the Indian manufacturing. Our analysis reveals that the decline in investment is more pronounced for firms with higher productivity. Further, we find evidence showing a slowdown in the flow of capital and labor from less productive to high productive firms. Theoretically, controlling for initial firm size, more productive firms should expand their capital and labor at a higher rate. However, post-GFC, evidence suggests that the relationship between firm productivity, investment, capital, and labor

growth has weakened. This indicates that part of the fall in investment can be attributed to a fall in allocative efficiency which is likely to have an impact on aggregate productivity and income as documented in the misallocation literature. Further, probing into the causes behind the slowdown in the relationship between firm productivity, investment, capital and labor growth, we find that financial constraints, age, size play a key role in investment slowdown. Finally, we show a counterfactual scenario, where we analyse the extent of extra output and aggregate productivity that could be generated in the absence of misallocation.

Assessment of Possible Economic Alignment between G20 Nations with Special Focus on India, G7 and G12: A General Equilibrium Analysis

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The paper will analyze the ex-ante effects of India's possible alignment with G20 countries. The study considers G7, G12, and G20 countries as separate blocks. The study analyzes India's bilateral tariff and non-tariff liberalization, free flow of factors of production, Global Value Chain (GVC) participation, output-oriented technological progress in manufacturing, transport, and communication and the introduction of shipping technology in India. The study considers liberalization in G7 standalone, G12 standalone, G20 standalone, and also G20 comprehensive liberalization. The study also considers India's bilateral standalone liberalization with G7, G12, and G20 countries separately using computable general equilibrium analysis with the help of the Global Trade Analysis Project (GTAP) 10 database. The overall results indicate that strengthening of GVC standalone in the G20 region may bring maximum welfare to the region. Further, the sectors which may gain the most seem to be grain crops, meat and meat products, textiles and apparel, etc., and in terms of factors of production, all other factors of production would gain but land and natural resources seem to lose in terms of real returns to factor of production. Addressing issues related to factor movements and policies strengthening global value chains can bring about relatively higher growth and welfare respectively in the G20 Nations as compared to other trade and industrial policies.

Understanding the Growth Dynamics of Investment and Rate of Profit in India's Organized Manufacturing Sector

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This study is carried out in the backdrop of severe crisis in investment in the Indian industry and manufacturing sectors, whereby Capital Formation has significantly slowed down in the second decade of twenty first century. The study adopts the theoretical approaches of heterodox schools of thought to understand the determinants of investment in the organized manufacturing sector in India. The study demonstrates the relationship between Rate of Profit and Investment rate. The study also reveals that the struggle between capital and labour is the most important determinant of investment in the long run. We also extend the analysis to various size classes of firms (Large, Medium and Small). Based on the analysis of empirical results and global scenario, we explore policy interventions, whereby we suggest for an "activist" State with greater involvement in public research, public investment, demand management, and labour welfare, for a sustained long term growth and investment in manufacturing.

Factor augmenting technology and elasticities of factor substitution in production structure: A study on Indian industries

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Elasticity of factor substitution measures the degree(ease) at which factors can be substituted when relative factor price changes. Factor augmenting technology refers to the adoption of a technology which is biased towards a particular factor (either capital or labour) irrespective of the change in relative factor prices. The empirical estimation of elasticity of factor substitution has far reaching implications towards economic growth, distribution of income and many other macroeconomic variables. The far reaching impact of elasticity of factor substitution on steady-state conditions and other results of convergence has been widely studied (e.g.Turnovsky (2002), Grandville (1989),Klump and Grandville (2000), Klump and Preissler (2000), Miyagiwa andPapageorgiou (2003, 2007)). In the Indian context,Golderet al. (2013) found that the estimated value of the elasticity for 2-digit manufacturing sector was less than unity for majority of the 2-digit industries between 1980-81 to 2006-07 and the technology adopted was mostly labour saving. In the literature there were large number of empirical papers which tried to estimate the elasticity of factor substitutions for Indian Manufacturing Sector (Banerjee (1971, 1973); Goldar (1986, 2012); Jha et.al (1991); Ahluwalia (1991); Virmani and Hasim (2009)).Using KLEMS production specification, we estimate the Allen-Uzawa (AES) elasticity of factor substitution between factors of production and check whether the adopted technologies for Indian industries were labour augmenting or capital augmenting. We use ASI concorded series of the industry database to estimate the production function.

5.2. Growth and Productivity in Indian Manufacturing

Trade Liberalisation and Productivity Growth in Indian Manufacturing Industry: Role of Resource Allocation and Catching-up

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This study examines the impact of trade liberalisation introduced in India since 1991 on the productivity growth of Indian manufacturing industry. The study focuses on the role of resource allocation and catching up of firms in driving aggregate productivity growth. The recent theoretical literature analysing the impact of trade liberalisation on productivity uses heterogeneous firms framework, in which firms have different levels of productivity. Trade liberalisation in these models increases aggregate productivity through resource allocation from less productive firms to more productive firms and this in turn increases the aggregate productivity. In these models, increased competition also forces firms occupying lower part of the productivity distribution to catch up with the best productivity firms. However, a close examination of the theoretical literature modelling the impact of increased competition through trade liberalisation on firms' incentive to invest in productivity enhancing activities shows that it depends on many firm-specific and industry specific features. Though the theoretical literature is inconclusive on the impact of increased competition on firms' incentive to invest in productivity enhancing activities, the literature elicit a number of firm-specific and industry-specific factors shaping the impact. The present study uses firm level panel data for the period 1992-93 to 2005-06 - a period during which foreign trade regime of India underwent significant liberalisation. Firm level productivity is estimated using a gross output production function. Unbiased estimation of the contribution of resource allocation to aggregate productivity requires addressing omitted price bias while estimating productivity. We use the recent methodology presented in Gandhi, Navarro, and Rivers (2020a) to estimate a gross output production function, which addresses both omitted price bias and simultaneity bias. The results of the study suggest that in a number of industries resource allocation to more productive firms

accounts for a significant share of productivity growth. The contribution of resource allocation to exporters was also found to be significant in driving aggregate productivity growth. The study also finds evidence for productivity catch up among firms. The results also show that the impact of import competition on productivity growth depends on the extent of concentration in the domestic market. Similarly, import competition also increases productivity growth of initially low productive firms if they are operating in a concentrated market.

Determinants Of Productivity Growth Of Manufacturing And Services Sectors Of The Indian Economy In The Wake Of Climate Change

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The study investigates the trends in the aggregate carbon emissions and their intensity along with the trends in productivity growth of the Indian economy both at the aggregate level as well as at the disaggregate level over the period 1990-2019. The study considers manufacturing and services sectors of the Indian economy for the analysis. The study finds that while carbon emissions have been rising exponentially, carbon emissions intensity has started falling over the period under study. The study further finds that productivity growth has shown impressive rise over the period 1990-2019 both at the aggregate level as well as for the manufacturing and the services sectors. The study then investigates the determinants of the aggregate productivity growth as well as the productivity growth of the manufacturing and services sectors using a comprehensive model of productivity growth considering various potential determinants viz., capital deepening, human capital, technological progress, macroeconomic variables like government size, openness, quality of institutions, other variables like cross-sectoral productivity growth and the climate change. Using econometric techniques of GMM, the results of the paper suggest that capital deepening, government size and climate change are the significant determinants of productivity growth of the aggregate economy as well as that of manufacturing and services sectors. Another key finding of the study is that climate change has a negative and significant impact on the productivity growth both at the aggregate level as well as disaggregate levels for the Indian economy over the period 1990-2019.

Bankruptcy Reform And Its Implication On The Economy: Evidence From A Quasi-Natural Experiment

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The study investigates the impact of bankruptcy reform on the bank's transformation risk. Using introduction of Insolvency and Bankruptcy Code (IBC) in 2016 as an exogenous shock and employing a difference-in-difference approach, we show that IBC has significantly increased the financial depth among states with high bank transformation risk (treated) compared to other states (control). The firms located in treated states are borrowing significantly more while having a lower cost of debt with respect to the firms located in control states. We document that private banks and healthy banks greatly benefited from the fall in transformation risk, highlighted by the increase in the supply of credit and profitability after introduction of IBC, compared to government-owned banks and unhealthy banks. Further exploration suggests that the IBC has relaxed entrepreneurs' financial constraints causing an increase in the real economic activities among treated states than those control states. Moreover, we find that the reform has significantly increased household income and reduced their reliance on the government-sponsored employment guarantee scheme. Our results are robust to a battery of tests on potential endogeneity concerns. Our study highlights the importance of a sound bankruptcy design to optimally balance the bargaining power of borrowers and lenders which essentially increases the pay-off of both parties during bankruptcy

proceedings. That, in turn, contributes significantly to the financial and economic development across states.

Ease of Doing Business and Firm Productivity - Evidence from Indian Industries and States

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The World Bank Ease of Doing Business (WB EoDB) index marks a significant contribution to the literature by initiating the analysis of business regulations across countries. However, multiple studies have argued that the EoDB parameters do not adequately capture the on-ground conditions and are not representative of the overall business environment (Ghosh, Saha, and Bhowmick, 2019). Given the paucity of work showing the nature of the business environment faced by Indian firms. Addressing the limitations of the WB index and bridging the literature gap, the present study attempts to explore the impact (enabler or deterrent) of business environment components on the productivity of Indian firms, where “ease” is interpreted in terms of the reduction “cost” of doing business, underlining the relevance of lower cost of doing business over better EoDB (Canare et al., 2019). In addition, we examine the heterogeneity in the findings across Indian states and industries and study the impact of country-level characteristics of the business environment on firm productivity. Against this backdrop, the study employs System GMM and uses novel data from the Ministry of Corporate Affairs’ XBRL database for the years 2012 – 2020. The overall findings suggest that more compliant firms report higher productivity and benefits from being part of the formal sector of the economy. Besides, the firm’s expenses on logistical requirements, harmonized with the existing state infrastructure could result in improved productive capacity. However, expenditures on basic utilities are found to hurt TFP, insinuating the existence of inefficiencies in the public services delivery system. The results more or less remain the same when the analysis is done at NIC 2-digit and separately done for certain states.

Output and Employment Growth Experiences of the Manufacturing Sector in India

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This paper analyses the growth performance of the manufacturing sector in India from 1973-74 to 2019-20 mainly in terms of output (GVAD) and employment. In doing so, a special attempt is made to realise the impact of the New Industrial Policy implemented since 2014-15 on the manufacturing sector and finds that the policy failed to favour the manufacturing sector particularly in promoting its growth in GVAD and employment among many other variables. The paper also recommends the government to take utmost care while implementing serious economic policies to ensure, protect and promote conducive economic atmosphere by which the manufacturing sector can thrive.

5.3. Towards Sustainability: Renewables, critical minerals and circular economy

Circularity of Critical Raw Materials: A Step Towards India’s Net-zero Targets 2070

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The energy sector in India contributes to about 70% of carbon emissions, followed by the transportation (14%) and construction (7.5%) sectors. The country is on a path towards accelerating the energy transition from coal to renewable energy sources, which will play a critical role in achieving the net-zero targets. In addition, the government is encouraging the transition from fossil fuel-based transport systems to electric vehicles. Critical raw materials (CRMs) are needed in abundance to ensure green technology adoption in energy as well as transportation sectors. Thus, the availability and sustainable management of CRMs and identification of their

substitutes are important factors that can facilitate this transition. In this study, the criticality of raw materials was measured by applying a statistical rank methodology by minimising different factors associated with its availability. Further, the supply–demand scenario with the resistive adoption of circular economy in green technology was explored. CRMs are the current and future fuel that could either accelerate or decelerate the country’s economic growth while transitioning from conventional sources of energy to green energy. In particular, the rate of adoption of solar, wind, and hydrogen sources as well as electric vehicles largely depends on the availability of CRMs used in these applications. This report highlights the criticality of raw materials in the Indian demography to determine potential ways for minimising the supply–demand mismatch and to support the application of circular economy at the beginning of the life cycle of a material. Several challenges are associated with the supply of CRMs, among which import dependency is a major setback for India.

Sustainability and Green Industrialization: A case of Indian Solar PV (Photovoltaic) Technological Innovation System

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The study attempts to analyse Indian solar PV (photovoltaic) technological innovation system and knowledge production in its innovation dynamics. The Indian PV industry has become one of the frontrunners in the renewable energy sector with consistently increasing the generation of power. The study relies on both primary and secondary data. It adopts technological innovation system framework to understand the crucial role, interplay of the various actors and institutions, the nature of the linkages and the knowledge production from various actors and to see the several key functions in the Indian PV technological innovation system (TIS). Analyzing these key functions will help in identifying the inducement and blocking mechanisms and to see the future directions pertaining to PV technological innovation system in the country. The study has found that entrepreneurs carry out many activities that perform a major impact. Processes related to knowledge development are found to be stable. At the same time, there is a large fluctuation in the processes related to market formation and guidance of the search. The number of research publications and patents has increased after the introduction of the National Solar Mission. Though the country is far behind others regarding investment in solar research and development (R&D). Inconsistent regulations, unpredictable behaviour of the government and the lack of a clear vision for the technology are the key barriers in the technological innovation system.

A Global Assessment of Green Hydrogen Value Chain: Synthesizing Policy Learnings

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The transition towards sustainable energy systems has been gaining momentum in recent years, with green hydrogen emerging as a key component in the transition. It has picked up global momentum for a path towards low carbon planetary future and has been set on an unprecedented innovation front from 2008 onwards. As a renewable energy carrier, green hydrogen has the potential to replace fossil fuels in various sectors, such as transportation, chemical, and industry, and contribute towards decarbonization. However, the development of the green hydrogen value chain faces significant challenges such as high capital cost, limited infrastructure, lack of policy and regulatory framework, and demand gaps. In order to address these challenges and facilitate a smoother transition toward a green hydrogen economy, this study aims to address two sets of questions. First is to identify and understand the leading players in the green hydrogen value chain, particularly in the upstream and midstream segments through a comprehensive mapping of the value chain and secondly synthesize and curate policy lessons as an indicator for good practices in the current value chain. The study conducted a global mapping exercise and identified several countries that are leading the development of the green hydrogen value chain. The research

utilised datasets on patents, exports, and IEA Hydrogen Project to rank countries in various segments of the value chain. Europe emerged as the leader with over 30% of the proposed projects. China holds leading position in exports and patent landscape for all the value chain segments. Moreover, countries who are mining the earth minerals are not the one who are exporting it indicating a strategic and dedicated processing base for raw minerals in countries like China, the USA. Furthermore, the study developed a matrix, an extension of the mapping exercise through a ranking-based system. It is based on the export vs. patent landscape and identifies the leading countries in both parameters. The analysis identified seven distinct policy learnings across three themes: legal & regulatory, financial mechanisms, and technology and innovation. These global learnings can be applied by nascent economies, in the early stages of developing or transitioning to a hydrogen economy. The present paper serves to furnish an overview of the global nature of the green hydrogen value chain, delineate the countries that wield substantial positions, and explicate the factors that enabled them to achieve such prominence. Those factors then translated into well-informed policy learnings rationalized through country-level case studies.

Nudging Circular Economy in Indian Industry: An Evaluation using ICRIER 'Sampada' WSUT Model

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Sustainable consumption choices and achieving a circular economy are important to Mission LiFe (Lifestyle for Environment). This paper looks at the potential impact of industries' sustainable consumption patterns on the waste 'reduced, reused and recycled' by the sector. Sustainable consumption patterns, in this case, are expected to not only augment the resources available for production processes but also reduce the environmental load from waste disposal. Higher economic activity through waste management has a virtuous impact on the economy (via the multiplier) and the environment. Using the ICRIER Sampada Waste Supply-Use Model (WSUT) 2018-19 for India, this paper looks at the waste generation, treatment technology, and costs for 37 sectors of the Indian economy. The model covers five different waste streams- biodegradable municipal solid waste (MSW), non-biodegradable MSW, biomedical waste, hazardous waste, and plastic waste- and five treatment technologies- composting, incineration, material recovery, waste to energy, and landfill; to provide a comprehensive overview of waste management in India. Focusing on waste flows from 15 industries, the paper provided information on industrial waste generation by different types, the extent of waste recycled by industries, and costs for various treatment technologies. Using the WSUT, it explores the potential impact of recycling and sustainable consumption, and makes the case for nudging circular economy practices in the Indian industry.

Trends And Patterns Of Zed Certified Msmes: A Sectoral And States Level Analysis

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Zero Defect Zero Effect (ZED) is an initiative launched by the Government of India with the objective of promoting quality manufacturing practices and sustainable industrial development among MSMEs. ZED focuses on eliminating defects in products and processes while minimizing the environmental impact of industries. It emphasizes the principles of efficiency, waste reduction, and continuous improvement. In the context of India, ZED is particularly important as the country is one of the world's fastest-growing economies and has a significant manufacturing sector. The initiative aims to enhance the competitiveness of Indian industries, both domestically and globally, by fostering a culture of quality consciousness and environmental responsibility. This research aims to examine the distribution of Zero Defect Zero Effect (ZED) firms across different states and sectors in India. By analyzing available data, the study will provide insights into the number of

ZED-certified firms in each state and sector. Additionally, it will explore the factors contributing to variations in ZED firm numbers with respect to states and sectors through the lens of various state-level policy initiatives and support. The findings address key insights for policymakers and stakeholders to identify strengths, weaknesses, and opportunities for promoting ZED practices in specific regions and industries.

7.1. FDI, Trade and Global Value Chains

Revitalizing Global Value Chains through Sectoral Trade Agreements: Insights from CGE Analysis for Automobile Industry

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Free Trade Agreements (FTA) are expected to promote trade in general and enable a country to join a GVC. Yet in reality FTAs have rarely enabled a country to join a GVC due to presence of low preference utilization rate, stricter Rules of Origin (RoO), exclusion of sensitive sectors etc. And now, COVID-19 pandemic has caused further disruptions to GVC. We propose an alternative called 'Sectoral Trade Agreement (STA)', which is an FTA confined to a particular industry among all the major producer countries of all parts and components for that industry. Our CGE based results show that almost each country involved in STA gains in allocative efficiency. Even non-STA country gains in terms of output and/or export in certain sectors. India registers the highest 78% growth in exports of Automobiles whereas its output and domestic sales go down in this sector but in other sectors like Services, Electronics etc. its output expands. Minus extraction sector, India's aggregate output is higher in STA in comparison to FTAs. A comparative analysis between bilateral FTAs and STA shows higher aggregate welfare for bloc in STA. Hence, the STA design may bypass RoO, sensitive sectors and boost utilization rate. STA overrides the major criticism of FTA of being discriminatory against non-partners as in STA, non-partners also gain in a way through global value chains.

The Impact of Foreign Direct Investment on Global Value Chain Participation in High Technology Industries: An Empirical Analysis of India and G20 Economies

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International trade in intermediary commodities has grown exponentially in recent decades, and it is a change significant enough to influence the growth trajectory of world nations. India is seen as a potential frontrunner to replace China as the global offshore manufacturing leader. As the spillover benefits across the Global Value Chains (GVCs) are spread unevenly, the positioning and intensity of participation dictate how well a nation can perform in this trade network. Industries characterized by a substantial allocation of resources towards research and development (R&D) are commonly categorized as high-technology industries, and such sectors are associated with a higher level of value-added activities in comparison to other sectors. Here Foreign Direct Investments (FDIs) play a pivotal role in shaping the structure and intensity of value chain networks. Using the OECD Trade in Value added (TiVa) dataset spanning 1995–2020, this paper tries to identify the comparative role of FDI in driving Backward and Forward GVC participation in High Technology Manufacturing Industries between India and G20 nations. In order to comprehensively analyze the positioning of GVC participation across the different stages of production linkages, this paper incorporates the GVC positioning index, which provides valuable insights into the distribution and role of countries in the overall value chain network. Additionally, the study incorporates the Revealed Comparative Advantage (RCA) framework to assess and compare the comparative competitive advantage of nations in high-technology industries. We also use Panel Data modeling techniques to capture the role of FDI in influencing GVC

participation. This approach enables a comprehensive analysis of the interplay between FDI inflows, GVC dynamics, and comparative advantage within the high-technology sector. The results show that Research and Development expenditure is crucial to moving up along GVCs as well as increasing the participation intensity.

Do Foreign Trade Agreements Facilitate Global Value Chain Participation? – Evidence from India

Saon Ray

ICRIER

While assessing the impact of trade agreements across countries, little attention has been paid to understanding its role in facilitating global value chain participation. The present paper examines whether preferential agreements have facilitated India's participation in the global value chain using a panel dataset for India and its 61 partner countries over the period 1995-2018. The paper uses a fixed-effect model and observes that trade agreements have facilitated India's backward linkage i.e., refers to the ratio of the foreign value-added content of exports to the economy's total gross exports, by 15%. Contrastingly, there is no statistically significant evidence of increasing India's forward linkage i.e., the ratio of the domestic value-added sent to third economies to the economy's total gross exports. While assessing the impact of trade agreements on forward vs. backward linkage the paper has controlled for other gravity-model variables like the size of the partner countries, openness to trade, entry cost, and distance by using the CEPII databases. The paper uses the OECD TIVA database to assess India's global value chain participation.

Innovation Dynamics in Emerging Economies: An Empirical Study of Global Value Chains and Indian Manufacturing Industries

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Global Value Chain (GVC) is a phenomenon of fragmented production in which the production process is broken down into numerous activities carried out by multiple firms located in different countries. In other words, through GVC participation, firms specialise in a particular activity, and multiple firms across countries coordinate to produce a product in contrast to the traditional way of producing a whole product. The impact of GVC participation on developing countries' innovation is not clear yet. This study aims to examine the relationship between GVC embeddedness (participation and position) and innovation performance in India. To achieve our objective, we use data from various sources, including TIVA (Trade in Value Added) database of OECD, the latest edition 2021 for measuring GVC Participation and the Position, and Industry Outlook database of CMIE and EPWRF India Time Series for measuring different control variables. The international industry classification was matched with the Indian industry classification with the help of NIC (National Industries Classification) 2008. We measured innovation performance by the number of patent applications filed under PCT (Patent Cooperation Treaty). The study covers the period from 2009-2018, belonging to 14 Indian manufacturing industries comprising 140 industries level observations. To account for the endogeneity issue arising from reverse causality between GVC participation and innovation performance, the study employs a Two-step System GMM (Generalised Method of Moments), a dynamic panel data model for empirical estimation. To the best of our knowledge, this is the first attempt to empirically examine the impact of GVC participation and position separately on the innovation performance of Indian manufacturing industries. Empirical results show that GVC participation and position both significantly and positively affect innovation performance. However, GVC Participation has an Inverted-U-shaped impact on innovation performance. This Inverted-U-shaped relationship shows that the manufacturing industry within the developing countries can escalate Innovation by participating in GVC initially but up to a specific limit only; after that, GVC participation alone cannot enhance innovation, as developing countries are stuck at the lower end of the smile curve of GVC. We further contribute to the existing literature by splitting the GVC participation into Forward and

Backward participation and examining the effect of both independently on innovation performance. A striking result is that only forward GVC participation significantly impacts innovation, not Backward GVC participation. It may be due to the reason that countries' linkage through backward participation is only in low value-added activities like assembling and processing products. They are stuck in the middle-income trap by the developed countries and cannot absorb new technology. These findings propose to the policymakers that emerging countries should focus more on improving their GVC position through increased R&D expenditures instead of merely depending on excessive GVC participation for enhancing innovation. Furthermore, the focus should be on increasing Forward GVC participation instead of Backward participation, as the latter does not have a significant impact on innovation.

Private And Social Welfare Implications of Buyer Power and Vertical Mergers in Supply Chain Competition

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This paper studies how the buyer power of downstream firms can affect the market outcomes in both upstream manufacture and downstream retail markets. In a two-tier oligopoly, where upstream firms are locked in pair-wise exclusive relationship with their downstream retailers, we study choice of firms between vertical merger and Downstream First Mover Pricing regimes. On working with three cases of no vertical merger, single chain vertical merger and double chain vertical merger we find that upstream firm and downstream firm prefers vertical integration over Downstream First Mover Pricing only when products are more differentiated. For both single and double chain merger, elimination of double marginalization is pro-competitive.

7.2. Industrial Structure and Employment Issues

Whither India's SHG-led Enterprises? Status and Bottlenecks of Developing NRLM SHGs into Business Enterprises

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The Deendayal Upadhyay Antyodaya-National Rural Livelihood Mission (DAY-NRLM) – which with approximately 83 lac SHGs (27% pre-NRLM) with a registration of more than nine crore women is the largest of any membership-based organization of the poor. With this massive outreach and near saturation of membership, sustainability and future growth are major questions in front of the NRLM. Will the emergence and evolution of women's collectives in India further develop and mature into viable businesses that will bring women as mainstream participants of economy and polity? With this background this paper analyses the status of SHGs under the NRLM program in terms of membership, fund disbursement, financial health and enterprise development using secondary data from the NRLM analytical reports published in program website, as well as other official datasets such as Mission Antyodaya and NITI Ayog's MDPI report. Secondary data and primary study results were used to examine the status of the mission's performance indicators as well as the challenges. Combining the NRLM data with state-level development indicators obtained from secondary sources multi-variate analyses are also employed to identify the drivers and bottlenecks of the NRLM's performance in enterprise creation and development. Primary qualitative study results were used to reflect on the local challenges of enterprise development. Univariate results revealed that more than 6.7 lacs enterprises are established through NRLM. However, further examination shows that these SHG-owned or SHG-led businesses are restricted in sectors such as food, basic value chain development in farm, arts and craft material, with low value products in non-farm. The enterprises face risk from saturated market, incomplete or broken value chain development and lack of a transparent and fair pricing

system within small enterprises. Results recommend that for a viable development of SHG-led enterprise, policy for holistic development should be designed as the success of enterprises depends on multiple micro and macro development factors – some of which are outside of NRLM's domain.

Scenario of Employment Creation under Pradhan Mantri Employment Generation Programme: A Zonal Study of India

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Since independence, the Indian economy has dealt with the problem of unemployment, and to curb this situation, the government of India has initiated many employment-generating schemes so that micro, small, and medium enterprises (MSMEs) can flourish without any hurdles. Employment generation and motivating people to create self-employment opportunities are features of inclusive and sustainable growth in an economy. MSME plays a significant role in determining the future of any developing economy because it generates employment, increases output, and contributes to the expansion of the country's exports. It ensures a more equitable distribution of national wealth. MSME has the potential to create a large number of employment opportunities with a low level of investment. It reduces the gap between developed and underdeveloped economies. Setting up industries, especially in rural areas, helps in eradicating the problem of poverty and minimises regional imbalances in the country. As we all know that the resources are scarce and we have to use it in a better way to extract more from it. The scarce resources can be underutilised or over utilised if the human resource factor are not managed properly. The objective of development project is to achieve the highest economic growth in a country by proper utilization of its human resource. The only factor which helps an economy to grow is industrialization. Industrialization is the only way to achieve social and economic development of the society by bringing all the factors together and use it in a more productive way. The PMEGP scheme was one of the schemes introduced by the government of India in 2008 for creating jobs by providing margin money (subsidy) to entrepreneurs, helping them to establish their units, and creating self-employment opportunities for many more. The PMEGP scheme is a merger of two schemes. The amalgamation of the Prime Minister Rozgar Yojana (PMRY) and the Rural Employment Generation Programme (REGP) resulted in the PMEGP programme on March 31, 2008. This paper aims to study the impact of the number of units assisted and margin money subsidies utilized on the estimated employment generation under PMEGP during 2009–2021 across six different zones of India i.e., central, north, north-east, east, south, west. The study is based on panel data models. The results show that the impact of the number of units assisted on job creation was positive and significant from 2009–10 to 2021–22. But margin money shows a negative and highly insignificant impact on employment generation from 2009–2010 to 2014–15 and a positive and significant impact on creating employment opportunities from 2015–2021. The overall impact of the margin money subsidy for 13 years is positive but statistically insignificant. On the basis of the present study, it can be seen that there is a massive growth that can be witnessed after the COVID-19 wave. The percentage growth of margin money disbursed, number of units assisted, and employment creation in 2021–22 is 165 percent, 114 percent, and 131 percent, respectively, since 2014–15

Keywords- PMEGP, Margin money subsidy, number of units assisted, employment opportunities created, entrepreneurs, MSMEs

Trend and Pattern of Deindustrialization of Sugar Industry in Bihar: A Regional Imbalance

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The paper aims to understand the trend and pattern of the deindustrialization of the sugar industry in Bihar and its impacts on Bihar's backwardness from regional imbalance dimensions. De-industrialization is the decline of manufacturing in an economy due to a lack of investment in

manufacturing, the shutting of factories, layoffs, an adverse balance of trade, etc. In the context of Bihar, it found that—since post reforms period more than 19 sugar industries have been shut down. This might have not only affected the employment and output in the state but due to such a massive shutdown of sugar industries (19 out of 28, 67 %), it might have deteriorated the state positions at the all-India level, which not only induces regional imbalances in the country but the same is now found within the state as well. This is a major concern in a backward state like Bihar. Therefore, the major objective of this paper is to understand the process of the deindustrialization of the sugar industry (one of the important Agro-based industries of Bihar) in the state and became the victim of regional imbalance. The trend and pattern data analysis has been collected from the Indian Council of Agriculture Research -Coimbatore data (from 1950-2019) and the current data is updated from the Department of Sugar Industry, Bihar. The study revealed a wide range of imbalances has been found in the Sugar Industry of Bihar after the post-reform period. At the time of Independence Bihar's sugar factories contribute 20% and at present its contribution is only 2% of the Indian Economy. The Sugar Industry has both forward and backward linkages (multiplier effect) and generates employment for millions of farmers and workers in Bihar. Because manufacturing sector strongly links with so many sectors for their final output which enhance the economic activity across the economy. When an industry grows its output, it creates more demand and creates job and investment opportunities in all other sectors like transportation, construction, retail, etc. The shutting down of such large manufacturing industries depresses the employment opportunity for workers who are employed in these industries. The closure of such industry not only hampered the worker's and farmers' livelihoods but it's also physically damaged the heavy machinery in which plants invest lots of money. It is a matter of grave concern as various billions of rupees are locked up in many closed sugar industries. The decline of such industry makes the state more backward and increases regional imbalances.

Effect of Enforcement of Labour Regulations on the Provision of On-The-Job Training by firms

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This paper investigates the effect of employment protection regulations on the provision of 'on-the-job training' by firms across the developing world. It uses firm-level data from 65 countries collected by the World Bank's Enterprise Survey during the period of 2015–19. Our findings show that there is a significant and positive relation between incidence of job training and differential impact of labour regulations. Enforcement makes a huge difference on incidence of job training. These findings are robust across multiple specifications and standard errors are clustered at country level.

7.3. Sectoral Dimensions of Manufacturing

Indian pharmaceutical industry: Trade and competitiveness

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India emerged as one of the fast-growing pharmaceutical industries in the world with expanding exports and trade surpluses. It captures a significant global market share due to the patent regime. Trade-Related Aspects of Intellectual Property Rights (TRIPS) is considered an emerging point in the history of the Indian pharmaceutical industry. The agreement on TRIPS was introduced in India with special changes, the reintroduction of the product patents and an extension of the patent period from 7 years to 20 years. However, the obligations to implement the agreement of TRIPS changed the conditions of the Indian pharmaceutical industry. The reintroduction of the product patent regime provides some flexibility for domestic firms to make generic drugs cheaply through a reverse engineering process. This aspect of having skills in producing off-patent drugs at low

cost contributes to India becoming a pharmacy of the world. India experiences the twelfth position among exporters worldwide. Its share of India is 10 percent in the global market, supplying COVID drugs to more than 100 countries at affordable prices. Thus, it is imperative to investigate the India trade competitiveness with other developed countries and the performance of Indian pharmaceutical industry. The objective of the paper is analysing the India therapeutic segment trade competitiveness with top exporting countries. The paper further analyses the India pharmaceutical industry trade competitiveness and its export import analysis. This paper highlights the TRIPS regime's impact on the Indian pharmaceutical industry and analyses the Indian pharmaceutical industry's export competitiveness post-TRIPS and during COVID-19. The current study intended to measure comparative advantages and disadvantages in terms of therapeutic segments using Revealed Comparative Advantage (RCA) index. The entire assessment has been based on secondary data covering the period 2000 to 2022. The study found that India became more competitive post-TRIPS and patents significantly influenced exports. Further, comparative analyses with top exporting countries revealed that India is trade competitive than the USA and like Germany, however India is less competitive than Belgium, Switzerland, and Ireland. India is an emerging country and the strongest competitor for both developed and developing countries. The paper further showed that Indian pharmaceutical industry has favourable trade balance, and within its therapeutic segment is more competitive than overall sector.

Investment Pattern and Sources of Finance in the Handloom and Power loom Units in Uttar Pradesh

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In India, weaving units are largely unregistered, run in kachcha or semi-pakka premises, and are concentrated mainly in rural areas. This study examines the investment patterns and sources of finance in weaving units, separately in registered and unregistered units, to identify ways to improve their capital base and augment productivity. The analysis is based on a primary survey of 303 micro and small handlooms and powerlooms in the Varanasi district of Uttar Pradesh undertaken in 2019. Major findings indicate that the investment per unit in plants and machinery is significantly lower in unregistered units than in registered units. Large differences were also observed in these units as per their rural and urban locations, showing a much lower investment and productivity in the former. Most of the weavers, particularly in rural areas, reported that they wish to make investments, but financial constraints are major constraints. All the surveyed units in urban areas availed institutional loans, whereas in rural areas, approximately 74 percent of the units had borrowed from banks, cooperatives, and other formal sources. The results obtained from the 2SLS regression confirm that investment in handloom and power loom enterprises significantly depends on institutional finance, household income, backward production linkages with agriculture, availability of electricity, and local markets. Weavers face a high rate of interest, lengthy documentation, and procedures as major factors dissuading them from applying for institutional loans. Logistic regression shows that weavers' access to institutional loans depends largely on their registration status, size, and age of the unit, location, owners' education, and income. It is suggested to set up a network of sources of finance, whereby the concerned agencies can provide loans at a decent rate of interest to weavers with easy documentation procedures. Raising the awareness of loan procedures and government incentives among weavers should also be initiated. For this, it is important for all weavers to register their units with state agencies.

India's Capital Goods Sector: An Evaluation of the Domestic Value Addition Performances

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The paper evaluates domestic value addition performance of the Indian capital goods sector from 1980 to 2016. We find a declining trend in the domestic value-added per unit of output across all capital goods sub-sectors. However, the decline in value-added plays out unevenly across subsectors. An analysis of the nature and pattern of integration of the Indian capital goods sector into GVCs shows that the domestic value-added content of capital goods exports has decreased over time while foreign value-added content has risen. All subsectors of capital goods saw a decline in net value-added gains from integrating into the global value chain. Contrary to the Indian capital goods sector's experience, the foreign value-added content in China's capital goods exports has been declining, and post-2007 onwards, the domestic value-added content has increased. The declining domestic value addition per unit of output and the rising backward linkage led integration suggests the lack of focus on value-added processes in domestic production structure development in India while integrating to GVCs. We argue that India's capital goods sector needs to focus on value-added processes and keep pace with technological change to increase domestic value addition and thereby derive gains from global value chain participation.

Medical Devices industry in India- What India manufactures?

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Medical devices are becoming increasingly important in the treatment process apart from drugs and pharmaceuticals. This is primarily because devices unlike pharmaceuticals, are not only therapeutic but are also used for diagnosis and monitoring. With there being a rise in the burden of non-communicable diseases in recent times, diagnosis and monitoring for disease management assumes critical importance. The medical devices industry is characterized by wide product heterogeneity- everything from a simple needle to a much more complex cardiac stent is considered as a medical device. Products can be classified into different groups based on their purpose of use - disposables, surgicals, therapeutics, diagnostics, implants and furniture. High value low volume devices like, implants (eg. cardiac stents), diagnostics (eg. MRI or CT scanners) and therapeutic products rank higher in technological classification than low value high volume disposables (eg. syringes and needles) and surgical products. Import dependence on high value technology intensive devices can reduce the accessibility of the same amongst the masses, making the need for local manufacture very crucial. Hence, the need arises to understand the product composition and structure of the local medical devices industry in India, along with an understanding of India's international trade in medical devices. This paper makes an attempt at studying the structure and product composition of the medical devices manufacturing industry in India. The main aim is to understand the type of products that the local industry is manufacturing and those for which India remains highly import dependent. The paper also tries to understand the regional composition and the importance of intra-industry trade in medical devices for India. The analysis is primarily based on secondary data sources. The Annual Survey of Industries (ASI) dataset is used for data on domestic manufacture while international trade data following HS classification is taken from the UN Comtrade database. Data is used at the most disaggregated NIC and HS codes levels. These two datasets have different years of data revision. Hence to avoid problems of data concordance, we use ASI data for the period 1999-2000 to 2018-19 and UN Comtrade data for the period 2003-2021. The paper finds that the local medical devices manufacturing industry in India comprises mainly of small firms and is at a very nascent stage. It also finds that the local industry is primarily concentrated in the manufacture of low value low technology products like disposables and surgicals. International trade data shows how India remains highly dependent on imports for her needs of high value technology intensive devices like diagnostics, implants and therapeutics, suggesting a possible need for targeted policy interference

to enhance affordability of quality healthcare through reduced import dependence and increased local manufacture. Further, the paper finds that India's trade in medical devices is highly concentrated regionally, with India importing most of her devices from the USA. It also shows how intra industry trade plays a very important role in India's total medical devices trade.

The Impact of Closed Mills over the Indian Economy

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The textile and clothing sector is a vital component of India's economy. In terms of textile and apparel exports, India ranks as the third largest exporter globally. Apart from its economic significance, the textile sector in countries like India plays a crucial role in providing employment opportunities on a large scale, contributing significantly to inclusive growth. This sector is largely informal and spread across rural and backward areas with a significant proportion of workers being women. The majority of textile units are unorganized, with no labor rules, labor unions, or social security regulations in place for the workers. The present paper is thus trying to analyze impact of closed mills on the export and import of textile industry. Further it also considers principal characteristics of textile industry and over the period 1989-90 to 2018-19, how these principal characteristics changes.

9.1. Technology and Innovation

Innovation System, Value Added Trap and Developing Economies: Examining a Traditional Manufacturing Cluster from India

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The paper explores the relationship between innovation systems (IS) and participation in value chains (VC) to understand the challenges concerning upgrading of an industrial cluster in a developing country. It is argued that the inter-linkages of various actors, organizations and institutions at one or more levels (MLs)- micro level (local), meso level (national) and macro level (global) led the firms in the industrial cluster to participate in one or more VCs- local value chains, regional value chains and global value chains, upgrading the cluster over time, which we termed as 'Cluster Upgrading System' (CUS). In this context, a case of one of the oldest industrial cluster producing sports goods in Jalandhar, India is examined. The analysis is based upon the information gathered through primary survey of 45 firms. It was found that the cluster is largely labour intensive in nature and is facing challenges of competing with both low-cost clusters and technological advanced clusters, raising fear of it being slipping into low value added trap. We found lack of inter-linkages amongst firms, and their relationship with training and financial institutes that hampers mutual learning for upgrading the whole cluster implying for some necessary policy implications.

ICT adoption and factor productivity of manufacturing firms in India

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This paper characterises the effect of information and communication technology (ICT) adoption on factor productivity of Indian manufacturing firms during 2010-19. The study focuses on self-selection and endogenous impact of ICT adoption on capital-labour productivity and discusses policy strategies to capture untapped growth opportunities. We find that, ICT adopters have greater stakes for survival and growth, have larger proportion of tangible assets, and are intensively into exporting and outreach. In addition, ICT adoption leads to a 155 percent growth in

capital productivity, 62 percent fall in labour productivity – leading to a net growth of 80 percent in capital-labour productivity ratio.

Does Import Competition Spur Firms' Innovation Behavior: Evidence From Indian Manufacturing *Hariom & Ruchi Sharma*

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The relationship between innovation, productivity and trade is the focus of considerable scholarly works based on data from developed as well developing economies. In India, the trade liberalization episode provides an interesting context for empirically estimating the causal impact of trade openness and its ensuing impact on competition and productivity growth through innovation. The existing studies use different data sources, and methodology for calculating TFP (output method and value-added method) along with single and double deflation approach. These variations have translated into contradictory outcomes. Also, few studies have reported conceptual inaccuracy based on the underestimation of capital stock, adverse agricultural growth, water in tariff and, shorter period of analysis as the reason behind the differences in the results. Moreover, the rich literature under this umbrella has only used input and output tariffs as a measures of import competition and a few have used effective rates of protection (ERP). In addition, there is a lot more focus on TFP with lesser analysis of possible channels for instance increase in competition leading to productivity growth. As theoretical literature espouses, transition from trade shocks to productivity growth could not be possible without innovation. Thus, in the present study, we analyzed the impact of ERP on innovation (research and development (R&D) expenditure). By employing the panel data estimation tools, particularly dynamic panel models and panel quantile regression, this study finds a positive relationship between R&D expenditure and industrial imports at NIC-4 -digit levels. And confirms the negative relationship between different measures of tariff and R&D expenditure of a firm.

Zombie Firms and their impact on Innovation: An Industry-level Empirical Analysis of the Indian Economy

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In this study, we analyze a sample of non-financial firms in India from 2002 to 2019 to identify zombie firms, explore their prevalence during the sample period, and assess their impact on industry-wide innovation. Using fixed effects within-group and quantile regression analysis over 18 years and 23 industries, we evaluate how the presence of zombie firms affects an industry's research and development expenditures, serving as a proxy for innovation. Before 2010, we find a negative relationship, indicating that markets with a higher proportion of zombie firms tend to have lower R&D expenditures. This trend persists for R&D-wise matured markets post-2010, following the introduction of the R&D tax credit scheme. However, this relationship shifts to positive for less mature markets, suggesting that the implementation of the scheme notably influenced these markets. The results shed light on the detrimental impact of zombie firms on innovation and contribute to a deeper understanding of broader macroeconomic dynamics in India. Our findings emphasize the need for policymakers to address the challenges posed by zombie firms to foster sustainable economic growth and promote innovation in the Indian market.

Does FDI Spillovers Generate Innovation? The Catalytical Role of R&D Intensity and Geographical Cluster

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Using firm-level data from 347 Indian patenting manufacturing firms, the present study finds that foreign direct investments do not have any significant intra-industry or inter-industry spillover effects on the technology innovation of the Indian knowledge-creating manufacturing firms. The

analysis also negates the possibility of any cluster-specific FDI spillovers significantly affecting the innovation output of the firms. The findings explicitly recognise the importance of internal capacity building through research spending in absorbing foreign technology and learning from foreign technological know-how. Furthermore, the empirical findings confirm that exporting firms positively affect the innovation output of local firms via intra-industry linkages. In contrast, the exporting firms adversely impact the innovation output of the firms via inter-industry spillovers. The paper also confirms the labour-intensive nature of innovation in the Indian subcontinent.

9.2. OFDI, Government Support and Firm Performance

Covid-19, Government Support And Firm Productivity: A Tale Of Two Industries

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Despite its prominent role in the global economy, the Micro, Small, and Medium Enterprise (MSME) sector often faces challenges to its survival and growth. The COVID-19 pandemic compounded their problems. This study probes the role of Indian government support and digitalisation in mitigating the challenges caused due to COVID-19. To see the role, the study focuses on firms in two key industries, namely, Pharmaceuticals and Textiles, from 2010 to 2022. Akerberg–Caves–Frazer method is used to analyse the productivity performance of firms. To understand the effect of COVID-19, we subdivided the study period into pre-COVID (2010-2019) and COVID period (2020-2022). Results show that the average productivity has declined during the COVID period in both industries. The decline, however, is more in textiles (3.5%) than in the pharma industry (2.4%). We also find productivity decline across all size classes. Subsequently, we examined the role of digitalisation and credit support on firm productivity after accounting for firm characteristics. Our econometric analysis does not provide convincing evidence of digitalisation and government policy in improving productivity of MSMEs. The significant heterogeneity in firm responses to pandemic-led shocks suggests that a one-size-fits-all solution is neither practical nor prudent in addressing the issues faced by firms following the COVID pandemic.

Economic Upgrading of Firms: A Study of the Indian Textile and Clothing Industry

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Though India is one of the major exporters in the global Textile and Clothing (T & C) market, it has been experiencing a decline in its competitive edge. It is experiencing cost competitiveness due to abundant supply of cheap labours as it is engaged with more labour intensive, less value-added activities within the T&C value chain. But developing countries with similar cost advantages have outperformed India in this sector. This situation highlights the necessity for Indian T&C firms to compete on the basis of non-price factors. Thus, entering into Global Value Chain (GVC) is not sufficient. Reaping the benefit in terms of achieving economic upgrading is also necessary. This study empirically examines the economic upgrading process of the T&C firms by estimating the firm productivity and profitability. At the outset, the study examines whether firms with high levels of productivity and profitability are engaging in the Global Value Chain (GVC). Subsequently, it investigates to what extent GVC linkages can contribute to improving the productivity and profitability of Indian textile and clothing (T&C) firms. It has also captured the GVC linkages through backward and forward linkages of the firms. Two-stage empirical strategy of propensity score matching and system generalized method of moments (PSM - GMM) is used here. And it employs PROWESS database for the time period 2000 – 2019. . The study reveals that more

profitable and productive firms are engaged with the GVC. However, GVC participation of a firm positively impacts the productivity of it only if it is engaged to value chain through forward linkages. Conversely, backward linkages do not have a statistically significant effect on the firm productivity. However, both forward and backward linkages significantly impact firms' profit.

Impact of Termination of India's Bilateral Investment Treaties on Outward Foreign Direct Investment

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Bilateral investment treaties (BITs) are critical in promoting Foreign Direct Investment (FDI) flows among countries. This is especially true for FDI flows to emerging economies. Till 2015, India had signed BITs with 83 countries, of which 74 were in force. A problem with these agreements was that they were incomplete contracts, and the foreign investors in India took advantage of the inaccuracies. India developed a new Model BIT in 2015. In March 2017, India undertook a unilateral mass termination of her BITs (in two cases, termination occurred during September-December 2016, and in several other cases, during April-December 2017). The effect of these BIT terminations on India's FDI inflows has been carefully examined recently by Kotyrló and Kalachyhin (2023) and Hartman and Spruk (2023). Applying sophisticated econometric techniques to analyze the impact of the termination of India's BITs on India's inward FDI flows, these two studies found that BIT termination led to a substantial decrease in India's inward FDI flows. This paper examines econometrically the effects of BIT termination on India's outward FDI (OFDI). Data on India's OFDI have been taken from the overseas direct investment database of the Reserve Bank of India. To examine the impact of BIT termination on India's OFDI, a Gravity Model is estimated from annual data on OFDI by destination (host) country from 2011 to 2019 using the panel Tobit model. The explanatory variables considered for the analysis include the GDP of the OFDI destination (host) country, India's share in the imports of the destination country, the share of ores and metals in the destination country's total exports, the distance between India and the destination country, and the destination country's competitiveness index and degree of trade openness. The results show that the termination of BITs during 2016-2018 caused a substantial decline in India's OFDI. Confirmation of this finding is obtained by applying the Callaway and Sant'Anna (2021) difference-in-difference estimator applied to quarterly country-wise data on India's OFDI for Q1 2015 to Q4 2019, employing a staggered difference-in-difference research design. Two other findings of the study are: (a) the adverse effect of BIT termination was stronger for non-OECD countries than OECD countries, and (b) the technology-seeking portion of the OFDI by Indian enterprise was less affected by BIT termination than market-seeking or mineral-resources-seeking OFDI.

Outward Fdi And Its Impact On The Parent Firm: A Case Of Indian Manufacturing Firms

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Literature points that the participation in Global Value Chains (GVCs) is strongly linked to the ability of countries to conduct more OFDI operations and attract quality FDI. Developing economy firms which are often placed at the lower end of the value chains requires access to modern technology, sophisticated skills, and modern production processes to move up the value chain. Investing overseas, especially in developed economies, enables the firms to gain access to such state-of-the-art technology and managerial skills. Considering the importance of OFDI in enabling greater GVC participation, we study the impact of overseas investment activities of Indian

manufacturing firms on the parent firm in the home country. The study focuses on the impact of OFDI on the parent firm's participation in GVCs and domestic output. The study uses the RBI's firm-level overseas direct investment data in combination with the financial data sourced from Prowess database for the period 2008-2020. The impact of overseas investment activity on the parent firm is analysed by employing the Propensity Score Matching (PSM) method combined with the Difference-in-Difference (DID) technique. The combined approach i.e., PSM-DID, eliminates the effect of all non-random elements in deciding to invest abroad and helps deal with the self-selection issue. A sub-sample analysis based on the location of investment (developed or developing) and the mode of investment (whether investment is made through a Joint Venture or Wholly Owned Subsidiary) is also included in the study. Domestic output witnessed improvement over time after investing abroad. Results point to a positive impact on the GVC participation of the parent firm. The analysis calls for policies to encourage Indian firms to venture abroad as it may allow them to access technological and strategic assets and help them in their efforts to move up the value chain.

Emerging Trends and Macroeconomic Determinants of Outward FDI from India- Some New Facts and Evidence

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Last few decades have witnessed a growing trend in outward foreign direct investment (OFDI) by the developing countries. India has also emerged as one of the important developing countries that have steadily increased their share of overseas investment in the last two decades. However, recent trends in Indian OFDI indicate that outbound investments from India may have a different motive than learning by doing. Outward FDI from India have undergone a considerable change not only in terms of magnitude and sectoral composition but also in terms of regional concentration. Therefore, this paper has a two-fold objective. The first objective of the study is to characterise Indian OFDI to assess the overall trend patterns in outward foreign direct investment from India, with a detailed firm level analysis. The paper studies the magnitude (aggregate and sectoral), the ownership pattern of Indian firms and the regional concentration in destination patterns of Indian firms investing overseas. The highlight of this paper is the revelation of highly skewed concentration of Indian OFDI in the hands of a few Indian firms. Further, destination pattern reveal that global overseas investments by these top Indian firms are chiefly targeted into countries such as Mauritius, Singapore, British Virgin Islands and Cayman Islands, considered to be tax havens of the world. Statistical tests confirm that tax haven countries are more likely to receive high values of Indian OFDI as compared to non-tax haven countries. Investments in these countries could be due to tax evasion and meant for round tripping of capital flows into India i.e., coming back as FDI inflows, which brings us to the second objective of this paper i.e. to identify whether corporate tax rate is one of the macroeconomic determinants of Indian OFDI. Macroeconomic and policy related factors such as level of economic development, inflows of FDI, trade openness, human capital, exchange rate and corporate tax rate are assessed as determinants of Indian OFDI in this study using Granger Causality framework. Results show that corporate tax rate granges causes Indian OFDI validating the above finding that higher outflows from India are targeted to countries which have a much lower tax rate and advantageous fiscal tax regimes like Mauritius and Singapore, suggesting that outward FDI may not have been a channel of learning by doing process for India.

11.1. Innovative activity and Leveraging Industry 4.0 for Competitiveness

Exploring the Moderating Role of Technological, Organizational, and Environmental Factors on the Sustainability Applications of Industry 4.0: A Multi-level Analysis

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The implementation of Industry 4.0, driven by cutting-edge technologies like artificial intelligence; the Internet of Things (IoT); and big data analytics, represents a strategic and timely response to the challenges posed by intensifying competition and evolving customer demand in today's dynamic business landscape. This study investigates and validates the intricate relationships among diverse factors influencing the successful implementation of sustainable manufacturing practices in Industry 4.0. The rapid advancement of Industry 4.0 has engendered a paradigm shift in the manufacturing sector, presenting significant opportunities for enhancing sustainability through waste reduction, heightened energy efficiency, and the development of eco-friendly products and services. Given the scarcity of resources and adverse environmental and societal repercussions associated with conventional manufacturing approaches, the imperative of embracing sustainable manufacturing practices has gained paramount importance. The attainment of sustainability objectives in manufacturing necessitates the harmonious integration of product, process, and system considerations, which holistically address their interdependent sustainability impacts. Nevertheless, reaping the full spectrum of sustainability benefits offered by Industry 4.0 necessitates overcoming multifaceted challenges. Technological challenges arise from the substantial investments required for the adoption of Industry 4.0, infrastructure, and software, which can pose significant burdens, particularly for small and medium scale enterprises grappling with resource crunch. Organizational challenges entail transformative shifts in manufacturing practices towards flexibility and agility and investments in employee training to optimize technology utilization. Environmental challenges arise from potential negative consequences, including heightened energy consumption and the generation of electronic waste, necessitating meticulous consideration and the implementation of effective mitigation strategies. This study underscores the pivotal roles played by influential factors such as environmental regulations, labor laws, top-level management commitment, organizational restructuring, stakeholder support, and strategic roadmaps in shaping the successful implementation of sustainable manufacturing in Industry 4.0. Moreover, a comprehensive understanding of Industry 4.0's contributions to sustainable innovation hinges upon an appreciation of its technological implementation levels, the quality of functional principles, and the contextual circumstances in which businesses operate. Future research endeavours are encouraged to explore how technological, organizational, and environmental factors, at both micro (corporate) and macro (socio-regional) levels, moderate the sustainability applications of Industry 4.0. Adopting a systemic approach that integrates diverse perspectives can effectively address existing knowledge gaps concerning the nexus between Industry 4.0 and sustainable development. Additionally, it is imperative to investigate the legislative frameworks and support programs necessary for the effective management and regulation of Industry 4.0 and its technological innovations by governmental bodies and regulatory authorities. This study employs a multilevel analysis encompassing individual companies and socio-regional contexts to delve into the moderating influence of technological, organizational, and environmental factors on the sustainability applications of Industry 4.0. The research findings demonstrate that technological factors such as technology availability and expertise exert positive moderating effects on the sustainability applications of Industry 4.0. Similarly, organizational factors, including company culture and sustainability commitment, exhibited positive moderating influences. In contrast, environmental factors such as regulatory environments and public awareness of sustainability concerns exert negative moderating effects. By embracing Industry 4.0 and proactively addressing organizational and environmental challenges within the context of Industry 4.0, companies can

bolster the sustainability of their operations. This study contributes to the existing literature on Industry 4.0 and sustainability by providing a comprehensive understanding of the technological, organizational, and environmental factors shaping the sustainability applications of Industry 4.0. A multilevel analysis approach provides valuable insights into the moderating effects of these factors. Furthermore, this study underscores the potential of companies to enhance sustainability by embracing Industry 4.0. Future research endeavors could prioritize investigations of the multifaceted influences of various factors at different levels.

Determinants of ICT adoption in case of Indian manufacturing sector

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Use of ICT are changing the way businesses operate, how they are constituted, and how they compete in the global economy. The role of ICT in firms has been studied in this study by incorporating ICT adoption in India's manufacturing sector. To carry out the above, we established an unbalanced panel using CMIE prowess data from 2005 to 2022. There are two sorts of empirical analysis employed to address the aforementioned issue, namely the Probit and obit model. We discovered that the firm's size, ownership structure, profit intensity, export intensity, and net intangible assets all have a positive influence on the likelihood of ICT adoption when using a panel Probit model. The age of the firm is proven to be a negative predictor of ICT adoption. Using the panel Tobit model, on the other hand, we also investigated the intensity of ICT adoption. The findings corroborate those derived from the Probit model. Through this research, the study has discovered the numerous promoting aspects in technology adoption. As a result, policymakers were able to implement a variety of measures to reap its benefits in India's industrial sector through encouraging firm ICT adoption.

Family Firms, Innovation and Complementarity of Product Market Competition

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The paper constructs a theoretical framework suggesting a moderating impact of product market competition in determining the relationship between family ownership/control and innovation. We argue that the elimination of 'career concerns' of CEOs in firms with greater family share may explain the mechanism followed to encourage R&D investments. Empirical testing of the hypotheses is performed using data from the Indian manufacturing industry for the period 2001-2018. The findings suggest that the domestic product market competition complements the relationship between family ownership/control and R&D investments. This indicates that family firms tend to invest more in R&D as domestic product competition increases. The data suggest that the effect of family involvement on innovation is due to the reduction of managerial career concerns, as we find that managerial turnover (conditional on poor performance) is lower if family involvement is higher. This effect is significantly stronger under higher degrees of competition.

Path formation for Science, Technology and Innovation (STI): a critical evaluation of the Indian Challenge

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The author will examine some of the immediate challenges of transformation of India's system of science, technology and innovation (STI) for the benefit of industrial development of the future. STI policy researchers have pointed out that compared to China in India the intra-industry and inter-industry spillovers from foreign direct investment in R&D and manufacturing are far less significant. The key reason is the absence of parallel programmes for indigenous innovation in India. Indigenous innovation or independent innovation through the programs run in parallel has

been an integral feature of China's long-term ambitions for S&T self-reliance. In the absence of parallel programs for indigenous innovation, India's higher education institutions (HEIs) are the incubator for those who wish to go abroad and for those who wish to join the R&D centers exporting engineering R&D services to the U.S.-owned industries from the STI enclaves located in Bangalore, Hyderabad, Gurugram and Noida. Bangalore alone accounts for about 64 per cent of the patents granted to Indian inventors at the USPTO. Most of the patents have been secured by MNCs operating from India. Most of the patents technology-wise are in computer implemented inventions. Many MNCs and particularly those from the USA use now India as a base for doing R&D and creating IPRs. The export of R&D services from India grew by around 40 per cent in nominal terms per annum during the period 2004-18: export of R&D services, which were just USD 118 million in 2004, touched almost USD 4 billion in 2018. Foreign R&D centers act as more of extractive cum listening devices. The U.S. innovation system benefits much from the access to talent and publicly funded R&D activity outcomes. Absence of programs run in parallel run with the help of public procurement of indigenous innovations is virtually making a difference. The amount spent on importing technology from abroad in the form of the amount spent on royalty and technology licensing fees. There is a significant decline in the ratio of the expenditure made on domestic technology development vis-à-vis technology import. The ratio was 13.63 in 2000. It is 2.18 in 2018. Estimations of the drain taking place through the MNCs operating in the domains of seeds, pesticides, pharmaceuticals, automobile and electronics also confirm no or little benefit for indigenous or independent innovation. Currently the total number of S&T professionals working in India is about 5 lakhs, close to 2 lakhs of India's S&T personnel are working for transnational capital directed RDE activity. The PLI schemes aim to place India's industrial development trajectory more firmly within the global supply chain. Policies and programmes for indigenous or independent innovation are missing from the package of STI policies. There is the lack of continuity in the innovation bureaucracies. The absence of complementary investments in technology development from the side of industry and governmental agencies publicly funded research institutions and state owned enterprises (SOEs) will continue to encounter failures with regard to indigenous or independent innovation. The innovation policy for industrial development would require directional changes. The path formation for future industrial development demands technology development to be directed towards solving the local problems of agriculture, energy and environment, public health and the use of dispersed STI capacities and decentralization of the state capacity for the implementation of societal missions. The STI policy will have to offer a wider meaning to self-reliant development. S&T institutions will have to be redirected to achieve favorable outcomes through a very different kind of strategic alliances and collaborations which are not aiming to earn money but are aiming to contribute to plans and policies directed towards the implementation of societal missions jointly by the Union Government, State Governments and industrial firms.

Public Sector Funding of R&D and Productivity Growth in India

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India is a pioneering developing country that explicitly recognized science, technology, and innovation as a key factor in development since its independence. As well known, technological change contributes to the economic growth through productivity enhancement. Thus, the state undertakes massive investment in research and development through public funded research organizations, universities, academic institutions, and industry. Such investments are expected to support the private sector enterprises' innovation activities and catalyse the entrepreneurial spirit within an economy. During the Cold War, the importance of government led R&D gained prominence not just in USA and Russia but also in Europe. Arrow (1962) clarifies the fundamental market failures preventing laissez faire efficiency in the production of new ideas that corroborate the stance for higher R&D investment by the government. Most theoretical and empirical

scholarship on technology and R&D evolved against the backdrop of capital-rich developed economies, mainly the OECD countries. But a few studies have focused on the emerging and less developed economies especially a country like India. Thus, this study aims to analyse the dynamic interaction among total factor productivity (TFP), GDP, stocks of domestic public and private R&D in India. We apply co-integrated vector-error-correction model (VECM) (Greene, 2012) which estimates long-run relationships between the variables by the co-integrating equations, using the Johanson Trace Test and simultaneously assess the short run residuals. We extract the data for period between 1968- 2017 on public and private R&D expenditures and GDP from the Digital Repository of DST while TFP data from the Penn World Tables (PWT 9.1 version). In addition, by performing simulations for the impulse response function (IRF), we verify the aspect of crowding in and crowding out between the public and private (domestic) stocks / expenditure of R&D. Preliminary results as shown by the co-integration equations denote that the public sector R&D has positive impact on TFP. Moreover, public sector R&D has positive relation with GDP. This paper helps to understand the role of public investments in STI in fostering economic development.

11.2. MSMEs in India: Employment, Digitalisation, Exports and R&D

E-Commerce, and the Indian Retail and Manufacturing Sectors - An Empirical Analysis with a Special Focus on Organised Sector MSMEs

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The sudden boom in the e-commerce sector (due to its key players) has been questioned in several economies in the world, particularly so in India. The country's Traders' associations have complained that the sector has been growing at the expense of the offline retail sector, primarily the MSMEs. In this context, this study is one of the first attempts to analytically evaluate the significance of booming online retail on India's production economy (including both manufacturing and retail segments). The results indicate while e-commerce has assumed a significant role in positively impacting the sales of the overall retail and manufacturing sector of the country (on average) during the period 1989-2020, the same does not hold true for its MSMEs. The impact on MSMEs has been positive, though not significant – indicating the untapped potential of the MSMEs to take advantage of the growing online commerce. Similar results hold true for the overall retail and MSME retail when it comes to their international trade participation/GVCs. The findings advocate re-considering the country's e-commerce policy, which is still in its draft stage presently.

R&D And It Intensity Leveraging Msmes Performance In India: A Way To Industrial Transformation

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MSME (Micro, Small, and Medium Enterprises) forms an important part of the Indian Economy by not only contributing significantly to economic development through increased industrial output, employment, exports, innovations, etc., but also through social development by generating opportunities and proving to be the nursery of entrepreneurship through business innovations. Another feature of this sector is to provide livelihood with low capital investments and high utilization of local resources. The paper focuses on aligning their business environment with R&D

and IT to effectively avoid failures, increase revenue, reduce costs, and improve customer responses through e-business. Consequently, this study examines the performance of MSMEs after incorporating the impact of R&D intensity and IT intensity along with other variables in the model.

Digitalization and Exports: A Case of Indian Organized Sector Manufacturing MSMEs

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Does digitalization promote export intensity and facilitate export market entry of Indian manufacturing Micro, Small, and Medium Enterprises (MSMEs)? There is no academic work at the firm level documenting the nexus between digitalization and exports. We empirically address this under-researched area by using the Centre for Monitoring Indian Economy's Prowess database consisting of around 800 manufacturing MSMEs for the period 1990-2019. The summary of the findings based on the robust econometric techniques such as the System Generalized Method of Moments and Dynamic Probit Regression Model, and employing three alternative definitions of digitalization, reveals that a higher level of digitalization of an Indian manufacturing MSME increases its export intensity. Additionally, greater exposure to international markets in previous periods, increased labour productivity, technical know-how, and servicification are also associated with the greater export intensity of the firm. Also, a digitalized manufacturing MSME firm is more likely to enter the export market, vis-à-vis a non-digitalized one. In fact, the likelihood further increases if digitalization is complemented with technical knowledge. The findings advocate an urgent need for manufacturing MSMEs to go for digitalization to sustain and strengthen their contribution to the Indian economy, specifically in the post-COVID era.

Employment Status of Women in the Powerloom Sector: A case study of Varanasi, Uttar Pradesh

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This paper examines the status of employment of people in the power loom sector by assessing the multiple activities (other than the power loom) of people and their participation, especially women's participation. The objective of this study is to understand the time allocation of people (who are related to the power loom sector) in the power loom sector daily and to evaluate the factors that affect the time spent in the power loom sector. This study has focused on women's contribution to the power loom sector as well as in multiple activities and discusses gender inequality in domestic chores.

Role of Migration, Agglomeration and Urbanization on Inequality: A District-level Analysis for Haryana and Madhya Pradesh

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Migration of labor is a crucial determinant responsible for increasing wage income differentials in the formal and informal sectors. In addition to migration, the agglomeration of industries plays a significant role in income differentials. The urban agglomeration of industries has a significant impact on labor force participation. Further, rural-to-urban migration significantly contribute to higher economic growth. The paper aims at identifying various factors such as economic, social, infrastructure, migration, informal economy, urbanization etc. that determine the inequality at district level. The data for selected indicators will be tested for the two states Haryana and Madhya Pradesh for the year 2010-11, extracting data from NSS 67th round. The agglomeration of

industries is reflected by the EG-Index, net -migration from rural to urban reflects net migration. The district-wise Gini coefficients reflect the inequality prevailing in the districts. A cross-section regression analysis is performed and it is concluded that urban agglomeration, urbanization and migration have dissimilar impact on inequality at district level in both the states. Therefore, the district-level policies should be formulated so that the aim of reducing the inequality can be visualized at the grass root level.

11.3. Geography of Industrialisation and Balanced Regional Development

Impact of Agglomeration Economies on Plant Productivity - Evidence from Indian Manufacturing Sector

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The paper examines the impact of localization economies vis-à-vis urbanization economies on the productivity of manufacturing plants over time from 2005-06 to 2009-10 across 451 districts of India. Both the localization and urbanization economies have been calibrated at the plant level across 105 industries defined at the four-digit level of national industrial classification. The instrumental variable estimation technique has been implemented through generalized methods of moments (IV-GMM) on the organized sector plant-level panel data. Both the Annual Survey of Industries (ASI) 2005-06-to-2009-10-unit level data with plant identifier for the organized sector as well as the NSS 62nd round survey for the unorganized sector have been used in the empirical analysis. The paper has observed that over time localization economies have a negative and significant impact on the productivity of the organized sector plants across districts. This indicates the presence of diseconomies due to the spatial proximity of plants within the same industry and the same district, leading to the de-concentration of the organized manufacturing sector. Further while analyzing the impact of spatial co-location of organized and unorganized plants, the paper observed that the sub-contraction of labor within the same industry and same district, increase the technical efficiency of the organized sector plants belonging to low-tech, medium-low-tech, and medium-high-tech industries. Contrastingly, the urbanization economies among the unorganized sector plants are only found to increase the technical efficiency of plants belonging to the medium-high-tech industries of the organized sector.

Manufacturing Productivity in Indian States: The Role of Infrastructure, Agglomeration, and Exports

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The growth in the Indian manufacturing takes place through investment and productivity growth. The present study attempted to estimate total factor productivity (TFP) at the state / NIC 3-digit industry level during the period 2008-09 to 2019-20 for 18 states and 20 industries using the Akerberg framework of TFP estimation. Data on state as well as industry level on firm characteristics were taken from the Annual Survey of Industries (ASI) reports for the periods from 2008-09 to 2019-20. The study shows that some of the laggard industrial states have done better in terms of productivity, while some of the advanced states have seen no change in TFP. Also, there is varying growth in TFP across the industries, while some industries have shown a decline in TFP. Interestingly, the endowment of physical infrastructure has a positive impact on

TFP, but its impact was minimal, while increase in the financial and social infrastructure have no impact on states' TFP. A rise in manufacturing exports have no significant role in states' TFP.

Pattern And Determinants Of The Growth In The Size Of The Manufacturing Sector Since The 1980's: Inter-State Analysis

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Plethora of research has advanced over the years zooming in on the pivotal role of the manufacturing sector amongst the three major sectors of the economy. Owing to the enormous geographical, location, agro-climatic, social and political diasporas of India, it is very unlikely that the size and structure of manufacturing is similar if not the same across the states of India. So, this study seeks to divulge into understanding the size and growth of the manufacturing sector across the sixteen major states of India traversing over the time period from 1980-1981 to 2013-2015. The inter-state disparities in the growth and size of the manufacturing sector has been analyzed by taking into consideration different indicators, namely, the amount of fixed capital, size of the value of output and the total number of persons engaged. But the share of a state in all India manufacturing sector cannot be used as a measure of the size of the manufacturing sector in a state because this share depends not only on the size of manufacturing sector in a particular state, but also on the absolute size of its economy and population. Thereafter, the size of the manufacturing sector across the states has been studied after neutralizing for the size of the state economy and population. For this purpose two measures are used, namely, percent share of the manufacturing sector in State Domestic Product (SDP) and value of gross output of the manufacturing sector per-capita of the population of the state. Given this diversity, this comparative study makes an attempt to showcase a comprehensive disaggregated analytical picture of the disparities at a sub-national level. It proffers evidence that the disparities among the sixteen major Indian states continue to persist in the manufacturing sector depicted through the regional scheme pattern, dummy variable regression analysis, Location Quotient, σ convergence and β convergence. This study also tries to explore the significant causal factors responsible for the dispersion in the manufacturing sector among the Indian states through regression analysis, wherein the impact of literacy rate, level of development, urbanization and the like have been looked into with greater detail. Policy implications suggested for the laggard states have been to identify the caveats and implementation of policies for them should be at national level to bolster the overall growth of the manufacturing sector.

Geographical Concentration Of Indian Manufacturing Industry: Study Of Agglomeration And Co-Agglomeration Pattern

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The study explores the geographical concentration and co-agglomeration of manufacturing industries to understand inter-and intra-industry spill-overs in India. This study uses Ellison and Glaeser indexes for capturing agglomeration and co-agglomeration and discusses the challenges in the application of the indexes and adjustments required for the Indian database. This study finds that the spatial concentration of Indian manufacturing is high but declined over time. The majority of the industries within broad industry groups are not highly co-agglomerated. It can be said that in India local industrial spill-overs due to concentration are mostly group-specific, not industry-specific; hence, diversified rather than specialised local production structures boost industrial concentration.

Geographical Dispersal of Manufacturing Industry in India

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It is well known that industrial locations in India exhibit persistent geographical clustering, leading to significant regional imbalance in formal sector industrial employment. In this paper we present geographical analysis of the manufacturing industry in India using plant locations, without reference to administrative boundaries. The focus of the study is the process of dispersal of location outside dominant clusters, and into areas of low industrialisation. For an all India spatial-temporal analysis we use location data for new completed plants for all industry types from Projects Today for the period 2002 - 2018. A case study of the auto-component industry is done using the plant level directory of the Auto Component Manufacturer's Association (2016). We use the algorithm of Density Based Spatial Clustering of Application with Noise (DBSCAN) to identify plant clusters and their properties. Analysis of the Projects Today data shows that there are three distinct periods of plant completion; slow growth for the initial 6 years, accelerated growth for the next 5 years, and then decelerating growth with a sharp downturn by 2017-18. We identify cluster formation and dispersal at the all- India level for each temporal period. We show that during the accelerated growth period the following processes take place simultaneously: industrial location disperses to low industrialised regions outside identified clusters, existing cluster peripheries expand, and growth within clusters also continues. During the contraction period, locations tend to withdraw back towards the cluster cores, and cluster peripheries contract. The case of Bihar shows that some of the low industrialised areas populated during the expansion period can continue to attract new location in later low periods. We then study a case of specialisation in cluster formation, using location patterns of plants of the auto component industry. The rise of the automobile sector has been one of the success stories of Indian manufacture since the late 1990s. Auto component manufacturers have driven this growth, making it the third largest employer in formal sector manufacture. Spatial analysis of this sector shows that it forms significant clusters, and that they reside within the larger multi-industry clusters shown in Part I. Regional analysis of these patterns shows that the south region of India exhibits a larger presence of vehicle assembly plants, greater depth in ancillaries by plant size, and greater geographical dispersal of plants outside clusters, as compared to the north. The south effectively constitutes a large motor vehicle agglomeration for which the north of India is an export market. We show that, while the agglomeration advantages offered by clusters remain a powerful centripetal force for new industrial location, periods of good economic growth and strong regional characteristics can be equally strong centrifugal forces leading to location dispersal to improve regional imbalances.